

Florida Onsite Sewage Nitrogen Reduction Strategies Study

Task A.26
PNRS II Test Facility Data Summary Report No. 5

Progress Report

April 2011



HAZEN AND SAWYER Environmental Engineers & Scientists In association with



OTIS ENVIRONMENTAL CONSULTANTS, LLC

Florida Onsite Sewage Nitrogen Reduction Strategies Study

TASK A.26 PROGRESS REPORT

PNRS II Test Facility Data Summary Report No. 5

Prepared for:

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FDOH Contract CORCL

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Prepared by:



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1.0 Background

Task A of the Florida Onsite Sewage Nitrogen Reduction Strategies Study includes the evaluation of passive treatment systems to remove nitrogen from septic tank effluent. The Passive Nitrogen Removal Study II (PNRS II) is a follow-up to the previous experimental evaluations of passive nitrogen removal technologies conducted in Passive Nitrogen Removal Study I. The objective of the PNRS II study is to extend the field pilot testing of the two-stage biofiltration process that was initiated in PNRS I. A unique test facility was constructed for the purpose of this evaluation. The Task A.15 PNRS II Quality Assurance Project Plan (QAPP) documents the objectives, experimental biofiltration systems, monitoring framework, sample frequency and duration, and analytical methods to be used at the PNRS II Test Facility.

2.0 Purpose

This data summary report documents data that was collected in the PNRS II monitoring and sampling event which was conducted March 17, 2011. The corresponding sample event report was submitted as Sample Event Report No. 5, April 2011, as a deliverable under Task A.25. The monitoring event consisted of an assessment and evaluation of PNRS II operation, measurement of flowrates for all systems and flowrate adjustment if warranted, measurement of field parameters, collection of biofilter influent and effluent samples, and their analyses in a NELAC certified laboratory.

3.0 Materials and Methods

3.1 Project Site

The PNRS II Test Facility is located at the University of Florida Gulf Coast Research and Education Center (GCREC) in southeast Hillsborough County, Florida. The specially designed facility enables the simultaneous operation and performance testing of numerous biofilter treatment trains in parallel using the same wastewater source. The source of the influent wastewater is the septic tank effluent from the existing onsite wastewater

system serving the GCREC. Details of the design and construction of the PNRS II test facility were presented previously in Task A.17, A.18, A.19 and A.24 documents.

3.2 Modifications of PNRS II Systems

The results of Sample Event No. 1 through 4 and careful observation of PNRS II systems were used to formulate recommendations for modifications to the test systems at the GCREC pilot facility. The modifications that were made following Sample Event No. 4 are presented in this section. All recommendations were based on the overall goal of PNRS II: to provide functional specifications for modular biofiltration components for passive onsite nitrogen reducing wastewater treatment systems.

3.2.1 Lignocellulosic Containing Biofilters (DENIT-LS1, DENIT-LS2, DENIT-LS3, DENIT-LS4, UNSAT-IS1, UNSAT-IS2, UNSAT-IS3 and UNSAT-IS4)

The media within all the biofilters containing lignocellulosic media was replaced with new lignocellulosic material from a different source. The new lignocellulosic material was composed of sawdust and woodchip material (1-5 mm) originating from interior sections of Southern Yellow Pine and did not include bark; it was produced by sawing operations at a Florida sawmill. The one horizontal and three upflow denitrification biofilters containing lignocellulosic media were rebuilt using the same configurations and media percentages as previous. The four in-situ simulator biofilters were rebuilt in different configurations as discussed in the next section.

3.2.2 In-situ Simulator Biofilters (UNSAT-IS1, UNSAT-IS2, UNSAT-IS3 and UNSAT-IS4)

All in-situ simulator biofilters were rebuilt with revised media configurations and the new lignocellulosic media. The new media configurations will assist in optimizing the design for PNRS II mini-mounds and in-tank vertical flow biofilters featuring unsaturated media overlying saturated media. The four in-situ biofilters were each rebuilt with a similar configuration of four media layers over a total media depth of 30 in. The three bottom layers of all in situ biofilters were identical: a 12-inch mixture of 60 percent expanded clay (1.53-3 mm) and 40 percent lignocellulosic media underlain by a 2-inch layer of pea gravel, underlain in turn by a 4-inch layer of elemental sulfur pastille. The media configuration in the upper 12 in. differs in each in-situ biofilter. The new top layer media configurations are:

- o UNSAT-IS1
 - 4" Torpedo Sand (0.4 2 mm)
 - 8" Fine Sand (0.10 0.25 mm)

- o UNSAT-IS2
 - 4" Expanded Clay (1.53 mm 3.175 mm)
 - 8" Expanded Clay 1/8 as received (<3.175 mm)
- o UNSAT-IS3
 - 4" Clinoptilolite 8x14 (1.4 2.38 mm)
 - 8" Clinoptilolite 16x50 (0.3 1.2 mm)
- o UNSAT-IS4
 - 4" Torpedo Sand (0.4 2 mm)
 - 8" Fine Sand (0.10 0.25 mm)

The influent supplied to the in-situ biofilter array and surface loading rates were also changed. Influent to IS2 was changed to STE and IS4 influent was changed to nitrified effluent from single pass UNSAT-CL3. Influent to IS1 and IS3 are STE. The target surface loading rates to In-situ biofilters were 0.80 gal/ft²-day to In-Situ 1, 3 and 4 and 1.2 gal/ft²-day to In-situ 2. The dosing cycle was changed from 4 hour (6 dose/day) dosing cycle to 24 hour (24 dose/day) for all in-situ units. Sample ports were installed in IS1 and IS2 in the pea gravel separating the expanded clay & lignocellulosic mixture from the sulfur layer to enable sampling after treatment in the lignocellulosic layer but before the sulfur layer.

3.3 Monitoring and Sampling Locations and Identification

A schematic of the PNRS II test facility is shown in Figure 1. Septic tank effluent (STE) from GCREC is pumped from PNRS II-STE-T1 into the PNRS II systems through five points of entry: Hydro-1, Hydro-2, UNSAT-IS-1, UNSAT-IS-2 and UNSAT-IS3. PNRS II biofilters are grouped into the four types of systems shown in Figure 1, Group I, II, III and IV systems. The nomenclature and reactor/sample identification used for the PNRS II test facility sampling events are listed in Table 1. The sample designations listed in Table 1 also largely correspond to the locations at which flow volumes are measured in each sample event.



PNRS II Test Facility System Schematic

FLORIDA ONSITE SEWAGE NITROGEN REDUCTION STRATEGIES STUDY PNRS II TEST FACILITY DATA SUJMMARY REPORT NO. 5

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	Table 1	
Group (Figure 1)	PNRS II Sample Identification	Sample Identification
Group (Figure 1)		
	STE PNRS II Storage Tank I	
	Stage 1 Single Pass Biofilters	UNSAT-EC3
		UNSAT-CL1
		UNSAT-CL3
I		DENIT-SU4
		DENIT-LS3
	Stage 2 Single Pass Upflow Biofilters	DENIT-SU3
		DENIT-LS2
		DENIT-LS4
		RC1
		RC2
	Recirculation Tanks	RC3
		RC4
		RC5
I		UNSAT-SA2
		UNSAT-EC4
	Stage 1 Recirculating Biofilters	UNSAT-CL2
		UNSAT-CL4
		UNSAT-PS1
	Pump 15 Tank	P15-T
	Denite Feed Collection Tank	DFT
		UNSAT-SU1
III	Stage 2 Horizontal Biofilters	UNSAT-SU2
	Stage 2 Honzontal Dioliters	UNSAT-LS1
		UNSAT-GL1
		UNSAT-IS1
	In Situ In Tank Simulator Single Dass Riefilter	UNSAT-IS2
	III-Situ III-Talik Sililulator Siligie Pass Bioliller	UNSAT-IS3
N/		UNSAT-IS4
IV	In City In Tonk Cimulator Cingle Deep Disfilter	UNSAT-IS1-SP
	Sample Dort	UNSAT-IS2-SP
	Sample Full (above SI Llaver)	UNSAT-IS3-SP
		UNSAT-IS4-SP

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3.4 Operational Monitoring

Start-up of the PNRS II test facility occurred on May 17, 2010 and all systems have operated continually since that time. The entire facility operation is checked at least once per week and a detailed log of operational observations and activities is maintained. The programmable logic controller (PLC) which controls many of the dosing and pump controls also records pump run times and flow data from flow meters at the facility, and these data can provide useful insight on facility operations.

3.5 Water Quality Sample Collection and Analyses

Influent and effluent water quality samples from the PNRS II test systems for Sample Event 5 were collected March 17, 2011. A sample of STE was collected from the feed line connecting STE Storage Tank 1 (PNRS II-STE-T1) to Hydrosplitter 1 which supplies STE to the single pass Stage 1 biofilters (Figure 1). A manual dose event was initiated on the control panel until sufficient STE sample volume was collected in a clean sample container. Stage 1, 2, and in-situ simulator biofilter and recirculation tank effluents were each sampled by directing the entire flow from the biofilter into a large, clean sample container over a period of time sufficient to obtain the desired sample volume (approximately 3.5 liters). Sample containers were immediately placed in coolers on ice prior to subdivision of the composited sample.

The composite samples in the 3.5 liter sample containers were then subdivided into analysis-specific sample containers. 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 D, were used to document the transfer of samples from field personnel to the analytical laboratory. One chain of custody form was filled out for each set of samples and placed inside the cooler.

Equipment blank, field blank, and field sample duplicates were taken. The equipment blank was collected using a previously cleaned STE sample collection bottle. The bottle was filled with distilled water provided by the laboratory and allowed to sit for eight minutes. The sample containers were then analyzed for the same parameters as the samples. The field blank was collected by filling sample containers with distilled water that had been transported from the laboratory into the field along with other sample containers. The field sample duplicates were collected immediately subsequent to the regular samples from the same composite sample. The duplicate sample containers for this event were filled with PNRS II T1-STE effluent, DENIT-SU4 effluent, DENIT-LS2 effluent

ent, and DENIT-LS4 effluent. Additionally, laboratory split samples were collected immediately subsequent to the regular samples from the same composite sample. The laboratory split sample containers for this event were filled with PNRS II T1-STE effluent and UNSAT-IS2 effluent.

Field parameters were measured using portable electronic probes and included temperature (Temp), dissolved oxygen (DO), oxidation-reduction potential (ORP), pH, and specific conductance. Temperature (Temp), dissolved oxygen (DO), and oxidation-reduction potential (ORP) were measured with probe tips placed in flow through samplers located directly in the outlet pipe at each sample location. Specific conductance and pH were measured using external sample collection reservoirs. Field parameter results are listed in Appendix B. The influent and effluent samples were analyzed by the laboratory for: total alkalinity, total Kjeldahl nitrogen (TKN-N), ammonia nitrogen (NH₃-N), nitrate nitrogen, (NO₃-N), nitrite nitrogen (NO₂-N), carbonaceous biochemical oxygen demand (CBOD₅), total dissolved solids (TDS), total suspended solids (TSS), chemical oxygen demand (COD), and orthophosphate (PO₄). For some of the denitrification biofilters containing elemental sulfur media, influent and effluent sample analyses were also conducted for sulfate (SO₄) and hydrogen sulfide (H₂S). Table 2 lists the analytical parameters, analytical methods, and detection limits for these analyses.

Analytical Parameter	Method of Analysis	Laboratory Detection Limit (mg/L)
Total Alkalinity as CaCO ₃	SM 2320B	2 mg/L
Total Kjeldahl Nitrogen (TKN-N)	EPA351.2	0.05 mg/L
Ammonia Nitrogen (NH ₃ -N)	EPA350.1	0.01 mg/L
Nitrate/Nitrite Nitrogen (NO _x -N)	EPA353.2	0.01 mg/L
Carbonaceous BOD (CBOD ₅)	SM 5210B	2 mg/L
Total Dissolved Solids (TDS)	SM 2540C	10 mg/L
Total Suspended Solids (TSS)	SM 2540D	1 mg/L
Chemical Oxygen Demand (COD)	EPA 410.4	10 mg/L
Orthophosphate as P	EPA 300.0	0.01 mg/L
Total Phosphorus (TP)	SM 4500PE	0.01 mg/L
Fecal Coliform (fecal)	SM9222D	1 ct/100mL
Sulfate (SO ₄)	EPA300.0	0.2 mg/L
Hydrogen Sulfide Unionized (H ₂ S)	SM4500S F	0.01 mg/L
Sulfide	SM4500S F	0.1 mg/L

Table 2
Analytical Parameters, Method of Analysis, and Detection Limits

FLORIDA ONSITE SEWAGE NITROGEN REDUCTION STRATEGIES STUDY PNRS II TEST FACILITY DATA SUJMMARY REPORT NO. 5

3.6 Flow Monitoring

Flow rates for all PNRS II systems were calibrated at initial start-up. The flow rates are then measured and recorded at each sampling event and adjusted as necessary to maintain flow rates consistent with the experimental design following the sampling event. Flow volumes are measured just after sampling and field analyses and represent the flow rates in effect during the water quality monitoring. Flow rates are then adjusted as necessary to correspond to the target flow rates in the experimental design. For this Sampling Event, influent flow volumes were measured on March 23, 2011 and reported in the Sampling Event No. 5 Report. Flow monitoring results are presented in Appendix C.

4.0 Results and Discussion

4.1 Operational Monitoring

Start up of the PNRS II test facility occurred on May 17, 2010. The test systems have been operated continuously since the May 17th start up, with the exception of occasional power interruptions or outages (see operation and maintenance log). The power interruptions were of relatively short duration. For the most part, operation of the pilot biofilters was fully and automatically resumed when power was restored. The only exceptions are the three peristaltic pumps: Pump 5 which supplies the two In-Situ simulators UN-SAT-IS1 and IS2, Pump 10 which supplies the two column In-Situ simulators UNSAT-IS3 and IS4, and Pump 11 which supplies the four horizontal flow denitrification biofilters. Initially, the peristaltic pumps displayed an error message and required manual restarting upon disruption of the power supply; their off times were somewhat longer than the other system pumps. The peristaltic pump settings were saved through the power outage, and the same pump operation was resumed once the error code was acknowledged. The peristaltic pumps have since been reprogrammed to start automatically in the event of temporary discontinuance of the power supply. Appendix A provides the operation and maintenance log which includes actions taken since start-up. Appendix B provides summary tables of the PLC recorded data of daily runtimes and flows for the test facility between January 13th and March 16th (Day 241 through Day 303 since startup) used to check general pump operation and performance.

The recycle rates to the recirculating systems are monitored and recorded in the PLC as Pumps 6, 7, 8, 9 and 15 flows. The data shows that the recycle flows are very close to the initially set 44 gpd rate for Pumps 6, 7, 8 and 9, indicating that the desired recycle ratio of approximately 3:1 is being met. The Pump 15 flow rate is close to the target rate

of 88 gpd; however, the recycle ratio of 6:1 is not being met which is further discussed in Section 4.3.

4.2 Water Quality Analyses

Water quality analytical results for Sample Event No. 5 are listed in Table 3. Quality Control samples, including field blanks, equipment blanks, and external duplicate and lab split samples are also included in this table. Results for the blanks were examined for obvious problems with sample contamination or improper decontamination of sampling equipment. Duplicate and split samples were examined for reproducibility, and where the differences were significant relative to the sample value, the laboratory was notified and requested to verify accuracy in reporting and reanalysis of the sample was requested if warranted. Significant difference determinations for the various lab analyses were based upon a review of reproducibility data in Standard Methods and EPA guidelines as well as on experience of the project team and data accuracy requirements for this project.

Table 4 shows the results of the QC sampling for this sample event, and a calculation of the percent difference between the sample value and the duplicate/split samples. The sample results that are highlighted in this table were forwarded back to the laboratories for verification and potential reanalysis. Any changes to these data from this verification will be reflected in the next data summary report.

A summary of the water quality data collected to date for the PNRS II systems is presented in Table 5. The following discussion summarizes these results. The laboratory report containing the raw analytical data is included in Appendix D.

Influent Water Quality Water quality characteristics of STE collected in Sample Event 5 remained closer to typical STE composition than were STE samples collected earlier in the PNRS II study. Sample Event 5 STE parameters for TSS, COD, and CBOD₅ were still somewhat low, but within the range expected for domestic STE. The measured STE total nitrogen (TN) concentration was 78 mg/L, which is in the high end of the range that has been typically reported for Florida single family residence STE. The performance of the various biofilter systems was compared by considering the changes through treatment of nitrogen species (TKN-N, NH₃-N, and NO_X-N), as well as supporting water quality parameters.

Group I Single Pass Biofilters Effluent NH_3 -N levels were below 0.04 mg/L for the four Stage 1 single pass biofilters and DO levels were greater than 6.1 mg/L (Table 3) TSS

and C-BOD₅ were 2 mg/L or below in all effluents. Organic N ranged from 3.1 to 5.2 mg/L in these same four systems. NO_x was significantly increased in all Stage 1 biofilter effluents corresponding to the decrease in TKN. The four single pass biofilters performed exceptionally well in removing suspended solids, reducing organic oxygen demand, and in converting ammonium to oxidized nitrogen.

Effluent NO_X-N was less than 0.07 mg/L in four of the five Stage 2 single pass denitrification biofilters. It appears that the new lignocellulosic material was supporting denitrification similarly to the sulfur and glycerol biofilters. One of the three lignocellulosic biofilters with new media (DENIT-LS2) exhibited incomplete denitrification with effluent NO_x-N of 15 mg/L. The DENIT-LS2 biofilter is the biofilter with the least amount of lignocellulosic media (25% lignocellulosic, 75% expanded clay). DENIT-LS3 with the highest lignocellulosic media content, exhibited elevated levels of oxidizable organic matter (CBOD₅ and COD) in effluent.

The influent to the DENIT-LS4 biofilter was effluent from the recirculation pump tank for the polystyrene biofilter (UNSAT-PS1) which contained 22 mg/L NH₃-N and 14 mg/L NO_x-N. While very successfully denitrifying the relatively low influent NO_x-N, DENIT-LS4 effluent contained 14 mg/L NH₃-N. This result again confirms that NH₃-N will be readily transported through anoxic denitrification biofilters which are at the same time capable of achieving significant NO_x reduction.

Group II Stage 1 Recirculating Biofilters NH_3 -N levels were at or below 0.05 mg/L for the four recirculating Stage 1 biofilters containing clinoptilolite, expanded clay, and sand media, and effluent DO was 2.9 to 8.1 mg/L. Effluent NO_x -N ranged from 32 to 37 mg/L and organic N from 2.5 to 2.95 mg/L for these four recirculating Stage 1 biofilters. The nitrification performance of these biofilters was quite acceptable and TN reduction from recirculation (pre-denitrification) averaged 52%. TSS and C-BOD₅ were 2 mg/L or below in all effluents. The ammonia and DO concentrations in UNSAT-PS1 effluent were 15 mg/L and 0.6 mg/L, respectively, indicating incomplete nitrification. UNSAT-PS-1 also had significantly higher effluent TKN of 16 mg/L.

Group III Stage 2 Horizontal Biofilters Influent NOx-N to these biofilters (from the denite feed tank (DFT)) was 38 mg/L. Effluent NO_x-N was 0.06 mg/L and less in the four Stage 2 horizontal biofilters. The low NO_x-N were accompanied by depressed DO and ORP of -259 to -282 mV. Thus, the horizontal biofilters were effective in producing a reducing environment and achieving their NO_x-N reduction goal. DENIT-LS1 with the new lignocellulosic media exhibited complete denitrification, with effluent NO_x-N less

than 0.02 mg/L. DENIT-LS1 exhibited elevated effluent levels of oxidizable organic matter and TSS, however, this was the first effluent sample taken after replacement of the lignocellulosic media.

Group IV In-Situ Simulator Systems For UNSAT-IS1, effluent NH₃-N was 8.7 mg/L indicating incomplete nitrification. UNSAT-IS1 and UNSAT-IS3 exhibited low effluent NO_x-N of less than 0.06 mg/L. UNSAT-IS2 and UNSAT-IS4 exhibited incomplete denitrification, with effluent NO_x-N of 8.3 mg/L and 5.8 mg/L respectively. In-situ simulator effluent SO₄ concentrations were 20, 210, 200 and 170 mg/L, for IS1, IS2, IS3 and IS4 respectively. The lower effluent SO₄ concentrations from the rebuilt IS1 and IS2 suggest an improvement over the previous media configurations.

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Table 3Water Quality Analytical Results

Group (Figure 1	Sample ID	Media Composition	Analytical Laboratory	Sample Date/Time	Sample Type	Temp (°C)	pH All	Total kalinity mg/L)	DO (mg/L)	ORP (mV)	Specific Conductance (µS)	TDS (mg/L)	TSS (mg/L)	CBOD _s (mg/L)	COD (mg/L)	TN (mg/L N) ¹	TKN (mg/L N)	Organic N (mg/L N) ²	NH3-N (mg/LN)	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 Sul (mg/L P) (m	ide H2S SO g/L) (mg/L) (mg
	STE Sample														/											
	PNRS II STE-Tank 1		Southern	3/1//11 12:15	G	21.4	7.5	400	2.8	-231.7	1,099	450	110	95	380	78.05	/8	13	6	0.0	0.0	1 0.05	65.06	13	5.4	5.2 1.2
	PNRSTISTE-Tank 1-D		Southern	3/1//11 12:20	G	21.4	7.5	400	2.8	-231.7	1,099	430	13	61	430	/8.15	/8	64	14	0.14	0.0	0.15	14.15	0.2	5.4	24.2
	PINKS II S IE-Talik 1-D2		Pace	3/1//11 12:20	6	21.4	7.5	367		-231.7	1,099	430	60.0	00.0	3/2	/1.4	/1.3	15.8	57.3	0.05	0.05	0.1	57.0	0.2	ə./	3.1 20
	Stage 1 Single Pass Biofilters Effluent	15" Excanded Clay	Southorn	2/17/11 11:20	c	0.0	7.4	100		25.7	1.040	720	-		22	(0.01	20	2.000	0.007				57.045			
	UNISAT EC2	20° Expanded Clay	Southorn	2/17/11 11:30	6	9.0	7.1	210	6.0	25.7	1,048	720	4	4	16	50.91 53.21	3.9	3,803	0.03	0 0	0.0	1 57.01	57.045		1.0	
	UNISAT CL1	15" Cliportilelite	Southern	2/17/11 11:20	G	10.0	7.4	100	6.2	10.7	1,033	950			22	79.21	5.5	5.205	0.011	4	0.0	49.01	72.021		1.0	
	UNSAT-CL3	30° Clinophonte	Southern	3/17/11 11:15	6	10.6	7.4	230	7.5	8.2	1,155	850			18	66.11	3.1	3.067	0.021	6	0.0	1 63.01	63.043		3.0	
	Stage 2 Single Pass Linflow Biofilters Effluent	30 cimopulonte	Journen	5, 11, 11 11.15		10.0	1.5	2.50	1.5	0.2	1,100	0.00	-		10	00.11	3.1	5.007	0.05.		0.0	. 05.01	05.045		5.0	
	DENIT-SUA	10% Limestone: 30% Sulfur: 60% Expanded Clav	Southern	3/17/11 0:30	6	14.7	7.4	210	0.1	-231.6	1 311	1 100	1		32	1 33	13	11	0.1	0.0	0.0	1 0.03	0.23		13	1.0 0.29 5
1	DENIT-SU4-D	10% Limestone: 30% Sulfur: 60% Expanded Clay	Journem	3/17/11 9:35	6	14.7	7.4	220	0.1	-231.6	1 311	1 100		2	32	1.22	1.3	0.98	0.22	0.0	0.0	1 0.02	0.23		13	1.0 0.25 5
	DENIT-I \$3-REV	50% New Lignorellulosic: 50% Sand	Southern	3/17/11 9:25	G	17.3	7.4	410	0.8	-294.6	1.027	720		120	320	1.67	1.6	0.86	0.74	0.0	0.0	1 0.07	0.81		2.6	
	DENIT-SU3	80% Sulfur: 20% Ovster Shell	Southern	3/17/11 9:20	G	13.1	7.6	230	0.1	-285.2	1 552	1 200	6		39	3.02	3.0	1.5	1 9	0.0	0.0	1 0.02	1.52		2.3	(
	DENIT-LS2-REV	25% New Lignocellulosic: 75% Expanded Clav	Southern	3/17/11 9:10	G	14.3	8.0	350	3.4	-99.1	1.077	710	4	2	39	18.5	4.0	2.2	1.8	1	2 2	5 14.5	16.3		2.8	
	DENIT-LS2-REV-D	25% New Lignocellulosic: 75% Expanded Clav	Southern	3/17/11 9:15	G	14.3	8.0	350	3.4	-99.1	1.077	740	6	2	41	19.5	4.0	2.3	1.7	1	2.	5 15.5	17.2		2.4	
	DENIT-LS4-REV	30% New Lignocellulosic: 70% Expanded Clav	Southern	3/17/11 9:00	G	16.2	7.7	250	0.6	-195.5	835	450	10	2	90	14.03	14	0	14	0.0	0.0	1 0.03	14.03		2.2	
	DENIT-LS4-REV-D	30% New Lignocellulosic: 70% Expanded Clav	Southern	3/17/11 9:05	G	16.2	7.7	260	0.6	-195.5	835	420	10	2	76	15.03	15	1	14	0.0	0.0	1 0.03	14.03		2.1	
	Recirculation Tanks Effluent	· · · · · · · · · · · · · · · · · · ·																								-
	RC1		Southern	3/17/11 12:05	G	17.0	7.4	180	0.2	-69.7	894	530	1	2	32	36.4	14	2	12	2 2	1.	4 22.4	34.4		3.2	
	RC2		Southern	3/17/11 12:00	G	18.2	7.4	180	0.2	-67.3	904	550	2	2	34	37.2	13	1	12	2	3 1.	2 24.2	36.2		3.4	
1	RC3		Southern	3/17/11 11:55	G	17.6	7.5	230	1.5	-47.2	925	510	8	8	51	34	16	0	16	1	5.	0 18	34		6.6	
	RC4		Southern	3/17/11 11:50	G	16.9	7.8	290	0.1	-68.6	901	460	2	3	47	25.84	24	11	1	0.1	1.	7 1.84	14.84		6.1	
	RC5		Southern	3/17/11 11:40	G	16.5	7.4	230	0.5	-52.7	888	440	6	2	57	32.6	24	1	2	5.3	3.	4 8.6	31.6		5.7	
	Stage 1 Recirculating Biofilters Effluent							1																		
	UNSAT-CL4	30" Clinoptilolite	Southern	3/17/11 10:00	G	12.2	8.2	110	7.4	-98.2	860	600	1	2	16	35.71	2.7	2.694	0.006	3	0.0	1 33.01	33.016		4.9	
	UNSAT-CL2	15" Clinoptilolite	Southern	3/17/11 10:05	G	11.7	7.2	150	2.9	-48.3	900	620	1	2	22	38.95	2.8	2.794	0.006	3	0.1	5 36.15	36.156		2.3	
	UNSAT-EC4	30" Expanded Clay	Southern	3/17/11 10:10	G	14.9	7.0	110	8.1	-20.2	869	590	1	2	18	39.51	2.5	2.479	0.021	3	0.0	1 37.01	37.031		1.8	
	UNSAT-SA2	30" Sand	Southern	3/17/11 10:25	G	14.1	7.0	140	6.1	-26.5	859	560	1	2	18	35.01	3.0	2.95	0.050	3	0.0	1 32.01	32.06		2.1	
	UNSAT-PS1	30" Polystyrene	Southern	3/17/11 11:45	G	15.1	7.3	130	0.6	-49.9	845	490	2	2	51	30.7	16	1	15	1	3 1.	7 14.7	29.7		2.2	
	Pump 15 Tank (DENIT-LS4 Influent)		Southern	3/17/11 11:00	G	18.6	7.2	190	1.0	-3.5	834	480	1	4	45	37.98	24	2	2	1	0.9	8 13.98	35.98		3.8	
	Denite Feed Tank (Tank 3)								1																	
	DFT		Southern	3/17/11 11:05	G	18.8	7.2	140	7.5	5.6	891	610	1	2	22	41.31	3.3	3.235	0.065	5 31	0.0	1 38.01	38.075	9.10	1.9	1.4 0.53
	Stage 2 Horizontal Biofilters Effluent							1																		_
	DENIT-SU1	80% Sulfur; 20% Oyster Shell	Southern	3/17/11 8:16	G	7.2	7.0	250	0.1	-281.9	1,254	890	2	2	45	2.16	2.1	0.4	1.7	0.0	0.0	1 0.06	1.76		2.9	7
	DENIT-SU2	10% Limestone; 30% Sulfur; 60% Expanded Clay	Southern	3/17/11 8:20	G	5.3	7.0	190	0.5	-268.4	1,296	940	2	2	47	0.91	0.89	0.52	0.37	0.0	0.0	1 0.02	0.39		2.0	7.8 3.7 4
	DENIT-LS1-REV	50% New Lignocellulosic; 50% Expanded Clay	Southern	3/17/11 8:30	G	4.6	7.4	320	0.1	-271.5	886	630	20	150	320	1.82	1.8	1.19	0.61	0.0	0.0	1 0.02	0.63		2.0	
	DENIT-GL1	12" Gravel; 60" Expanded Clay	Southern	3/17/11 8:40	G	3.9	7.0	340	0.1	-259.0	927	540	1	. 2	36	4.92	4.9	0.8	4.1	0.0	0.0	1 0.02	4.12		3.0	
	In-situ Simulator Biofilters Effluent				A																					
	UNSAT-IS1 (receives STE)	4" Coarse Sand; 8" Fine Sand; 12" Mix (60% EC, 40% New Ligno); 4" Sulfur	Southern	3/17/11 12:45	G	10.7	7.3	400	NR	NR	999	660	2	120	240	8.96	8.9	0.2	8.7	0.0	0.0	1 0.06	8.76		5.2	
	UNSAT-IS2-SP (receives STE)	Above 4" Sulfur layer	Southern	3/18/11 13:55	G	25.8	6.6	69	0.5	-57.9	970	510	2	13	63	46.9	3.9	3.33	0.57	,		43	43.57		5.2	
	UNSAT-IS2 (receives STE)	4" EC>1.53mm; 8" EC As-Is; 12" Mix (60% EC, 40% New Ligno); 4" Sulfur	Southern	3/17/11 12:40	G	11.8	7.4	190	NR	NR	977	670	10	3	82	12.62	4.3	3.93	0.37	0.7	7.	6 8.32	8.69		0.68	1 1
IV	UNSAT-IS2-D (receives STE)	4" EC>1.53mm; 8" EC As-Is; 12" Mix (60% EC, 40% New Ligno); 4" Sulfur	Pace	3/17/11 12:45	G	11.8	7.4	204	NR	NR	977	682	6.0	3.9		12.13	3.2	2.82	0.38	0.8	8 8.	1 8.93	9.31	2.5	1.5	1.0 1
	UNSAT-IS3-SP (receives STE)	Above 4" Sulfur layer	Southern	3/17/11 12:35	G	6.2	7.6	500	NR	NR	1269	910	2	2	120	9.23	3.2	3	0.20	5.4	0.2	3 6.03	6.23		3.5	
	UNSAT-IS3 (receives STE)	4" CL 8X14; 8" CL 16X50; 12" Mix (60% EC, 40% New Ligno): 4" Sulfur	Southern	3/15/11 7:50	G	13.4	7.74	380	NR	-79.6	1481	990	1	3	96	2.57	25	0.8	170	0.0	0.0	1 0.02	1.72		2.3	
	LINSAT-ISA-SP (receives NO.)	Above 4" Sulfur laver	Southern	3/17/11 12:30	G	14.9	7.4	430	NR	NR	1087	800	2	10	80	9.51	3.5	3.2	0.30	61	0.0	1 6.01	6 31		0.46	-
	UNSAT-IS4 (receives NO ₂)	4" Coarse Sand: 8" Fine Sand: 12" Mix (60% EC, 40% New Ligno): 4" Sulfur	Southern	3/15/11 7:45	G	12.2	6.00	460	MR	10.1	1246	970		10	00	10.6	4.0	4 763	0.020		1	2 5 9	E 929		0.019	
	Eield Plank	Reagant Water	Southorn	2/17/11 10:20	-	17.2	7.0	2.0	0.2	20.9	1340	30		10	10	0.00	4.0	4.702	0.030	4.1	0.0	1 0.02	0.064		0.010	
	Field blank	Reagent Water	Southorn	2/17/11 10:45		17.0	7.5	2.0	9.3	-35.0	53	16		4	10	0.03	0.07	0.020	0.04	0.0	0.0	1 0.02	0.004	_	0.010	
Votes: 'Total Nit 'Organic 'Total Inc	rozen (TN) is a calculated value equal to the sur vitrozen (ON) is a calculated value equal to the rzanic Nitrozen (TIN) is a calculated value equa	meagent watch - Created art borte at m of TKN and NO. difference of TKN and NH. to the sum of NHs. and NO.	podden	3/17/1110.43	1	17.3	7.0	20	3.4	-20	26	10			10	0.07	0.05	0.034		0.0.			0.030		0.010	
EC: expar D.O Dis G - Grab s	ded clay, CL: clinoptilolite, PS: polystyrene, SU: solved oxygen ample	elemental sultur, LS: lignocellulosic, GL: glycerol, OS: oyster shell, NS: sodiu	m sesquicarbonate, GR	t: gravel																						
Gray-sha	ded data points indicate values below method of	detection level (mdl), mdl value used for statistical analyses						_								_	_	_		_	_	_				
Yellow-sl Orange -	aded data points indicate the reported value is shaded data points indicate too many colonies	between the laboratory method detection limit and the laboratory practica were present. The numberic value represents the dilution factor times the r	quantitation limit, val naximum reportable nu	ue used for stati umber of colonie	istical analy es.	/sis.																				
Purple-sh Blue-sha	aded data points indicate results based upon o ded data points indicate matrix spike was outsic	olony counts outside the method indicated ideal range. de typical range. All other QC criteria were acceptable.																								

Table 4
Sample Event No. 5 External QC Sample Results

Sample ID	HD Total Alkalinity TDS (mg/L)							OD₅ g/L)	CC (mg)D ;/L)	TK (mg/	'N 'L N)	NH; (mg/	⊦-N LN)	NO₃ (mg/l	-N LN)	NO (mg/	₂-N ′L N)	T (ՠք	'P g/L)	Orti (mg,	no P /L P)	SC (mg) ₄ ;/L)
	Value	% diff	Value	% diff	Value	% diff	Value	% diff	Value	% diff	Value	% diff	Value	% diff	Value	% diff	Value	% diff	Value	% diff	Value	% diff	Value	% diff
STE Lab	400		450		110		93		380		78		65		0.05		0.01		13				38	1
STE Dup	400	0.0%	430	-4.4%	130	18.2%	61	-34.4%	430	13.2%	78	0.0%	14	-78.5%	0.14	N/A	0.01	MDL			5.4			
STE Split	387	-3.3%	456	1.3%	60	-45.5%	88.8	-4.5%	372	-2.1%	71.3	-8.6%	57.5	-11.5%	0.05	MDL	0.05	MDL	8.2	-36.9%	5.7	5.6%	28.5	-25.0%
SU4 Lab	210		1100		1		2		32		1.3		0.2		0.02		0.01				1.3		510	
SU4 Dup	220	4.8%	1100	0.0%	2	N/A	2	MDL	32	0.0%	1.2	-7.7%	0.22	10.0%	0.01	N/A	0.01	MDL			1.3	0.0%		
LS2 Lab	350		710		4		2		39		4		1.8		12		2.5				2.8			
LS2 Dup	350	0.0%	740	4.2%	6	N/A	2	0.0%	41	5.1%	4	0.0%	1.7	-5.6%	13	8.3%	2.5	0.0%			2.4	-14.3%		
LS4 Lab	250		450		10		2		90		14		14		0.02		0.01				2.2			
LS4 Dup	260	4.0%	420	-6.7%	10	0.0%	2	0.0%	76	-15.6%	15	7.1%	14	0.0%	0.02	0.0%	0.01	0.0%			2.1	-4.5%		
IS2 Lab	190		670		10		3		82		4.3		0.37		0.72		7.6				0.68		210	1
IS2 Split	204	7.4%	682	1.8%	6	N/A	3.9	30.0%			3.2	-25.6%	0.38	2.7%	0.83	15.3%	8.1	6.6%			1.5	N/A	185	-11.9%
Field Blank	2		20		1		2		10		0.07		0.044		0.01		0.01		0		0.01		0	
Equipment Blank	2		16		1		2		10	6	0.05		0.016		0.01		0.01		0		0.01		0	1

Table 5Summary of Water Quality Data

Sample ID	Media Composition	Date of Start-up	Statistical Parameter	Temp (°C)	рН	Total Alkalinity (mg/L)	DO (mg/L)	ORP (mV)	Specific Conductance (µS)	TDS (mg/L)	TSS (mg/L)	CBOD ₅ (mg/L)	COD (mg/L)	TN (mg/L N) ¹	TKN (mg/L N)	Organic N (mg/L N) ² (NH3-N mg/L N)	NO3-N (mg/L N)	NO2-N (mg/L N)	NOx (mg/L N)	TIN (mg/L N) ³	TP (mg/L)	Ortho P (mg/L P)	Sulfide (mg/L)	H ₂ S (mg/L)	SO₄ (mg/L)	Fecal (Ct/100 mL)
STE Sample						J -		-		-						J _	4			_	-						
			N MEAN	24.25	ξ	3 2/2 96	1 26	-255-20	10/1 63	300.00	51.62	68.25	266.00	60.43	60.25	5 /	50.57	0.04	1	0.04	50.61	0.00	3	12.05	6 28	21 72	21605.00
STE-Tank 1		5/17/2010	STD. DEV.	24.33		83.61	1.50	-233.20	210.86	80.42	36.08	29.53	200.00	19.93	18.45	5 3.85	19.84	0.04	0.02	0.04	19.85	3.49	2	5.25	4.46	16.56	37086.23
			MIN	13.7	6.4	1 210	0.04	-308.9	649	240	15	22	210	30.031	. 30	5	20	0.02	0.01	0.01	20.023	6.6	5	5.2	1.2	2.9	80
			MAX	28.3	7.5	5 430	2.8	-231.7	1250	470	110	94	380	80.01	. 80	15	67	0.05	0.036	0.06	67.01	13	3	16	12	38	77000
Stage 1 Single Pa	ss Biofilters Effluen	t															_										
			n	5	5	5 5	5 5	4	5	5	5	5	4	5	5	5 5	5	2	2	5	5	1	L :	3	3	5	2
			MEAN	18.76		148.00	7.10	76.93	996.00	648.00	1.20	2.00	15.25	48.86	3.84	3.23	0.61	51.00	0.06	45.02	45.64	3.90	1.00	0.42	0.04	57.20	
UNSAT-EC1	15" Expanded Clay	5/17/2010	STD. DEV.			27.75	5		215.95	170.35	0.45	0.00		17.60	0.98	3 0.94	0.82	8.49	0.07	16.72	17.07						
			MIN	7.8	6.7	7 110	0 6.6	25.7	617	350	1	2	10	21.2	2.2	2 2.19	0.01	45	0.01	19	19.01	3.9	9 :	0.1	0.01	46	1
			IVIAX	28.6	/.25	180	/.9	137.5	1150	//	2	2	22	5.00	4.8	5 4.29	1.7	5/	0.11	62	63.3	3.9		. 1	0.06	67	3900
			MEAN	19.08		174.80	6.89	70.73	1060.80	696.00	1.40	2.00	13.25	50.44	3,44	1 2.95	0.49	46.50	0.01	47.00	47.49	3.90	0 1.50				
UNSAT-EC3	30" Expanded Clay	5/17/2010	STD. DEV.			57.84	1		206.54	166.82	0.55	0.00		23.19	0.96	0.57	1.07	3.54	0.00	22.24	23.16						
			MIN	6.3	6.8	3 84	6.1	22.2	712	410	1	2	10	21.2	2.2	2 2.19	0.005	44	0.01	19	19.01	3.9	9 1.5	5			1
			MAX	29.2	7.34	1 220	7.9	117	1250	850	2	2	16	85.9	4.9	3.495	2.4	49	0.01	81	83.4	3.9	9 1.5	5			4
			n	5	5	5 5	5 5	4	5	5	5	5	4	5	5	5 5	5	2	2	5	5	1	4 :	3	3	5	2
UNICAT OLD		= (+= /2010	MEAN	18.54		216.00	6.27	66.18	1130.20	716.00	2.40	2.00	17.00	44.03	3.20	3.19	0.01	52.00	0.09	40.83	40.85	8.00	1.80	0.47	0.03	53.40	
UNSAI-CLI	15" Clinoptilolite	5/1//2010	STD. DEV.			29.66		40.7	160.69	147.24	2.61	0.00		21.41	. 1.12	2 1.12	0.01	29.70	0.11	20.42	20.43			0.47	0.04	10.74	
			MAX	5.8	7.1	180	3.53	10.7	1271	4/0	1	2	10	20.7	2.6	2.595	0.005	31	0.01	72.01	72.021	8	5 1.0	0.1	0.01	57	10
			n	29.3	0.2	5 230	5 5	4	5	030	5	5	4	/0.21	. 3.2	5 5	0.021	/3	2	75.01	75.051	1	D 1.0	- 1	0.08	02	100
			MEAN	19.24		286.00	7.79	53.18	1214.40	776.00	1.40	2.00	20.00	51.08	3.06	3.05	0.01	52.00	0.04	48.02	48.03	6.80	3.00				
UNSAT-CL3	30" Clinoptilolite	5/17/2010	STD. DEV.			40.37	7		163.31	127.59	0.55	0.00		23.46	0.55	0.55	0.01	15.56	0.04	23.59	23.59						
			MIN	8.3	7.3	3 230	6.85	8.2	974	550	1	2	13	22.8	2.7	7 2.684	0.005	41	0.01	20	20.01	6.8	3	3			
			MAX	28.7	8.64	1 340	9.9	100.5	1388	850	2	2	29	82.7	· 4	3.99	0.033	63	0.07	80	80.005	6.8	8 3	8		$ \longrightarrow $	110
			n	2	2	2 2	2 2	1	2	2	2	2	10,000	2	2	2 2	2			2	2	1	L			\vdash	1
UNSAT-PS1	20" Polystyrene	5/17/2010	MEAN	27.80		220.00	2.60	60.00	200.62	345.00	3.00	4.35	48.00	43.25	26.16	1 8.30	26.20			8.75	34.95	5.90					
(old)	50 rorystyrene	5/17/2010	MIN	27	7.28	3 160	2.5	60	599	270	1.41	1.51	48	25.3	16	5 7	6.4			8.2	15.7	5.9	9				930
			MAX	28.6	7.6	5 280	2.7	60	1010	420	4	5.7	48	61.2	53	3 9.6	46			9.3	54.2	5.9	9				930
Stage 2 Single Pa	ss Upflow Biofilters	Effluent																									
			n	2	2	2 2	2 2	1	2	2	2	2	1	2	. 2	2 2	2			2	2	1	i	2	2	2	1
	80% Sulfur: 20%		MEAN	27.60		145.00	0.15	-106.60	1162.00	755.00	1.00	2.95	22.00	1.09	1.04	1 0.83	0.21			0.05	0.26	3.20)	0.95	0.31	405.00	
DENIT-SU4 (old)	Sodium Sesqui.	5/17/2010	STD. DEV.			7.07	7		329.51	275.77	0.00	1.34		0.43	0.37	7 0.23	0.15			0.06	0.21			1.20	0.42	205.06	
			MIN	27.1	6.6	140	0.1	-106.6	929	560	1	2	22	1.201	0.77	0.67	0.1			0.01	0.11	3.2	2	0.1	0.01	260	1
			n	20.1	. 7.5	1 3	3 4	-100.0	4	330	3	3.9	- 22	1.55	1.3	3 3	0.51	2	2	0.091	0.401	3.2		1.0	0.0	330	
DENUT CITA	10% Limestone;		MEAN	15.55		220.00	3.42	-77.80	1457.50	1066.67	3.00	2.00	21.67	1.19	1.13	3 0.96	0.17	0.06	0.02	0.06	0.23		1.30	0.71	0.15	496.67	
(new)	30% Sulfur; 60%	10/25/2010	STD. DEV.			17.32	2		159.56	57.74	2.65	0.00		0.24	0.21	L 0.16	0.06			0.06	0.12			0.50	0.12	70.95	
(new)	Expanded Clay		MIN	7	6.8	3 210	0.1	-231.6	1311	1000	1	2	13	0.91	0.89	0.79	0.1	0.02	0.01	0.02	0.12		1.3	0.14	0.08	420	
			MAX	21	7.4	1 240	7.8	138	1659	1100	6	2	32	1.33	1.3	3 1.1	0.22	0.1	0.03	0.13	0.35		1.3	1	0.29	560	
	E 00/		n Marani	10.02	-	220.00	1 5	4	1110.20	(70.00	4	4	10 (7	26.47	2.00	1 4	4	1 42.00	1	22.52	22.02	2.20	L			\vdash	
DENIT-LS3 (old)	Lignocellulosic:	5/17/2010	STD_DEV	19.92		16.33	2.80	56.70	267.06	210.87	1.25	4.50	18.07	20.47	2.95	2.54	0.41	43.00	0.05	23.52	23.92	3.30	, 				
	50% Sand	-,,	MIN	6.6	6.7	7 200	0.1	-79	695	370	0.50	2	11	2.01	2.0.	1.05	0.012	43	0.05	0.01	0.96	3.3	3				1
			MAX	28.1	7.7	7 240	5.4	259.3	1432	840	2	12	29	45.35	4.3	3 3.78	0.95	43	0.05	43.05	43.062	3.3	3				1
			n	1	1	1 1	L 1	1	1	1	. 1	1	1	1	. 1	L 1	1	1	1	1	1						
DENIT-LS3	50% New		MEAN	17.30		410.00	0.80	-294.60	1027.00	720.00	2.00	120.00	320.00	1.67	1.60	0.86	0.74	0.06	0.01	0.07	0.81		2.60)		┥──┤	
(new)	Lignocellulosic;	1/28/2011	STD. DEV.	17.0				204.5	1007		-	120	220	1.0		0.00	0.74	0.00	0.00	0.07	0.04					⊢−−−∔	
1	50% Sand		MAX	17.3	7.4	410	0.8	-294.6	1027	720	2	120	320	1.67	1.6	0.86	0.74	0.06	0.01	0.07	0.81		2.6	-		⊢ −−+	
			n	1/.3	1.4	410	0.8	-294.b	1027	/20	5	120	320	1.6/	1.6	0.86	0.74	0.06	0.01	0.07	0.81	1	2.0	2	2	5	
			MEAN	19.53		242.00	1.85	-233.02	1485 50	1002.00	7,20	5,80	38.50	2.51	2.45	3 1.65	0.82	0.01	0.03	0.03	0.86	6.20	230	4.70	2,38	474.00	
DENIT-SU3	80% Sulfur; 20%	5/17/2010	STD. DEV.	15.55		44.38	3	255.02	136.91	183.08	6.30	4.97	50.50	0.54	0.54	1 0.48	0.41	0.01	0.03	0.02	0.40	0.20	2.5	2.30	1.89	126.61	
	Oyster Shell		MIN	6.9	6.7	7 170	0.1	-285.2	1257	710	1	2	26	1.85	1.8	3 1.2	0.46	0.01	0.01	0.01	0.47	6.2	2 2.3	2.4	0.85	340	1
			MAX	28.4	7.6	5 280	7.7	-180	1655	1200	16	13	50	3.02	3	3 2.24	1.5	0.01	0.04	0.05	1.52	6.2	2 2.3	7	4.5	650	e

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Sample ID	Media Composition	Date of Start-up	Statistical Parameter	Temp (°C)	рН	Total Alkalinity (mg/L)	DO (mg/L)	ORP (mV)	Specific Conductance (µS)	TDS (mg/L)	TSS (mg/L)	CBOD _s (mg/L)	COD (mg/L)	TN (mg/L N) ¹	TKN (mg/L N)	Organic N (mg/L N) ²	NH3-N (mg/L N)	NO ₃ -N (mg/L N)	NO2-N (mg/L N)	NOx (mg/L N)	TIN (mg/L N) ³	TP (mg/L)	Ortho P (mg/L P)	Sulfide (mg/L)	H ₂ S (mg/L)	SO₄ (mg/L)	Fecal (Ct/100 mL)
			n	2	2	2	2	1	. 2	2	2	2	1	2	2	2	2			2	2	1					1
DENIT-LS2	50%	E (47 /2010	MEAN	27.25		375.00	2.10	-11.50	1223.00	680.00	5.00	3.75	24.00	17.45	2.25	1.99	0.27	r		15.20	15.47	5.70					
(original)	Lignocellulosic;	5/1//2010	STD. DEV.			7.07			318.20	240.42	5.66	2.47		20.72	1.20	1.15	0.05			19.52	19.57						
	50% Expanded Clay		MIN	27.2	7.8	370	0.1	-11.5	998	510	1	2	24	2.8	1.4	1.17	0.23			1.4	1.63	5.7					1
			MAX	27.3	8.14	380	4.1	-11.5	1448	850	9	5.5	24	32.1	3.1	2.8	0.3			29	29.3	5.7					1
	250/		n McAN	15 43	3	220.00	3	5	1015 (7	2 000 00	1.50	2 00	21.00	21.70	2 25	210	2	41.00	1	20.54	20.02						1
DENUT LS2 (old)	25%	10/25/2010		15.43		330.00	4.47	00.37	1315.07	820.00	1.50	2.00	21.00	31.79	3.25	3.10	0.09	41.00	0.07	28.54	28.03						
DENTI-L32 (Olu)	75% Expanded Clay	10/23/2010	STD. DEV.	6.0	7.2	14.14	4.1	125	124.24	20.57	0.71	0.00	16	10.95	0.78	2.615	0.01	. 41	0.07	1/./3	17.72						1
	75% Expanded citay		MAX	21.5	7.5	340	4.1	262.1	1447	860	2	2	26	13.0	2.7	2.013	0.083	41	0.07	41.07	/1 155						1
			n	1	7.01	340	1	205.1	1	1	1	1	1	45.77	3.0	5.7	0.1	1	0.07	41.07	41.155		1				-
	25% New		ΜΕΔΝ	14 30		350.00	3.40	-99.10	1077.00	710.00	4.00	2 00	39.00	18 50	4.00	2 20	1.80	12.00	2 50	14 50	16 30		2.80				
DENIT-LS2	Lignocellulosic:	1/28/2011	STD_DEV	14.50		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00				
(new)	75% Expanded Clav	-,,	MIN	14.3	8	350	3.4	-99.1	1077	710	4	2	30	18.5	4	2.2	1.8	12	2.5	14.5	16.3		2.8				
	,		MAX	14.3	8	350	3.4	-99.1	1077	710	4	2	30	18.5	4	2.2	1.8	12	2.5	14.5	16.3		2.8				
			n	5	5	4	5	4	5	4	4	4	3	4	4	4	4	1	1	4	4	1					2
	30%		MEAN	20.12		242.50	2.28	-49.78	897.40	410.00	30.50	4.28	25.67	31.84	28.50	12.68	15.83	3.10	0.29	3.34	19.17	6.90					
DENIT-LS4 (old)	Lignocellulosic;	5/17/2010	STD. DEV.			80.98			197.05	95.57	58.34	3.35		24.75	25.96	14.41	12.06	5	0.20	4.58	12.19	0.00					
	70% Expanded Clay		MIN	7.4	7.3	180	0.4	-137.8	618	270	1	2	20	14.01	12	2.5	5.8	3.1	0.29	0.01	5.81	6.9					1
			MAX	28.1	7.62	360	5.2	81	1120	480	118	9.1	35	67.17	67	34	33	3.1	0.29	9.8	33.17	6.9					12
			n	1	1	1	1	1	. 1	1	1	1	. 1	1	1	1	. 1	1	1	1	1		1				
05117164	30% New		MEAN	16.20		250.00	0.60	-195.50	835.00	450.00	10.00	2.00	90.00	14.03	14.00	C	14.00	0.02	0.01	0.03	14.03		2.20				
DENII-LS4	Lignocellulosic;	1/28/2011	STD. DEV.																					1			
(new)	70% Expanded Clay		MIN	16.2	7.7	250	0.6	-195.5	835	450	10	2	90	14.03	14	C	14	0.02	0.01	0.03	14.03		2.2				
			MAX	16.2	7.7	250	0.6	-195.5	835	450	10	2	90	14.03	14	C	14	0.02	0.01	0.03	14.03		2.2				
Recirculation Tar	nks Effluent	[-	-		-														-				1		1	
			MEAN	21.12		184.00	4	-25.49	908.40	502.00	3 40	4.76	30.00	36.70	15.00	4.26	10.74	17.50	0.07	21 70	22.52	5.80	3.20				2
RC1		5/17/2010	STD DEV	21.12		194.00	0.56	-53.40	152 21	98.84	2.61	4.70	50.00	10.07	2 12	4.20	2 00	17.50	0.57	0.43	11 70	3.00	5.20				
nei		5, 17, 2010	MIN	7.2	7.2	16.17	0.02	-128.3	637	30.04	2.01	3.60	27	26.52	2.12	5.23	2.50	1/	0.52	5.45	11.75	5.9	3.2				114
			ΜΔΧ	30.8	7.4	210	2.1	57	1011	580	7	11	37	53	17	93	13	21	1.4	36	49	5.8	3.2				8200
			n	50.0	5	5	4	4	5	5	5	5	4	5	5	5.5	5	2	2	5		1	1				2
			MFAN	21.16	-	182.00	1.10	-30.50	926.80	522.00	2.40	4.60	33.50	35.28	15.40	3.74	11.66	19.50	0.71	19.88	31.54	4.20	3.40				-
RC2		5/17/2010	STD. DEV.			26.83			147.33	102.81	1.14	3.58		6.91	2.61	4.04	3.72			5.50	8.68						
			MIN	7.4	7.1	140	0.1	-108.2	679	340	1	2	24	27	13	0	5.3	16	0.22	12	17.3	4.2	3.4				99
			MAX	30.5	7.4	210	2.5	58.5	1031	590	4	9	41	43	19	9.7	15	23	1.2	24.2	38	4.2	3.4				9100
			n	5	5	5	4	4	5	5	5	5	4	5	5	5	5	2	2	5	5	1	1				2
			MEAN	20.72		214.00	1.48	19.40	968.60	514.00	6.80	6.86	49.25	34.08	15.00	4.36	10.64	13.50	3.70	19.08	29.72	6.40	6.60				
RC3		5/17/2010	STD. DEV.			37.15	100		138.18	90.72	4.32	4.14		7.16	3.00	4.36	3.90			8.24	9.25						
			MIN	7.4	6.9	160	0.1	-47.2	760	360	1	2	30	27	12		5.5	13	2.4	11	16.5	6.4	6.6				109
			MAX	30.2	7.61	260	23	89	1128	590	13	12	61	45	19	10 5	16	14	5	33	41 7	6.4	6.6				13000
			n	50.2	5	5	4	4	5	5	5	5	4		5	10.5	5	2	2	5		1	1				23000
			MFAN	20.82	-	246.00	0.60	-17.05	992.80	534.00	9.80	4.34	39.75	31.47	17.20	6.22	10.98	5.07	2.60	14.27	25.25	6.70	6.10				-
RC4		5/17/2010	STD. DEV.			45.61			130.77	97.88	8.01	2.65		5.17	4.66	4.29	4.09			9.24	9.06						1
			MIN	8.3	7.3	180	0	-121.9	811	400	2	2.7	26	25.84	11	2	5.5	0.14	1.7	1.84	14.84	6.7	6.1				112
			MAX	30.4	7.8	290	1.9	73	1112	620	21	9	57	38	24	11	. 16	10	3.5	27	35.4	6.7	6.1				8700
			n	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	3	3		1				1
1 '			MEAN	15.47		236.67	1.77	-25.80	956.00	473.33	11.00	8.67	58.33	38.17	28.00	3.33	24.67	5.75	2.50	10.17	34.83		5.70)			
RC5		5/17/2010	STD. DEV.			20.82	1.42	110.83	84.07	30.55	5.20	7.02	2.31	6.30	3.61	2.52	2.89	0.78	1.27	3.34	6.22						
1 '			MIN	7.9	7.1	220	0.5	-120.7	888	440	8	2	57	32.6	24	1	23	5.2	1.6	7.9	30.9		5.7				12700
			MAX	22	7.4	260	3.3	96	i 1050	500	17	16	61	45	31	6	28	6.3	3.4	14	42		5.7				12700

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Sample ID	Media Composition	Date of Start-up	Statistical Parameter	Temp (°C)	рН	Total Alkalinity (mg/L)	DO (mg/L)	ORP (mV)	Specific Conductance (µS)	TDS (mg/L)	TSS (mg/L)	CBOD _s (mg/L)	COD (mg/L)	TN (mg/L N) ¹	TKN (mg/L N)	Organic N (mg/L N) ²	NH3-N (mg/L N)	NO3-N (mg/LN)	NO2-N (mg/L N)	NOx (mg/L N)	TIN (mg/L N) ³	TP (mg/L)	Ortho P (mg/L P)	Sulfide (mg/L)	H ₂ S (mg/L)	SO ₄ (mg/L)	Fecal (Ct/100 mL)
Stage 1 Recircula	ting Biofilters Efflue	ent																									
			n	5		5 5	5	4	5	5	5	5	5 4	5	5	5	5	2	2	5	5 5	5 1	L 1				
UNISAT CLA	20" Clinontilolito	E/17/2010	MEAN	20.10	0	188.00	8.16	11.40	980.80	616.00	2.40	2.00	13.25	34.41	2.40	2.39	0.01	34.50	0.08	32.01	32.02	7.60	4.90				
UNSAT-CE4	so chiloptilonte	5/17/2010	MIN	7.9	6.72	2 110	7.1	-98.2	132.41	480	3.13	0.00	11	10.3	2.1	2.09	0.001	2.12	0.10	14.00	7.921	7.6	5 4.9				
			MAX	29.3	8.2	2 270	11	55.5	1174	680	8	2	16	45.1	2.7	2.694	0.021	36	0.15	43	43.01	7.6	5 4.9				
			n	5		5 5	5	4	5	5	5	5	5 4	5	5	5	5	2	2	5	5 5	i 1	L 1				:
UNICAT CLO		F/17/2010	MEAN	18.94		170.00	5.86	-14.20	944.20	588.00	1.60	2.20	21.00	37.34	2.46	2.45	0.01	31.50	0.19	34.88	34.89	7.10	2.30				
UNSAT-CL2	15" Clinoptilolite	5/1//2010	STD. DEV. MIN	9.56		34.64	2.9	-88.9	106.06	84.68 440	0.89	0.45	16	14.98	0.47	0.47	0.01	6.36	0.06	14.76	14.76	71	23				
			MAX	27.1	7.8	5 200	7.9	50.2	1050	650	3	3	24	56.3	3.1	3.09	0.019	36	0.23	54	54.005	7.1	2.3				73
			n	5		5 5	5	4	5	5	5	5	5 4	5	5	5	5	2	2	5	5 5	5 1	L 1				
			MEAN	20.00)	138.00	7.90	4.08	894.00	568.00	1.20	2.00	14.25	36.90	2.40	2.38	0.02	33.50	0.26	34.50	34.52	3.80	1.80				
UNSAT-EC4	30" Expanded Clay	5/17/2010	STD. DEV.			19.24			139.55	125.18	0.45	0.00		12.25	0.36	0.36	0.01	4.95	0.35	12.05	12.05	5					
			MIN	7	6.9	9 110	6.9	-88.8	661	350	1	2	2 10	18.9	1.9	1.89	0.005	30	0.01	17	17.01	3.8	3 1.8				
			MAX	28.5	7.28	5 5	10	78.8	1000	660	2	2	18	52.3	2.9	2.89	0.038	37	0.5	50	50.005	3.8	1.8				2
			MEAN	19.54		126.00	7.33	9.85	849.20	537.60	3.40	2.20	17.25	32.74	3.00	2.71	0.29	28.50	0.36	29.74	30.04	6.30	2.10				
UNSAT-SA2	30" Sand	5/17/2010	STD. DEV.			18.17			141.51	121.53	5.37	0.45		9.01	0.49	0.45	0.37	4.95	0.49	8.53	8.64	l					
			MIN	6.2	6.04	4 110	6.1	-70.8	604	330	1	2	13	19.2	2.2	2.19	0.01	25	0.01	17	17.01	6.3	3 2.1				:
			MAX	28.2		/ 150	9.6	89.2	953	638	13	3	22	41.5	3.5	3.29	0.74	32	0.71	38	38.74	6.3	3 2.1				4
			n MFAN	14.90		3 3	4.53	3.87	908.33	510.00	5.33	6.00	47.33	52.33	20.33	3.00	17.33	11.50	1.50	32.00	49.33	5	2.20				
UNSAT-PS1	30" Polystyrene	10/22/2010	STD. DEV.			40.41			55.75	34.64	3.51	5.29	9	39.57	6.66	3.46	3.21	2.12	0.28	32.95	36.10)					
(new recirc)			MIN	5.8	7.2	2 130	0.6	-49.9	845	490	2	2	39	28.3	16	1	15	10	1.3	11.3	27.3	8	2.2				950
			MAX	23.8	5 7.3	3 200	7.8	90	950	550	9	12	52	98	28	7	21	13	1.7	70	91	L	2.2				950
Pump 15 Tank			n MEAN	14 77		3 3	4 92	3	3	E12 22	3	3	3 3	3	32.00	3	19.67	12.00	1.00	15 72	3 3	3	2 90				
(DENIT-LS4		10/22/2010	STD. DEV.	14.77		5.77	4.05	= 3.67	68.01	35.12	2.52	3.79	35.07	4.41	1.73	1.15	2.89	12.00	0.16	4.65	4.61	,	5.60	-			
Influent)		., ,	MIN	5		7 190	1	-26.9	834	480	1	3	33	33.2	21	. 2	17	11	0.98	12.2	29.2	2	3.8				3900
			MAX	20.7	7.4	4 200	7.1	18.8	970	550	6	10	45	42	24	4	22	13	1.2	21	38	3	3.8				3900
Denite Feed Tan	k (Tank 3)					-	-																				
			n	5	5	5 5	5	4	5	5	5	5	5 4	5	5	5	5	2	2	5	5 5	5 2	2 1	. 4	4	5	
DET		E/17/2010	MEAN	19.74		158.00	8.06	13.10	917.00	576.00	1.00	2.00	27.00	31.25	3.04	2.98	0.06	33.50	0.04	28.21	28.28	3 7.80	1.90	0.65	0.16	58.80	
DFI		5/1//2010	MIN	6.4		20.83	7.31	-40.9	107.55	390	0.00	0.00	18	10.88	2.4	2.346	0.07	0.30	0.04	11.06	16.17	6.9	5 1.9	0.00	0.01	9.20	
			MAX	28.1	8.06	5 200	9.8	62.2	1020	660	1	2	46	42.8	3.5	3.33	0.17	38	0.06	40	40.01	9.1	L 1.9	1.4	0.53	67	2
Stage 2 Horizont	al Biofilters Effluent																										
			n	5		5 🔬 5	5	4	5	5	5	5	5 4	5	5	5	5	2	2	5	5 5	5 1	1 1	. 3	3	5	
	80% Sulfur; 20%		MEAN	17.60		228.00	0.71	-275.08	1249.80	842.00	1.20	15.60	45.00	2.46	2.34	0.98	1.36	0.08	0.13	0.12	1.48	5.00	2.90	23.67	10.73	336.00	
DENIT-SU1	Oyster Shell	5/17/2010	STD. DEV.			19.24	0.67		143.19	132.74	0.45	10.33	8	0.38	0.34	0.74	0.77			0.14	0.67	,		6.11	1.42	87.64	
			MAX	0.2	7.19	5 200	0.1	-317.2	1080	1000	1	26	62	2.04	1.9	0.3	0.46	0.05	0.01	0.01	0.81		2.9	1/	9.2	230	
			n	20	7.1	2 2	2	1	2	2	2	20	1	2.55	2.7	2.14	2.4	0.11	0.24	2	2.44		, <u>2.</u> ,	23	2	430	
	200/ Sulfur: 200/		MEAN	26.35		235.00	0.87	-279.00	1400.00	810.00	1.50	12.45	50.00	4.11	1.50	1.04	0.47			2.61	3.08	4.80	D	7.05	3.36	305.00	
DENIT-SU2 (old)	Sodium Sesqui.	5/17/2010	STD. DEV.			35.36			2.83	169.71	0.71	10.68	3	3.24	0.42	0.22	0.64			3.66	3.02	2		9.83	4.73	233.35	
			MIN	24.8		7 210	0.5	-279	1398	690	1	4.9	50	1.825	1.2	0.88	0.01			0.025	0.945	4.8	3	0.1	. 0.01	140	
			MAX	27.9	9.08	8 260	1.23	-2/9	1402	930	2	20	50 50	6.4	1.8	1.19	0.92	2	2	5.2	5.21	4.8	5	14	6.7	4/0	
	10% Limestone;		MEAN	10.37		200.00	0.77	-190.20	1258.67	893.33	3.67	3.33	29.67	0.95	0.91	0.68	0.23	0.01	0.03	0.04	0.27	,	2.00	4.37	2.10	396.67	
DENIT-SU2 (new)	30% Sulfur; 60%	10/25/2010	STD. DEV.			10.00			114.65	136.14	3.79	2.31		0.20	0.18	0.14	0.18	0.00	0.03	0.02	0.18	3		3.40	1.89	95.04	
(new)	Expanded Clay		MIN	0.3	6.8	B 190	0.2	-268.4	1130	740	1	2	18	0.77	0.74	0.52	0.033	0.01	0.01	0.02	0.063	8	2	1	0.01	300	
			MAX	25.5		7 210	1.6	-90	1350	1000	8	6	47	1.16	1.1	0.8	0.37	0.01	0.05	0.06	0.39		2	7.8	3.7	490	
	5.0%		N MEAN	17.60		226.00	0.49	-127.05	921 20	507.50	1.00	12 19	26.00	16.22	2 10	1.80	0 30	22.00	0.10	14.22	14 52	0.46					
DENIT-LS1 (old)	Lignocellulosic:	5/17/2010	STD. DEV.	17.00		220.00	0.45	-127.05	123.69	95.35	0.00	23.95	20.00	14.21	0.56	0.89	0.30	22.00	0.10	13.79	13.43	0.40	1				
	50% Expanded Clay		MIN	0.3	6.8	B 190	0.09	-199.7	738	370	1	2	16	1.539	1.5	0.74	0.005	22	0.1	0.01	0.71	0.46	5				3
			MAX	27.3	7.1	7 250	1.1	-15.4	1076	590	1	56	5 44	33.7	2.7	2.695	0.76	22	0.1	31	31.024	0.46	5				1
			n	1	. :	1 1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	-	1				
DENIT-LS1	50% New	4 (20 /20) : :	MEAN	4.60)	320.00	0.10	-271.50	886.00	630.00	20.00	150.00	320.00	1.82	1.80	1.19	0.61	0.01	0.01	0.02	0.63	3	2.00				
(new)	Lignocellulosic;	1/28/2011	STD. DEV.					271 5		c 20		450	200	1.00		1.40	0.61	0.04	0.01	0.00	0.00	1	-	-			
	5570 Expanded Clay		ΜΔΧ	4.6	7.4	4 320	0.1	-2/1.5	886	630	20	150	320	1.82	1.8	1.19	0.61	0.01	0.01	0.02	0.63	1	2	-	1		
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Sample ID	Media Composition	Date of Start-up	Statistical Parameter	Temp (°C)	рН	Total Alkalinity (mg/L)	DO (mg/L)	ORP (mV)	Specific Conductance (µS)	TDS (mg/L)	TSS (mg/L)	CBOD ₅ (mg/L)	COD (mg/L) (TN mg/L N) ¹	TKN (mg/L N)	Organic N (mg/L N) ²	NH3-N (mg/L N)	NO3-N (mg/LN)	NO ₂ -N (mg/L N)	NOx (mg/L N)	TIN (mg/L N) ³	TP (mg/L)	Ortho P (mg/L P)	Sulfide (mg/L)	H ₂ S (mg/L)	SO4 (mg/L)	Fecal (Ct/100 mL)
LINSAT-IS4-SP			n Marani	5 10	1	100.00	12.00	25.10	1050.00	710.00	1 00	1	1	52.40	1	1	1	1	2.00	40.00	1 40.00					1	
(receives NO ₄)	Sample Port above	10/18/2010	STD DEV	5.10		100.00	12.00	35.10	1050.00	/10.00	1.00	2.00	22.00	52.40	3.50	3.40	0.10	46.00	2.90	48.90	49.00	-				92.00	
(receives NO ₃)	3" Sulfur layer	10/10/2010	MIN	5.1	6.6	100	12	35.1	1050	710	1	2	22	52.4	3.5	3.4	01	46	2.9	48.9	49					92	
(oiu)			MAX	5.1	6.6	100	12	35.1	1050	710	1	2	22	52.4	3.5	3.4	0.1	46	2.9	48.9	49					92	
			n	3	3	3	3	3	3	1	1	2	2	4	4	4	4	1	1	4	4					4	
UNSAT-IS4	12" Sand; 10" Mix		MEAN	12.77	7.20	246.67	3.59	160.90	707.34	620.00	7.00	2.00	32.00	16.17	1.49	1.42	0.07	0.11	0.01	14.68	14.75					307.50	
(receives NO ₃)	(60% EC, 40%	10/18/2010	STD. DEV.		0.24	41.63			616.33			0.00		18.59	0.56	0.58	0.03	~		18.11	18.08					185.90	
(old)	Ligno); 3" Sulfur)		MIN	8.4	7.05	200	0.84	150.4	0.01	620	7	2	29	0.99	0.87	0.778	0.036	0.11	0.01	0.12	0.212					110	
			MAX	18.3	7.48	280	8.96	179.5	1129	620	7	2	35	43.1	2.1	2.064	0.092	0.11	0.01	41	41.036					490	
			n	1	1	1			1	1	1	1	1	1	1	1	1	1	1	1	1		1			1	
UNSAT-IS4-SP	Sample Port above		MEAN	14.90		430.00			1087.00	800.00	20.00	10.00	80.00	9.51	3.50	3.20	0.30	6.00	0.01	6.01	6.31		0.46	i		120.00	
(receives NO ₃)	4" Sulfur laver	1/28/2011	STD. DEV.																								
(new)			MIN	14.9	7.4	430			1087	800	20	10	80	9.51	3.5	3.2	0.3	6	0.01	6.01	6.31		0.46			120	
			MAX	14.9	7.4	430			1087	800	20	10	80	9.51	3.5	3.2	0.3	6	0.01	6.01	6.31		0.46	i		120	
	4" Coarse Sand; 8"		n	1	1	1		1	1	1	1		1	1	1	1	1	1	1	1	1		1			1	
UNSAT-154	Fine Sand; 12" Mix		MEAN	12.20		460.00		19.10	1346.00	870.00	44.00	10.00	88.00	10.60	4.80	4.76	0.04	4.60	1.20	5.80	5.84		0.02			170.00	
(receives NO ₃)	(60% EC, 40% New	1/28/2011	STD. DEV.	12.2	C 00	400		10.1	1246	070		10	00	10.0	4.0	4.702	0.020	4.0	1.2		5.020		0.010			170	
(new)	Ligno); 4" Sulfur		MIN	12.2	6.99	460		19.1	1346	8/0	44	10	88	10.6	4.8	4.762	0.038	4.6	1.2	5.8	5.838		0.018			170	
Notori			IVIAX	12.2	0.99	400		19.1	1340	8/0	44	10	00	10.0	4.8	4.702	0.038	4.0	1.2	5.8	5.838		0.018			1/0	
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Purple-shaded d	lata points indicate re	esults based of		Ints outsid	e the met	hod indica	ted ideal r	ange.																			

4.3 Flow Monitoring

Influent and effluent flows were measured, recorded, and adjusted as necessary to maintain flow rates consistent with the experimental design following the sampling event. Flow measurements and adjustments are made following collection of liquid samples and field parameter analyses.

A flow test was conducted March 23, 2011. These flow measurements are considered to represent those in effect leading up to and during the Sample Event 5. The measured volumes and relative errors between measured and target flow rates are presented in Appendix C, Table 1. For the Group I systems, measured STE inputs to four of the five Stage 1 biofilters were close to the 15% operational target that is considered acceptable for PNRS II flow rates. The measured influent volume of UNSAT-PS1 was – 59.5% of the target volume. The UNSAT-PS1 biofilter conversion to a recirculating biofilter system required that the tubing from the Hydrosplitter be connected to an elevated recirculation tank which is different from the other 4 single-pass biofilters connected to the same Hydrosplitter. Therefore, it has been observed that the influent volume significantly decreases to UNSAT-PS1 over time which is most likely caused by the difference in hydraulic head. With the abandonment of UNSAT-PS1, this problem should be fixed.

Measured effluent volumes for Stage 1 single pass biofilters (Stage 2 influent) for three of the five biofilters were within 16% of the target volume. DENIT-LS2 and DENIT-SU3 were -23.9% and -31.9% of the target volume respectively (Appendix C, Table 1). Poss-ible reasons for the reduced volume into the directly connected Stage 2 biofilters include flow measurement methodology, leaks, clog in the pipe, etc. This issue will be further investigated.

For the Group II systems, all measured STE volumes to the Stage 1 recirculation tanks were within 16% of target volumes. Four of the five recycle flow volumes as recorded by the PLC were within 7% of target volumes based on the experimental design recycle ratio of 3.0. The recycle flow to recirculation system 4 was 0. An air lock was preventing the pump from running. The calculated recycle ratios (i.e. recycle flow volume divided by the STE flow volume) for three of the five recirculation systems were within 18% of the target recycle ratio of 3.0. Although the recycle rate to the UNSAT-PS1 was close to target, the recycle ratio was high due to the low influent STE flow that was previously discussed.

For Group III systems, the measured influent volumes to the Stage 2 horizontal denitrification biofilters were all within 4% of target. For Group IV biofilters, the UNSAT-IS1 measured influent volume was within 10% of the target volume. The UNSAT-IS2 measured influent volume was low but within 20% of the target volume. UNSAT-IS1 and IS2 biofilters are currently dosed from the same peristal-tic pump. The target hydraulic loading rates for IS1 and IS2 were 0.8 gal/SF-day and 1.2 gal/SF-day respectively. Therefore, the ability to provide different volumes to the two bio-filters is accomplished by using different tubing diameters. As observed in this sample event, neither of the target loading rates was met. Therefore, IS1 and IS2 target hydraulic loading rates were revised to 1.08 and 1.11 gal/SF-day which are the loading rates the tubing is able to provide. The UNSAT-IS3 and UNSAT-IS4 measured influent volumes were within 20% of target volumes.

After evaluating the influent flow test results, a few maintenance items were conducted:

- Peristaltic Pump 10 pump tubing to IS1 and IS2 was calibrated March 24th
- Peristaltic Pump 11 pump tubing to IS3 and IS4 was calibrated March 23rd
- Recirculation Pump 9 to recirculation system 4 was fixed on March 23rd
- Hydrosplitter tubing to UNSAT-PS1 recirculation tank (RC5) was revised to original position to Stage 1 single-pass influent located at the top of the UNSAT-PS1 biofilter on April 8th. The UNSAT-PS1 biofilter media will be replaced with clinoptilolite media.
- Hydrosplitters 1 and 2 were calibrated April 8th.

The flows were rechecked after modifications to the systems were made and are provided in Appendix C, Table 2.

5.0 PNRS II Sample Event No. 5: Summary and Recommendations

5.1 Summary

The results of the fifth sampling event serve to confirm that the experimental systems are functioning as intended and provide the basis upon which to make system adjustments and modifications. The Sample Event No. 5 results indicate that:

- Delivered flowrates to all biofilters continued to be generally within 15% of target;
- Septic tank effluent (STE) quality supplied to PNRS II systems is reasonably characteristic of typical household STE quality due to system modifications;
- Eight out of nine Stage 1 unsaturated biofilters produced effluent NH₃-N of 0.5 mg/L or less;

Eight out of nine Stage 2 saturated biofilters produced effluent NO_x-N of 0.07 mg/L or less;

These results provide continuing support of the nitrogen reduction potential of the PNRS II biofiltration systems. Where expected or desired PNRS II outcomes are not being achieved, they appear to be due to tractable issues can be addressed, as discussed in the following sections.

5.2 Recommendations

Careful observation of PNRS II systems and the results of Sample Events No. 1 through 5 were used to formulate recommendations for adjustments and modifications to the test systems and the GCREC pilot facility. The issues to be addressed, recommended modifications and their rationale, and expected outcomes are presented below. Recommendations are made for each of the PNRS II performance issues that have been identified. It is believed that each issue can be resolved by implementing the recommendations. All recommendations are based on the overriding PNRS II goal of providing functional specifications for modular biofiltration components for passive onsite nitrogen reducing treatment systems. The project team will continuously evaluate all PNRS II results including those that particularly result from implementation of the recommendations and make further adaptations as needed.

5.2.1 Polystyrene Biofilter (UNSAT-PS1)

In Sample Event 5, the unsaturated recirculating biofilter with polystyrene media (UN-SAT-PS1) continued to exhibit poor nitrogen performance as compared to the other stage one media. Performance of the polystyrene media improved after switching to recirculation, and improved further after increasing the recycle rate to 5:1. Further improvements may result from even higher recycle rates, but the energy and control requirements from the system would then not satisfy the "passive" objectives of the project. Therefore, it is recommended to discontinue this system.

5.2.2 DENIT-LS2

The DENIT-LS2 upflow denitrification biofilter with new lignocellulosic media continued to show limited NO_x reduction in Sample Event 5. This is the Stage 2 biofilter containing the smallest percentage of lignocellulosic media (25% lignocellulosic media mixed with 75% expanded clay). Therefore, a possible reason is not having enough of the lignocellulosic media. Other possible reasons include toxicity (release of toxic material from lignocellulosic material itself) or short circuiting. Continued monitoring is recommended.

5.2.3 Continue to Monitor Quality of STE Supplied to PNRS II Systems

The characteristics of GCREC septic tank effluent in Sample Event 5 continued to be more typical of Florida single family residences than in previous sample events. It seems likely that this was at least partially due to the system modifications that were implemented after Sample Event 2 but prior to Sample Event 3. Continued diligence will be maintained to insure that the PNRS II systems are supplied STE of acceptable characteristics.

5.2.4 Modify Operation

A track record of acceptable performance has been established for many PNRS II systems and increased flowrates are recommended. These are:

Stage 1 Biofilters

- Expanded clay and clinoptilolite media
 - increase loading rates:
 - Single pass: 3 gal/ft²-day to 5 gal/ft²-day STE Recycle: 3 gal/ft²-day to 6 gal/ft²-day STE

Stage 2 Biofilters

- Sulfur
 - increase loading rates:
 - Single pass coupled: single pass Stage 1 effluent

5.6 to 9.3 gal/ft²-day; 25.7 to 15.4 hour mean pore water residence time (MPWRT)

Horizontal: Stage 1 w/recycle combined effluent

10 to 20 gal/ft²-day; 43 to 21.5 hour MPWRT

- Glycerol
 - increase loading rate: 10 to 20 gal/ft²-day; 43 to 21.5 hour MPWRT

These flowrates will be implemented after Sample Event No. 6.



Appendix A: Operation & Maintenance Log

Table A.1Operation and Maintenance Log

Date	Description
5/17/2010	Start-up
5/20/2010	Pump 1 not in Auto, LL float alarm, refilled Tank 1 to HIGH float
5/24/2010	Glycerol batch #1 prepared (125 mL glycerol; 1875 mL DI water), feed rate ~ 8 mL/dose
5/26/2010	LL float alarm, refilled Tank 1 to HIGH float
6/1/2010	Replaced glycerol tubing
6/4/2010	LL float alarm, refilled Tank 1 to HIGH float, determined that LOW float is faulty
	Revised floats so that old Low Float is now High float
	Revised program installed so that only LOW Float turns on/off Pump 1
6/8/2010	Glycerol batch #2 prepared (125 mL glycerol; 1875 mL DI water), feed rate ~ 8 mL/dose
6/18/2010	Pump 1 screen cleaned with hose
6/21/2010	Pump 5 and 11 Error Code 18, cleared alarm and restarted pumps
	Pump 8 was on "OFF", turned back to "AUTO"
6/22/2010	Pump 5 had turned off, turned back on at 9:32 am
6/28/2010	Pump 5 and 11 Error Code 18, cleared alarm and restarted pumps
	Replaced glycerol tubing, kink in top, added elbow
	Russ replaced existing GCREC mound Pump 2 ~ 11:00 am
	All Systems Flow Check
7/1/2010	Sample Event #1
7/2/2010	Pump 1 screen cleaned with hose
7/8/2010	Glycerol tubing had released to bottom of container, replaced with polyethylene tubing
	Tank 1 LOW Float alarm, revised magnet distance to shorten Pump 1 runtime
	Pump 1 screen cleaned with hose
7/12/2010	Pump 5 Error Code 18, cleared alarm and restarted pump
7/14/2010	UPS beeping, problem with receptacle, temporary fix with extension cord
7/15/2010	Electrician fixed receptacle
7/16/2010	Per Dr. Stanley all condensate flow diverted from septic system
	Russ fixed existing GCREC Mound Pump 2 which had not been running
	Pump 5 and 11 Error Code 18, cleared alarm and restarted pumps
	Glycerol batch #3 prepared (125 mL glycerol; 1875 mL DI water), feed rate ~ 8 mL/dose

FLORIDA ONSITE SEWAGE NITROGEN REDUCTION STRATEGIES STUDY PNRS II TEST FACILITY DATA SUMMARY REPORT NO. 5

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	7/16/2010	Capillary mat added to PS-1		
	7/19/2010	IS 1 changed discharge (rotated 180°) now 15 inches of saturation from bottom of tank		
	7/20/2010	IS 2 changed discharge (rotated 180°) now 15 inches of saturation from bottom of tank		
	7/26/2010	Removed PS1 capillary mat from inside mesh bag, replaced with new mat on top of bag		
		Glycerol batch #4 (70 mL glycerol; 1930 mL DI water), feed rate ~ 10 mL/dose		
8/3/2010 Glycerol batch #5 (70 mL glycerol; 1930 mL DI water), feed rate ~ 10 mL/dos				
	8/4/2010	Cleaned crosses in Stage 1 Recirculating Biofilters		
		Added tees to outlet of RC1 and RC4 tanks to alleviate blockage build-up		
		Replaced Hydrosplitter 1 & 2 tubing		
		Replaced Stage 2 horizontal tubing from Pump 11		
		Cleaned Stage 2 horizontal sample ports		
		Lowered Pump 1 Low Float 2 wraps to decrease volume in tank(decrease residence		
		time)		
	8/10/2010	Glycerol batch #6 (70 mL glycerol; 1930 mL DI water), feed rate ~ 10 mL/dose		
		Raised Pump 1 Low Float 1 wrap because float down was below the hole		
	8/12/2010	Revised tubing connection at top of In-Situ simulator tanks to elbow		
	8/17/2010	Glycerol batch #7 (70 mL glycerol; 1930 mL DI water), feed rate ~ 10 mL/dose		
		Added tees to outlet in RC2 and RC3 tanks as well		
		Revised RC tanks discharge piping to flexible hose		
	8/19/2010	Pump 5 and 11 Error Code 18, cleared alarm and restarted pumps		
	8/23/2010	Possible leak detected at Recirc Tank #2 for P7		
	8/27/2010	Glycerol batch #8 (70 mL glycerol; 1930 mL DI water), feed rate ~ 10 mL/dose		
	8/31/2010	Sample Event #2		
	9/1/2010	Replaced elbow for Recirc Tank #2 (STE tubing) to fix leak		
		All Systems Flow Check		
	9/7/2010	Glycerol batch #9 (70 mL glycerol; 1930 DI water), feed rate ~ 10 mL/dose		
		Removed PS1 capillary mat		
	9/9/2010	Replaced Pump 5 pump tubing		
	9/10/2010	Cut the LS4 inlet pipe and used a drain snake to unclog both elbows		
	9/13/2010	Glycerol batch #10 (70 mL glycerol; 1980 DI water), feed rate ~ 10 mL/dose		
	9/17/2010	Modified Pump 7 runtime to 15 seconds per dose		
	9/21/2010	Reconnected the glycerol tubing between bottle and pump head which had separated		
		Added sample ports to recirculation pump tank discharge lines for flow measurement		
	9/28/2010	Glycerol batch #11 (70 mL glycerol; 1930 DI water), feed rate ~ 10 mL/dose		
		New clear glycerol bottle with graduated sides, replaced tubing		
	10/5/2010	Pump 5 and 11 Error Code 18, cleared alarm and restarted pumps		
	10/6/2010	Glycerol batch #12 (30 mL glycerol; 1970 DI water), feed rate ~ 10 mL/dose		

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10/7/2010	Pump 5 and 11 Error Code 18, cleared alarm and restarted pumps
10/8/2010	Modified Pump 1 discharge pipe to extend through Tank 1 hole in baffle wall
10/11/2010	DENIT-GL-1 nitrified STE influent tubing had disconnected, reattached
	Calibrated IS1 and IS2 tubing
	Calibrated Stage 2 horizontal tubing
10/14/2010	Glycerol batch #13 (30 mL glycerol; 1970 DI water), feed rate ~ 10 mL/dose
	Built new in-situ columns IS3 and IS4
10/15/2010	Unclogged PS1 discharge pipe
	Cleaned Pump 1 intake screen
	Lowered Pump 1 Low Float 1 wrap to decrease volume in tank
10/18/2010	Completed IS3 and IS4 piping, started dosing @ 9:30 am
	Added 3" coarse sand to UNSAT-IS1 for complete nitrification
10/19/2010	Started dye test DENIT-LS2 and DENIT-LS3
	Lowered Pump 1 Low Float 1 wrap to decrease volume in tank(to decrease residence
	time)
10/20/2010	Calibrated IS3 and IS4 tubing
	Glycerol batch #14 (15 mL glycerol; 985 DI water), feed rate ~ 10 mL/dose
10/22/2010	Moved Pump 1 to effluent baffle tee of existing GCREC Tank 1
	Converted UNSAT-PS1 to recirculating biofilter
10/25/2010	Glycerol batch #15 (15 mL glycerol; 985 DI water), feed rate ~ 10 mL/dose
	DENIT-SU4 media ~5.5" below initial level
	Removed DENIT-SU4, DENIT-SU2 and DENIT-LS2 media
	Cleaned tanks
	Replaced DENIT-SU2 media (30% sulfur, 10% limestone, 60% expanded clay mixture)
	Replaced DENIT-SU4 media (30% sulfur, 10% limestone, 60% expanded clay mixture)
	Replaced DENIT-LS2 media (25% lignocellulosic, 75% expanded clay mixture)
10/27/2010	Glycerol batch #16 (27 mL glycerol; 1973 DI water), feed rate ~ 10 mL/dose
11/1/2010	Glycerol batch #17 (27 mL glycerol; 1973 DI water), feed rate ~ 10 mL/dose
11/5/2010	Glycerol batch #18 (27 mL glycerol; 986.5 DI water), feed rate ~ 10 mL/dose
11/10/2010	Sample Event #3
11/11/2010	Glycerol batch #19 (27 mL glycerol; 1973 DI water), feed rate ~ 10 mL/dose
11/18/2010	Glued UNSAT-IS3 and UNSAT-IS4 discharge piping to stop potential leaks
	Glycerol batch #20 (27 mL glycerol; 1973 DI water), feed rate ~ 10 mL/dose
	Calibrated UNSAT-IS3 and IS4 tubing
11/19/2010	All Systems Flow Check
11/24/2010	Glycerol batch #21 (27 mL glycerol; 1973 DI water), feed rate ~ 10 mL/dose
11/29/2010	Glycerol batch #22 (27 mL glycerol; 1973 DI water), feed rate \sim 10 mL/dose

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11/29/2010 Threaded and glued UNSAT-IS3 and UNSAT-IS4 petcock valves			
12/1/2010	Tank 1 low-low float alarm activated, high float had activated in Tank 1 preventing		
	Pump 1 to run. Cleared both alarms		
12/3/2010	Cleared plug in DENIT-LS4 influent piping		
	Replaced Hydrosplitter 1 & 2 tubing		
	Replaced Pump 11 pump and system tubing		
	Replaced Pump 5 pump and system tubing		
	Glycerol batch #23 (27 mL glycerol; 1973 DI water), feed rate ~ 10 mL/dose		
12/7/2010	Hydrosplitter 1 Flow Check		
	Calibrated UNSAT-IS3 and IS4 tubing		
12/10/2010	Glycerol batch #24 (27 mL glycerol; 1973 DI water), feed rate ~ 10 mL/dose		
12/13/2010	Pump 5 and 11 Error Code 18, cleared alarm and restarted pumps		
12/14/2010	Increased Pump 15 runtime to 6:1 recycle rate		
12/17/2010	Glycerol batch #25 (27 mL glycerol; 1973 DI water), feed rate ~ 10 mL/dose		
12/22/2010	UNSAT-IS3 and IS4 effluent samples sent to Southern		
12/23/2010	DENIT-LS4, LS2, SU3, LS3, and SU4 effluent sample to Southern		
	Glycerol batch #26 (27 mL glycerol; 1973 DI water), feed rate ~ 10 mL/dose		
12/27/2010	Pump 5 and 11 Error Code 18, cleared alarm and restarted pumps		
12/30/2010	Hydrosplitter 1 Flow Check		
	Glycerol batch #27 (27 mL glycerol; 1973 DI water), feed rate ~ 10 mL/dose		
	All Systems Flow Check		
1/6/2011	Glycerol batch #28 (27 mL glycerol; 1973 DI water), feed rate ~ 10 mL/dose		
1/11/2011	UNSAT-IS3 and IS4 effluent Sample Event #4 samples sent to Southern		
	Ponding at surface of UNSAT-IS1 and IS2		
	Cleared line blockage at outlet from UNSAT-IS1 and IS2		
1/13/2011	Sample Event #4		
	Glycerol batch #29 (27 mL glycerol; 1973 DI water), feed rate ~ 10 mL/dose		
1/14/2011	Stage 2 Profile Samples sent to Southern		
1/17/2011	Pump 5 and 11 Error Code 18, cleared alarm and restarted pumps		
	All Systems Flow Check		
	Cleaned all recirculation system Stage 1 distribution pipes with tap water		
	Pump 7 was air locked - restarted		
1/18/2011	Hydrosplitter 1 Flow Check - calibration		
1/21/2011	Glycerol batch #30 (27 mL glycerol; 1973 DI water), feed rate ~ 10 mL/dose		
1/25/2011	Disassembled and cleaned UNSAT-IS1, IS2, IS3, IS4; DENIT-LS1, LS2, LS3, LS4		

1/26/2011 Pump 5 and 11 Error Code 18, cleared alarm and restarted pumps Installed new media UNSAT-IS1, IS2

Appendix A

1/26/2011	Installed new media DENIT-LS1
1/28/2011	Installed new media UNSAT-IS3, IS4
	Installed new media DENIT-LS2,LS3, LS4
	Replaced Pump 5 pump & system tubing
	Replaced Pump 10 pump & system tubing
1/31/2011	Recalibrated Pump 5 & 10
	Glycerol batch #31 (27 mL glycerol; 1973 DI water), feed rate ~ 10 mL/dose
2/2/2011	UNSAT-IS Flow Check
2/8/2011	Glycerol batch #32 (27 mL glycerol; 1973 DI water), feed rate ~ 10 mL/dose
2/16/2011	All Systems Flow Check
	Glycerol batch #33 (27 mL glycerol; 1973 DI water), feed rate ~ 10 mL/dose
	Cleaned all recirculation system Stage 1 distribution pipes with tap water
2/22/2011	Glycerol batch #34 (27 mL glycerol; 1973 DI water), feed rate ~ 10 mL/dose
3/2/2011	Glycerol batch #35 (27 mL glycerol; 1973 DI water), feed rate ~ 10 mL/dose
3/4/2011	Cleaned Pump 1 intake screen
	Glycerol batch #36 (13.5 mL glycerol; 1000 DI water), feed rate ~ 10 mL/dose
3/14/2011	Glycerol batch #37 (27 mL glycerol; 1973 DI water), feed rate ~ 10 mL/dose
	Pump 9 airlocked
	Started IS3 and IS4 sample collection
3/15/2011	Collected IS3 and IS4 sample
3/17/2011	Sample Event #5
3/18/2011	Stage 2 Profile Samples sent to Southern

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Figure A.1 Capillary Mat Installed above Polystyrene Media 7/16/10



Figure A.2 Revised In-situ Simulators Discharge Piping 7/20/10

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Figure A.3 RC1 Outlet Tee 8/4/10



Figure A.4 UNSAT-CL4 before Cleaning 8/4/10



Figure A.5 UNSAT-CL4 after Cleaning 8/4/10

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Figure A.6 Unclogging UNSAT-LS4 Influent Pipe 9/10/10



Figure A.7 2" Pipe Extension into PNRS II Tank 1 Pump Chamber 10/8/10

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Figure A.8 UNSAT-IS3 and UNSAT-IS4 Columns 10/14/10

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Appendix B: PLC Data Tables

Table B.1 Summary of PLC Recorded Daily Flows (1/13/11 – 3/16/11)							
Date Range		Average Recorded Flow (gpd)	Std. Dev.	MIN (gpd)	MAX (gpd)	Target Flow (gpd)	Relative Error ¹ (%)
	Pump 4 to Hydro 1	72	4.81	64	86	73.7	-3.0%
	Pump 14 to Hydro 2	57	5.16	25	62	58.9	-3.6%
	Pump 6 to Recirc. System 1	43	0.63	42	45	44.2	-3.1%
1/13/11-	Pump 7 to Recirc. System 2	44	0.75	42	46	44.2	0.2%
3/16/11	Pump 8 to Recirc. System 3	44	0.65	41	45	44.2	-2.8%
	Pump 9 to Recirc. System 4	31	17.12	0	46	44.2	-30.7%
	Pump 15 to Recirc. System 5	91	5.43	89	119	88.4	2.8%

¹Relative Error = (Recorded Flow – Target Flow)/ Target Flow *100

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Table B.2
Summary of PLC Recorded Daily Runtimes
(1/13/11 – 3/16/11)

Date Range		Average Recorded Daily Runtime (min/day)	Std. Dev.	MIN (min)	MAX (min)	Target Daily Runtime (min)	Relative Error ¹ (%)
	Pump 4 to Hydro 1	18.0	0.28	17.0	20.0	17.6	2.4%
	Pump 14 to Hydro 2	10.7	0.9	5.0	11.0	10.4	2.4%
	Pump 6 to Recirc. System 1	6.4	0.5	6.0	7.0	6.0	6.3%
1/13/11-	Pump 7 to Recirc. System 2	6.4	0.5	6.0	8.0	6.0	6.6%
3/16/11	Pump 8 to Recirc. System 3	6.4	0.5	6.0	7.0	6.0	6.3%
	Pump 9 to Recirc. System 4	6.4	0.5	6.0	8.0	6.0	6.9%
	Pump 15 to Recirc. System 5	12.9	3.4	0.0	15.0	14.0	-7.6%

¹Relative Error = (Recorded Runtime – Target Runtime)/ Target Runtime *100 ²Pump 4 Runtime was increased to increase UNSAT-PS1 STE influent volume to target level



Appendix C: Flow Test Results

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	1104	1631	Resul	13 (DC		viecan	bration	/	
			Target Input		Measure	ed Input		Recycle Ratio	
Group (Figure 1)	Biofilter/Flow	Target Input Volume	Dose/day	Target Input Volume	Measured Input Volume	Relative Error (%)	Target Recycle Ratio (RR)	Calculated Recycle Ratio (RR)	Relative Error (%)
		(mL/day)	(Dose/day)	(mL/dose)	(mL/dose)	(Measured Input -Target Input) / Target Input * 100	Volume Recycle / Volume STE	Volume Recycle / Volume STE	Measured RR - Target RR / Measured RR * 100
	Stage 1 Single Pass Biofilters								
	(Hydrosplitter 1)				3/23/2011 10:00 -				
	Date				11:00 am				
	UNSAT-PS1				940	-59.5%			
	UNSAT-CL3			2.240	1,880	-18.9%			
		55,656	24	2,319	2,510	8.2%			
	UNSAT-EC1				2,720	15.6%			1
	Mean				2,146	-7.5%			
1	Stage 2 Single Pass Upflow Biofilters				_,				
	Date				3/23/2011 9:00- 10:00 am				
	DENIT-LS4				2,700	16.4%			
	DENIT-LS2				1,765	-23.9%			
	DENIT-SU3	55,656	24	2,319	1,580	-31.9%			
	DENIT-LS3				2,340	0.9%			
	DENIT-SU4				2,020	-12.9%			
	Stage 1 Recirculating Biofilters				2,081	-10.5%			
	(Hydrosplitter 2)								
	Date				(3/23/2011) STE 10:30 - 11:30 am				
	RC1 : UNSAT-SA2				1,940	-16.3%			
	RC2 : UNSAT-EC4	55,656	24	2,319	1,990	-14.2%			
	RC3 : UNSAT-CL2			,	1,980	-14.6%			
	RC4 : UNSAT-CL4				2,160	-6.9%			
	Stage 1 Recirculating Biofilters				2,018 Flowmeter R	-13.0%			
	(Recycle)				3/23/2011				
	RC1 : UNSAT-SA2				7,097	2.0%		3.66	18.0%
2	RC2 : UNSAT-EC4	166.968	24	6.957	7,255	4.3%	3:1	3.65	17.7%
	RC3 : UNSAT-CL2	,		-,	7,097	2.0%		3.58	16.3%
	RC4 : UNSAT-CL4				0	-100.0%		0.00	-100.0%
	Mean DCE - LINSAT DC1	222.026	24	12.014	5,362	-22.9%	6-1	2.72	-12.0%
	Stage 1 Recirculating Biofilters (Hydrosplitter + Recycle)	333,330	24	13,314	12,332	-7.176	0.1	13.70	50.4%
	RC1 : UNSAT-SA2				9,037				
	RC2 : UNSAT-EC4	222,624	24	9,276	9,245				
	RC3 : UNSAT-CL2				9,077				
	RC4 : UNSAT-CL4				2,160				
	RC5 : UNSAT-PS1	389.592	24	16,233	13,872				
	Horizontal Denitrification Biofilters	,->-			20,072				
	Date				3/23/2011 9:30 - 10:30 am				
2	DENIT-SU1				315	2.0%			
3	DENIT-SU2	7 409	24	309.7	315	2.0%			
	DENIT-GL1	7,405	24	500.7	295	-4.4%			
	DENIT-LS1				302	-2.2%			
	Mean In-Situ Simulators				307	-0.6%			
I	Date				3/23/2011 8:30 -				
4	UNSAT-IS1 (STF)	14,865	24	619	9:50 am	9,8%			
	UNSAT-IS2 (Nitrified STE)	22,298	24	929	735	-20.9%			
	UNSAT-IS3 (STE)	0000			30	-19.4%			
	UNSAT-IS4 (Nitrified STE)	893	24	37	33	-11.3%			

Table C.1 Flow Test Results (before flow recalibration)

Notes: Yellow-shaded cells are measured values; grey-shaded cells are calculated values

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Table C.2Flow Test Results (after flow recalibration)
(Modifications are indicated in green)

			Target Input		Measure	ed Input		Recycle Ratio			
Group (Figure 1)	Biofilter/Flow	Target Input Volume	Dose/day	Target Input Volume	Measured Input Volume	Relative Error (%)	Target Recycle Ratio (RR)	Calculated Recycle Ratio (RR)	Relative Error (%)		
		(mL/day)	(Dose/day)	(mL/dose)	(mL/dose)	(Measured Input -Target Input) / Target Input * 100	Volume Recycle / Volume STE	Volume Recycle / Volume STE	Measured RR - Target RR / Measured RR * 100		
	Stage 1 Single Pass Biofilters (Hydrosplitter 1)										
	Date				4/8/2011 5:00 -						
	UNSAT-PS1				6:00 pm 2,350	1.3%					
	UNSAT-CL3				2,200	-5.1%					
	UNSAT-CL1	55,656	24	2,319	2,260	-2.5%					
	UNSAT-EC3				2,300	-0.8%					
	UNSAT-EC1				2,320	0.0%					
1	Mean				2,286	-1.4%					
	Stage 2 Single Pass Upflow Biofilters										
	Date				3/23/2011 9:00- 10:00 am						
	DENIT-LS4				2,700	16.4%					
	DENIT-LS2				1,765	-23.9%					
	DENIT-SU3	55,656	24	2,319	1,580	-31.9%					
	DENIT-LS3				2,340	0.9%					
	Mean				2,020	-10.3%					
	Stage 1 Recirculating Biofilters (Hydrosplitter 2)										
	Date				(4/8/2011) STE 3:30 - 4:30 pm						
	RC1 : UNSAT-SA2				2,290	-1.3%					
	RC2 : UNSAT-EC4	55,656	24	2,319	2,140	-7.7%					
	RC3 : UNSAT-CL2				2,330	0.5%					
	Mean				2,310	-2.2%					
	Stage 1 Recirculating Biofilters (Recycle)				Flowmeter R 4/8/2011						
	RC1 : UNSAT-SA2				6,781	-2.5%		2.96	-1.3%		
2	RC2 : UNSAT-EC4	166,968	24	6,957	7,097	2.0%	3:1	3.32	9.5%		
	RC3 : UNSAT-CL2				6,781	-2.5%		2.91	-3.1%		
	Mean				6,900	-0.3%		3.05	-0.3%		
	RC5 : UNSAT-PS1	333,936	24	13,914	14,036	0.9%	6:1	5.97	-0.5%		
	Stage 1 Recirculating Biofilters										
	(Hydrosplitter + Recycle)				0.071						
	RC2 : UNSAT-5A2				9,237						
	RC3 : UNSAT-CL2	222,624	24	9,276	9,111						
	RC4 : UNSAT-CL4				9,249						
	Mean				9,167						
	RC5 : UNSAT-PS1	389,592	24	16,233	16,386						
	Date				3/23/2011 9:30 -						
	Date				10:30 am						
3	DENIT-SU1				315	2.0%					
	DENIT-GL1	7,409	24	308.7	295	-4.4%					
	DENIT-LS1				302	-2.2%					
	Mean				307	-0.6%					
	In-Situ Simulators										
	Date				3/24/2011 dose @ 12:00 am						
۵	UNSAT-IS1 (STE)	20,160	24	840	840	0.0%					
+	UNSA1-IS2 (Nitrified STE)	20,640	24	860	860 3/23/2011 dose @	0.0%					
					9:42 am	_1.0%					
	 UNDELED3 (D)[1] 				50.5	-1.9%		1			

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Appendix D: Laboratory Report

FLORIDA ONSITE SEWAGE NITROGEN REDUCTION STRATEGIES STUDY PNRS II TEST FACILITY DATA SUMMARY REPORT NO. 5

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



Hazen and Sawyer 10002 Princess Palm Avenue Suite 200 Tampa, FLORIDA 33619

March 25, 2011 Work Order: 1102050

Laboratory Report

Project Name		PI	NRS II					
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Ву
Sample Description Matrix SAL Sample Number Date/Time Collected Collected by Date/Time Received		PNRS II STE-T1 Wastewater 1102050-01 03/17/11 12:15 Sean Harmon 03/17/11 14:15						
Field Parameters								
рН	SU	7.5	DEP FT1100	0.1	0.1		03/17/11 12:15	SDH
Water Temperature	°C	21.4	DEP FT1400	0.1	0.1		03/17/11 12:15	SDH
Specific conductance	umhos/cm	1,099	DEP FT1200	0.1	0.1		03/17/11 12:15	SDH
Dissolved Oxygen	mg/L	2.8	DEP FT1500	0.1	0.1		03/17/11 12:15	SDH
Inorganics								
Hydrogen Sulfide (Unionized)	mg/L	1.2	SM 4550SF	0.04	0.01	03/21/11 15:54	03/21/11 15:55	MMF
Ammonia as N	mg/L	65	EPA 350.1	0.010	0.005		03/21/11 16:38	SMD
Carbonaceous BOD	mg/L	93	SM 5210B	2	2	03/18/11 15:07	03/23/11 08:27	MEJ
Chemical Oxygen Demand	mg/L	380	EPA 410.4	25	10		03/23/11 08:00	ARM
Nitrate (as N)	mg/L	0.05	EPA 300.0	0.04	0.01		03/18/11 10:09	MEJ
Nitrite (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		03/18/11 10:09	MEJ
Phosphorous - Total as P	mg/L	13	SM 4500P-E	0.040	0.010	03/21/11 11:08	03/24/11 08:53	SMD
Sulfate	mg/L	38	EPA 300.0	0.60	0.20		03/18/11 10:09	MEJ
Sulfide	mg/L	5.2	SM 4500SF	0.40	0.10		03/21/11 15:31	MMF
Total Alkalinity	mg/L	400	SM 2320B	8.0	2.0	03/22/11 09:00	03/22/11 15:21	JMK
Total Dissolved Solids	mg/L	450	SM 2540C	10	10	03/18/11 11:22	03/22/11 15:03	MMF
Total Kjeldahl Nitrogen	mg/L	78	EPA 351.2	0.20	0.05	03/21/11 11:45	03/22/11 12:35	SMB
Total Suspended Solids	mg/L	110	SM 2540D	1	1	03/18/11 11:19	03/18/11 14:49	MMF
Sample Description Matrix SAL Sample Number Date/Time Collected Collected by Date/Time Received		RC1 Wastewater 1102050-02 03/17/11 12:05 Sean Harmon 03/17/11 14:15						
Field Parameters								
pH	SU	7.4	DEP FT1100	0.1	0.1		03/17/11 12:05	SDH
Water Temperature	°C	17.0	DEP FT1400	0.1	0.1		03/17/11 12:05	SDH
Specific conductance	umhos/cm	894	DEP FT1200	0.1	0.1		03/17/11 12:05	SDH
Dissolved Oxygen	mg/L	0.2	DEP FT1500	0.1	0.1		03/17/11 12:05	SDH
Inorganics	-							
Ammonia as N	mg/L	12	EPA 350.1	0.010	0.005		03/21/11 16:38	SMD
Carbonaceous BOD	mg/L	2	SM 5210B	2	2	03/18/11 15:07	03/23/11 08:27	MEJ
Chemical Oxygen Demand	mg/L	32	EPA 410.4	25	10		03/22/11 08:00	ARM
Nitrate (as N)	mg/L	21	EPA 300.0	0.04	0.01		03/18/11 10:09	MEJ

Francis I. Daniels, Laboratory Director Leslie C. Boardman, Q.A. Manager

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March 25, 2011 Work Order: 1102050

Project Name		PI						
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Ву
Sample Description Matrix SAL Sample Number Date/Time Collected Collected by Date/Time Received		RC1 Wastewater 1102050-02 03/17/11 12:05 Sean Harmon 03/17/11 14:15						
Nitrite (as N)	mg/L	1.4	EPA 300.0	0.04	0.01		03/18/11 10:09	ME
Orthophosphate as P	mg/L	3.2	EPA 300.0	0.040	0.010		03/18/11 10:09	ME
Total Alkalinity	ma/L	180	SM 2320B	8.0	2.0	03/22/11 09:00	03/22/11 15:21	JMK
Total Dissolved Solids	ma/L	530	SM 2540C	10	10	03/18/11 11:22	03/22/11 15:03	MMF
Total Kieldahl Nitrogen	mg/L	14	EPA 351.2	0.20	0.05	03/21/11 11:45	03/22/11 12:35	SME
Total Suspended Solids	mg/L	1 U	SM 2540D	1	1	03/18/11 11:19	03/18/11 14:49	MMF
Sample Description Matrix SAL Sample Number Date/Time Collected Collected by Date/Time Received		KG2 Wastewater 1102050-03 03/17/11 12:00 Sean Harmon 03/17/11 14:15						
Field Parameters								
рН	SU	7.4	DEP FT1100	0.1	0.1		03/17/11 12:00	SDH
Water Temperature	°C	18.2	DEP FT1400	0.1	0.1		03/17/11 12:00	SDF
Specific conductance	umhos/cm	904	DEP FT1200	0.1	0.1		03/17/11 12:00	SDF
Dissolved Oxygen	mg/L	0.2	DEP FT1500	0.1	0.1		03/17/11 12:00	SDF
Inorganics	ma/l	10	EDA 250 1	0.010	0.005		02/21/11 16:29	смг
	mg/L	12	SM 5210B	0.010	0.005	02/10/11 15:07	03/21/11 10.30	
Carbonaceous BOD	mg/L	2 U	5W 52 100	2	2 10	03/16/11 15.07	03/23/11 06.27	
Nitrate (ap N)	mg/L	34	EFA 410.4	20	10		03/22/11 06.00	
Nitrate (as N)	mg/L	23	EFA 300.0	0.04	0.01		03/18/11 10:09	
	mg/L	1.2	EFA 300.0	0.04	0.01		03/16/11 10.09	
	mg/∟	3.4	EPA 300.0	0.040	0.010	00/00/44 00:00	03/18/11 10:09	NE.
	mg/∟	180	SIVI 2320B	8.U	2.0	03/22/11 09:00	03/22/11 15:21	JIVIK
	mg/∟	550	5IVI 2540C	10	10	03/18/11 11:22	03/22/11 15:03	MMF
Total Kjeldani Nitrogen	mg/L	13	EPA 351.2	0.20	0.05	03/21/11 11:45	03/22/11 12:35	SIVIE
I otal Suspended Solids	mg/L	2	SM 2540D	1	1	03/18/11 11:19	03/18/11 14:49	MM

Sample Description	RC3
Matrix	Wastewater
SAL Sample Number	1102050-04
Date/Time Collected	03/17/11 11:55
Collected by	Sean Harmon
Date/Time Received	03/17/11 14:15

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Project Name		Р	NRS II					
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Ву
Sample Description Matrix SAL Sample Number Date/Time Collected Collected by Date/Time Received		RC3 Wastewater 1102050-04 03/17/11 11:55 Sean Harmon 03/17/11 14:15						
Field Parameters								
pН	SU	7.5	DEP FT1100	0.1	0.1		03/17/11 11:55	SDH
Water Temperature	°C	17.6	DEP FT1400	0.1	0.1		03/17/11 11:55	SDH
Specific conductance	umhos/cm	925	DEP FT1200	0.1	0.1		03/17/11 11:55	SDH
Dissolved Oxygen	mg/L	1.5	DEP FT1500	0.1	0.1		03/17/11 11:55	SDH
Inorganics								
Ammonia as N	mg/L	16	EPA 350.1	0.010	0.005		03/21/11 16:38	SMD
Carbonaceous BOD	mg/L	8	SM 5210B	2	2	03/18/11 15:07	03/23/11 08:27	MEJ
Chemical Oxygen Demand	mg/L	51	EPA 410.4	25	10		03/22/11 08:00	ARM
Nitrate (as N)	mg/L	13	EPA 300.0	0.04	0.01		03/18/11 10:09	MEJ
Nitrite (as N)	mg/L	5.0	EPA 300.0	0.04	0.01		03/18/11 10:09	MEJ
Orthophosphate as P	mg/L	6.6	EPA 300.0	0.040	0.010		03/18/11 10:09	MEJ
Total Alkalinity	mg/L	230	SM 2320B	8.0	2.0	03/22/11 09:00	03/22/11 15:21	JMK
Total Dissolved Solids	mg/L	510	SM 2540C	10	10	03/18/11 11:22	03/22/11 15:03	MMF
Total Kjeldahl Nitrogen	mg/L	16	EPA 351.2	0.20	0.05	03/21/11 11:45	03/22/11 12:35	SMB
Total Suspended Solids	mg/L	8	SM 2540D	1	1	03/18/11 11:19	03/18/11 14:49	MMF
Sample Description Matrix SAL Sample Number Date/Time Collected Collected by Date/Time Received		RC4 Wastewater 1102050-05 03/17/11 11:50 Sean Harmon 03/17/11 14:15						
Field Parameters								
pН	SU	7.8	DEP FT1100	0.1	0.1		03/17/11 11:50	SDH
Water Temperature	°C	16.9	DEP FT1400	0.1	0.1		03/17/11 11:50	SDH
Specific conductance	umhos/cm	901	DEP FT1200	0.1	0.1		03/17/11 11:50	SDH
Dissolved Oxygen	mg/L	0.1	DEP FT1500	0.1	0.1		03/17/11 11:50	SDH
Inorganics								
Ammonia as N	mg/L	13	EPA 350.1	0.010	0.005		03/24/11 15:20	SMD
Carbonaceous BOD	mg/L	3	SM 5210B	2	2	03/18/11 15:07	03/23/11 08:27	MEJ
Chemical Oxygen Demand	mg/L	47	EPA 410.4	25	10		03/22/11 08:00	ARM
Nitrate (as N)	mg/L	0.14	EPA 300.0	0.04	0.01		03/18/11 10:09	MEJ
Nitrite (as N)	mg/L	1.7	EPA 300.0	0.04	0.01		03/18/11 10:09	MEJ
Orthophosphate as P	mg/L	6.1	EPA 300.0	0.040	0.010		03/18/11 10:09	MEJ
Total Alkalinity	mg/L	290	SM 2320B	8.0	2.0	03/22/11 09:00	03/22/11 15:21	JMK

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Laboratory Report

Project Name		PI	NRS II					
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Ву
Sample Description Matrix SAL Sample Number Date/Time Collected Collected by Date/Time Received		RC4 Wastewater 1102050-05 03/17/11 11:50 Sean Harmon 03/17/11 14:15						
Total Dissolved Solids	mg/L	460	SM 2540C	10	10	03/18/11 11:22	03/22/11 15:03	MMF
Total Kjeldahl Nitrogen	mg/L	24	EPA 351.2	0.20	0.05	03/21/11 11:45	03/22/11 12:35	SMB
Total Suspended Solids	mg/L	2	SM 2540D	1	1	03/18/11 11:19	03/18/11 14:49	MMF
Sample Description Matrix SAL Sample Number Date/Time Collected Collected by Date/Time Received		RC5 Wastewater 1102050-06 03/17/11 11:40 Sean Harmon 03/17/11 14:15						
Field Parameters								
рН	SU	7.4	DEP FT1100	0.1	0.1		03/17/11 11:40	SDH
Water Temperature	°C	16.5	DEP FT1400	0.1	0.1		03/17/11 11:40	SDH
Specific conductance	umhos/cm	888	DEP FT1200	0.1	0.1		03/17/11 11:40	SDH
Dissolved Oxygen	mg/L	0.5	DEP FT1500	0.1	0.1		03/17/11 11:40	SDH
Inorganics								
Ammonia as N	mg/L	23	EPA 350.1	0.010	0.005		03/21/11 16:38	SMD
Carbonaceous BOD	mg/L	2 U	SM 5210B	2	2	03/18/11 15:07	03/23/11 08:27	MEJ
Chemical Oxygen Demand	mg/L	57	EPA 410.4	25	10		03/22/11 08:00	ARM
Nitrate (as N)	mg/L	5.2	EPA 300.0	0.04	0.01		03/18/11 10:09	MEJ
Nitrite (as N)	mg/L	3.4	EPA 300.0	0.04	0.01		03/18/11 10:09	MEJ
Orthophosphate as P	mg/L	5.7	EPA 300.0	0.040	0.010		03/18/11 10:09	MEJ
Total Alkalinity	mg/L	230	SM 2320B	8.0	2.0	03/22/11 09:00	03/22/11 15:21	JMK
Total Dissolved Solids	mg/L	440	SM 2540C	10	10	03/18/11 11:22	03/22/11 15:03	MMF
Total Kjeldahl Nitrogen	mg/L	24	EPA 351.2	0.20	0.05	03/21/11 11:45	03/22/11 12:35	SMB
Total Suspended Solids	mg/L	8	SM 2540D	1	1	03/18/11 11:19	03/18/11 14:49	MMF
Sample Description Matrix SAL Sample Number Date/Time Collected Collected by Date/Time Received		P15-T Wastewater 1102050-07 03/17/11 11:00 Sean Harmon 03/17/11 14:15						
Field Parameters								
рН	SU	7.2	DEP FT1100	0.1	0.1		03/17/11 11:00	SDH
Water Temperature	°C	18.6	DEP FT1400	0.1	0.1		03/17/11 11:00	SDH

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Project Name		PNRS II					
Parameters U	nits Results	* Method	d PQL	MDL	Prepared	Analyzed	Ву
Sample Description Matrix SAL Sample Number Date/Time Collected Collected by Date/Time Received	P15-T Wastewater 1102050-07 03/17/11 11:0 Sean Harmor 03/17/11 14:1	0					
Specific conductance umhos	/cm 834	DEP FT12	200 0.1	0.1		03/17/11 11:00	SDH
Dissolved Oxygen mg/	L 1.0	DEP FT15	0.1	0.1		03/17/11 11:00	SDH
Inorganics							
Ammonia as N mg/	L 22	EPA 350	.1 0.010	0.005		03/21/11 16:38	SMD
Carbonaceous BOD mg/	L 4	SM 5210	В 2	2	03/18/11 15:07	03/23/11 08:27	MEJ
Chemical Oxygen Demand mg/	L 45	EPA 410	.4 25	10		03/22/11 08:00	ARM
Nitrate (as N) mg/	L 13	EPA 300	.0 0.04	0.01		03/18/11 10:09	MEJ
Nitrite (as N) mg/	L 0.98	EPA 300	.0 0.04	0.01		03/18/11 10:09	MEJ
Orthophosphate as P mg/	L 3.8	EPA 300	.0 0.040	0.010		03/18/11 10:09	MEJ
Total Alkalinity mg/	L 190	SM 2320	B 8.0	2.0	03/22/11 09:00	03/22/11 15:21	JMK
Total Dissolved Solids mg/	L 480	SM 2540	C 10	10	03/18/11 11:22	03/22/11 15:03	MMF
Total Kieldahl Nitrogen mg/	L 24	EPA 351	.2 0.20	0.05	03/21/11 11:45	03/22/11 12:35	SMB
Total Suspended Solids mg/	L 1	U SM 2540	D 1	1	03/18/11 11:19	03/18/11 14:49	MMF
Sample Description Matrix SAL Sample Number Date/Time Collected Collected by Date/Time Received	UNSAT-IS1 Wastewater 1102050-08 03/17/11 12:4 Sean Harmor 03/17/11 14:1	5					
Field Parameters							
pH SU	7.3	DEP FT11	00 0.1	0.1		03/17/11 12:45	SDH
Water Temperature °C	10.7	DEP FT14	00 0.1	0.1		03/17/11 12:45	SDH
Specific conductance umhos	/cm 999	DEP FT12	200 0.1	0.1		03/17/11 12:45	SDH
Inorganics							
Ammonia as N mg/	L 8.7	EPA 350	.1 0.010	0.005		03/21/11 16:38	SMD
Carbonaceous BOD mg/	L 120	SM 5210	B 2	2	03/18/11 15:07	03/23/11 08:27	MEJ
Chemical Oxygen Demand mg/	L 240	EPA 410	.4 25	10		03/22/11 08:00	ARM
Nitrate (as N) mg/	L 0.05	EPA 300	.0 0.04	0.01		03/18/11 10:09	MEJ
Nitrite (as N) mg/	L 0.01	LI EPA 300	.0 0.04	0.01		03/18/11 10:09	MEJ
Orthophosphate as P mg/	L 5.2	EPA 300	.0 0.040	0.010		03/18/11 10:09	MEJ
Sulfate mg/	L 20	EPA 300	.0 0.60	0.20		03/18/11 10:09	MEJ
Total Alkalinity mo/	L 400	SM 2320	B 8.0	2.0	03/22/11 09:00	03/22/11 15:21	JMK
Total Dissolved Solids ma/	L 660	SM 2540	C 10	10	03/18/11 11:22	03/22/11 15:03	MMF
Total Kjeldahl Nitrogen ma/	L 8.9	EPA 351	.2 0.20	0.05	03/21/11 11:45	03/22/11 12:35	SMB
Total Suspended Solids mg/	L 2	SM 2540	D 1	1	03/18/11 11:19	03/18/11 14:49	MMF

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Project Name		P	NRS II					
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Ву
Sample Description Matrix SAL Sample Number Date/Time Collected Collected by Date/Time Received		UNSAT-IS2 Wastewater 1102050-09 03/17/11 12:40 Sean Harmon 03/17/11 14:15						
Field Parameters								
рН	SU	7.4	DEP FT1100	0.1	0.1		03/17/11 12:40	SDH
Water Temperature	°C	11.8	DEP FT1400	0.1	0.1		03/17/11 12:40	SDH
Specific conductance	umhos/cm	977	DEP FT1200	0.1	0.1		03/17/11 12:40	SDH
Inorganics								
Ammonia as N	mg/L	0.37	EPA 350.1	0.010	0.005		03/21/11 16:38	SMD
Carbonaceous BOD	mg/L	3	SM 5210B	2	2	03/18/11 15:07	03/23/11 08:27	MEJ
Chemical Oxygen Demand	mg/L	82	EPA 410.4	25	10		03/22/11 08:00	ARM
Nitrate (as N)	mg/L	0.72	EPA 300.0	0.04	0.01		03/18/11 10:09	MEJ
Nitrite (as N)	mg/L	7.6	EPA 300.0	0.04	0.01		03/18/11 10:09	MEJ
Orthophosphate as P	mg/L	0.68	EPA 300.0	0.040	0.010		03/18/11 10:09	MEJ
Sulfate	mg/L	210	EPA 300.0	0.60	0.20		03/21/11 14:03	MEJ
Total Alkalinity	mg/L	190	SM 2320B	8.0	2.0	03/22/11 09:00	03/22/11 15:21	JMK
Total Dissolved Solids	mg/L	670	SM 2540C	10	10	03/18/11 11:22	03/22/11 15:03	MMF
Total Kjeldahl Nitrogen	mg/L	4.3	EPA 351.2	0.20	0.05	03/21/11 11:45	03/22/11 12:35	SMB
Total Suspended Solids	mg/L	10	SM 2540D	1	1	03/18/11 11:19	03/18/11 14:49	MMF
Sample Description Matrix SAL Sample Number Date/Time Collected Collected by Date/Time Received		UNSAT-IS3-SP Wastewater 1102050-10 03/17/11 12:35 Sean Harmon 03/17/11 14:15						
Field Parameters								
рН	SU	7.6	DEP FT1100	0.1	0.1		03/17/11 12:35	SDH
Water Temperature	°C	6.2	DEP FT1400	0.1	0.1		03/17/11 12:35	SDH
Specific conductance	umhos/cm	1,269	DEP FT1200	0.1	0.1		03/17/11 12:35	SDH
Inorganics								
Ammonia as N	mg/L	0.20	EPA 350.1	0.010	0.005		03/21/11 16:38	SMD
Carbonaceous BOD	mg/L	2 U	SM 5210B	2	2	03/18/11 15:07	03/23/11 08:27	MEJ
Chemical Oxygen Demand	mg/L	120	EPA 410.4	25	10		03/22/11 08:00	ARM
Nitrate (as N)	mg/L	5.8	EPA 300.0	0.04	0.01		03/18/11 10:09	MEJ
Nitrite (as N)	mg/L	0.23	EPA 300.0	0.04	0.01		03/18/11 10:09	MEJ
Orthophosphate as P	mg/L	3.5	EPA 300.0	0.040	0.010		03/18/11 10:09	MEJ
Sulfate	mg/L	98	EPA 300.0	0.60	0.20		03/22/11 13:38	MEJ
Total Alkalinity	mg/L	500	SM 2320B	8.0	2.0	03/22/11 09:00	03/22/11 15:21	JMK

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Laboratory Report

Project Name		PI	NRS II					
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Ву
Sample Description Matrix SAL Sample Number Date/Time Collected Collected by Date/Time Received		UNSAT-IS3-SP Wastewater 1102050-10 03/17/11 12:35 Sean Harmon 03/17/11 14:15						
Total Dissolved Solids	mg/L	910	SM 2540C	10	10	03/18/11 11:22	03/22/11 15:03	MMF
Total Kjeldahl Nitrogen	mg/L	3.2	EPA 351.2	0.20	0.05	03/21/11 11:45	03/22/11 12:35	SMB
Total Suspended Solids	mg/L	2	SM 2540D	1	1	03/18/11 11:19	03/18/11 14:49	MMF
Sample Description Matrix SAL Sample Number Date/Time Collected Collected by Date/Time Received		UNSAT-IS4-SP Wastewater 1102050-11 03/17/11 12:30 Sean Harmon 03/17/11 14:15						
Field Parameters								
рН	SU	7.4	DEP FT1100	0.1	0.1		03/17/11 12:30	SDH
Water Temperature	°C	14.9	DEP FT1400	0.1	0.1		03/17/11 12:30	SDH
Specific conductance	umhos/cm	1,087	DEP FT1200	0.1	0.1		03/17/11 12:30	SDH
Inorganics								
Ammonia as N	mg/L	0.30	EPA 350.1	0.010	0.005		03/21/11 16:38	SMD
Carbonaceous BOD	mg/L	10	SM 5210B	2	2	03/18/11 15:07	03/23/11 08:27	MEJ
Chemical Oxygen Demand	mg/L	80	EPA 410.4	25	10		03/22/11 08:00	ARM
Nitrate (as N)	mg/L	6.0	EPA 300.0	0.04	0.01		03/18/11 10:09	MEJ
Nitrite (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		03/18/11 10:09	MEJ
Orthophosphate as P	mg/L	0.46	EPA 300.0	0.040	0.010		03/18/11 10:09	MEJ
Sulfate	mg/L	120	EPA 300.0	0.60	0.20		03/22/11 13:38	MEJ
Total Alkalinity	mg/L	430	SM 2320B	8.0	2.0	03/22/11 09:00	03/22/11 15:21	JMK
Total Dissolved Solids	mg/L	800	SM 2540C	10	10	03/18/11 11:22	03/22/11 15:03	MMF
Total Kjeldahl Nitrogen	mg/L	3.5	EPA 351.2	0.20	0.05	03/21/11 11:45	03/22/11 12:35	SMB
Total Suspended Solids	mg/L	20	SM 2540D	1	1	03/18/11 11:19	03/18/11 14:49	MMF
Sample Description Matrix SAL Sample Number Date/Time Collected Collected by Date/Time Received		UNSAT-EC1 Wastewater 1102050-12 03/17/11 11:30 Sean Harmon 03/17/11 14:15						
Field Parameters	.			. .	<i>.</i> .			
рН	SU	7.1	DEP FT1100	0.1	0.1		03/17/11 11:30	SDH
Water Temperature	°C	9.6	DEP FT1400	0.1	0.1		03/17/11 11:30	SDH

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Project Name		PI	NRS II					
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Ву
Sample Description Matrix SAL Sample Number Date/Time Collected Collected by Date/Time Received		UNSAT-EC1 Wastewater 1102050-12 03/17/11 11:30 Sean Harmon 03/17/11 14:15						
Specific conductance	umhos/cm	1,048	DEP FT1200	0.1	0.1		03/17/11 11:30	SDH
Dissolved Oxygen	mg/L	6.6	DEP FT1500	0.1	0.1		03/17/11 11:30	SDH
Inorganics Ammonia as N Carbonaceous BOD Chemical Oxygen Demand	mg/L mg/L mg/L	0.035 2 U 22 I	EPA 350.1 SM 5210B EPA 410.4	0.010 2 25	0.005 2 10	03/18/11 15:07	03/21/11 16:38 03/23/11 08:27 03/22/11 08:00	SMD MEJ ARM
Nitrate (as N)	mg/L	57	EPA 300.0	0.04	0.01		03/18/11 10:09	MEJ
Nitrite (as N) Orthophosphate as P	mg/L mg/L	0.01 U 1.0	EPA 300.0 EPA 300.0	0.04 0.040	0.01 0.010		03/18/11 10:09 03/18/11 10:09	MEJ MEJ
Sulfate	mg/L	67	EPA 300.0	0.60	0.20		03/18/11 10:09	MEJ
Total Alkalinity	mg/L	160	SM 2320B	8.0	2.0	03/22/11 09:00	03/22/11 15:21	JMK
Total Dissolved Solids	mg/L	720	SM 2540C	10	10	03/18/11 11:22	03/22/11 15:03	MMF
Total Kjeldahl Nitrogen	mg/L	3.9	EPA 351.2	0.20	0.05	03/21/11 11:45	03/22/11 12:35	SMB
Total Suspended Solids	mg/L	2	SM 2540D	1	1	03/18/11 11:19	03/18/11 14:49	MMF
Sample Description Matrix SAL Sample Number Date/Time Collected Collected by Date/Time Received		UNSAT-SA2 Wastewater 1102050-13 03/17/11 10:25 Sean Harmon 03/17/11 14:15						
Field Parameters								
рН	SU	7.0	DEP FT1100	0.1	0.1		03/17/11 10:25	SDH
Water Temperature	°C	14.1	DEP FT1400	0.1	0.1		03/17/11 10:25	SDH
Specific conductance	umhos/cm	859	DEP FT1200	0.1	0.1		03/17/11 10:25	SDH
Dissolved Oxygen	mg/L	6.1	DEP FT1500	0.1	0.1		03/17/11 10:25	SDH
<u>Inorganics</u> Ammonia as N	mg/L	0.050	EPA 350.1	0.010	0.005		03/21/11 16:38	SMD
Carbonaceous BOD	mg/L	2 U	SM 5210B	2	2	03/18/11 15:07	03/23/11 08:27	MEJ
Chemical Oxygen Demand	mg/L	18	EPA 410.4	25	10		03/22/11 08:00	ARM
Nitrate (as N)	mg/L	32	EPA 300.0	0.04	0.01		03/18/11 10:09	MEJ
Nitrite (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		03/18/11 10:09	MEJ
Orthophosphate as P	mg/L	2.1	EPA 300.0	0.040	0.010		03/18/11 10:09	MEJ
Total Alkalinity	mg/L	140	SM 2320B	8.0	2.0	03/22/11 09:00	03/22/11 15:21	JMK
Total Dissolved Solids	mg/L	560	SM 2540C	10	10	03/18/11 11:22	03/22/11 15:03	MMF
Total Kjeldahl Nitrogen	mg/L	3.0	EPA 351.2	0.20	0.05	03/21/11 11:45	03/22/11 12:35	SMB

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Laboratory Report

Project Name		PN	IRS II					
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Ву
Sample Description Matrix SAL Sample Number Date/Time Collected Collected by Date/Time Received		UNSAT-SA2 Wastewater 1102050-13 03/17/11 10:25 Sean Harmon 03/17/11 14:15						
Total Suspended Solids	mg/L	1 U	SM 2540D	1	1	03/18/11 11:19	03/18/11 14:49	MMF
Sample Description Matrix SAL Sample Number Date/Time Collected Collected by Date/Time Received		UNSAT-EC3 Wastewater 1102050-14 03/17/11 11:25 Sean Harmon 03/17/11 14:15						
Field Parameters								
pH Water Temperature Specific conductance	SU °C umhos/cm	7.1 10.8 1,059	DEP FT1100 DEP FT1400 DEP FT1200 DEP FT1500	0.1 0.1 0.1	0.1 0.1 0.1		03/17/11 11:25 03/17/11 11:25 03/17/11 11:25 02/17/11 11:25	SDH SDH SDH
Inorganics	IIIg/L	0.1	DEITTISSO	0.1	0.1		03/17/11 11.25	3011
Ammonia as N	mg/L	0.011	EPA 350.1	0.010	0.005		03/21/11 16:38	SMD
Carbonaceous BOD	mg/L	2 U	SM 5210B	2	2	03/18/11 15:07	03/23/11 08:27	MEJ
Chemical Oxygen Demand	mg/L	16	EPA 410.4	25	10		03/22/11 08:00	ARM
Nitrate (as N)	mg/L	49	EPA 300.0	0.04	0.01		03/18/11 10:09	MEJ
Nitrite (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		03/18/11 10:09	MEJ
Orthophosphate as P	mg/L	1.5	EPA 300.0	0.040	0.010		03/18/11 10:09	MEJ
Total Alkalinity	mg/L	210	SM 2320B	8.0	2.0	03/22/11 09:00	03/22/11 15:21	JMK
Total Dissolved Solids	mg/L	740	SM 2540C	10	10	03/18/11 11:22	03/22/11 15:03	MMF
Total Kjeldahl Nitrogen	mg/L	3.3	EPA 351.2	0.20	0.05	03/21/11 11:45	03/22/11 12:35	SMB
Total Suspended Solids	mg/L	2	SM 2540D	1	1	03/18/11 11:19	03/18/11 14:49	MMF
Sample Description Matrix SAL Sample Number Date/Time Collected Collected by Date/Time Received		UNSAT-EC4 Wastewater 1102050-15 03/17/11 10:10 Sean Harmon 03/17/11 14:15						
Field Parameters								
pH	SU	7.0	DEP FT1100	0.1	0.1		03/17/11 10:10	SDH
Water Temperature	°C	14.9	DEP FT1400	0.1	0.1		03/17/11 10:10	SDH
Specific conductance	umhos/cm	869	DEP FT1200	0.1	0.1		03/17/11 10:10	SDH
Dissolved Oxygen	mg/L	8.1	DEP FT1500	0.1	0.1		03/17/11 10:10	SDH

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Project Name	roject Name PNRS II								
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Ву	
Sample Description Matrix SAL Sample Number Date/Time Collected Collected by Date/Time Received		UNSAT-EC4 Wastewater 1102050-15 03/17/11 10:10 Sean Harmon 03/17/11 14:15							
Inorganics									
Ammonia as N	mg/L	0.021	EPA 350.1	0.010	0.005		03/21/11 16:38	SMD	
Carbonaceous BOD	mg/L	2 U	SM 5210B	2	2	03/18/11 15:07	03/23/11 08:27	MEJ	
Chemical Oxvgen Demand	ma/L	18 1	EPA 410.4	25	10		03/22/11 08:00	ARM	
Nitrate (as N)	ma/L	37	EPA 300.0	0.04	0.01		03/18/11 10:09	MEJ	
Nitrite (as N)	ma/L	0.01 U	EPA 300.0	0.04	0.01		03/18/11 10:09	MEJ	
Orthophosphate as P	ma/L	1.8	EPA 300.0	0.040	0.010		03/18/11 10:09	MEJ	
Total Alkalinity	ma/L	110	SM 2320B	8.0	2.0	03/22/11 09:00	03/22/11 15:21	JMK	
Total Dissolved Solids	ma/L	590	SM 2540C	10	10	03/22/11 09:36	03/23/11 09:23	MMF	
Total Kieldahl Nitrogen	ma/L	2.5	EPA 351.2	0.20	0.05	03/21/11 11:45	03/22/11 12:35	SMB	
Total Suspended Solids	mg/L	1 U	SM 2540D	1	1	03/18/11 11:19	03/18/11 14:49	MMF	
Sample Description Matrix SAL Sample Number Date/Time Collected Collected by Date/Time Received		UNSAT-CL1 Wastewater 1102050-16 03/17/11 11:20 Sean Harmon 03/17/11 14:15							
Field Parameters									
рН	SU	7.4	DEP FT1100	0.1	0.1		03/17/11 11:20	SDH	
Water Temperature	°C	5.8	DEP FT1400	0.1	0.1		03/17/11 11:20	SDH	
Specific conductance	umhos/cm	1,193	DEP FT1200	0.1	0.1		03/17/11 11:20	SDH	
Dissolved Oxygen	mg/L	6.2	DEP FT1500	0.1	0.1		03/17/11 11:20	SDH	
Inorganics									
Ammonia as N	mg/L	0.021	EPA 350.1	0.010	0.005		03/21/11 16:38	SMD	
Carbonaceous BOD	mg/L	2 U	SM 5210B	2	2	03/18/11 15:07	03/23/11 08:27	MEJ	
Chemical Oxygen Demand	mg/L	22	EPA 410.4	25	10		03/22/11 08:00	ARM	
Nitrate (as N)	mg/L	73	EPA 300.0	0.04	0.01		03/18/11 10:09	MEJ	
Nitrite (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		03/18/11 10:09	MEJ	
Orthophosphate as P	mg/L	1.8	EPA 300.0	0.040	0.010		03/18/11 10:09	MEJ	
Sulfate	mg/L	61	EPA 300.0	0.60	0.20		03/18/11 10:09	MEJ	
Total Alkalinity	mg/L	190	SM 2320B	8.0	2.0	03/22/11 09:00	03/22/11 15:21	JMK	
Total Dissolved Solids	mg/L	850	SM 2540C	10	10	03/22/11 09:36	03/23/11 09:23	MMF	
Total Kjeldahl Nitrogen	mg/L	5.2	EPA 351.2	0.20	0.05	03/21/11 11:45	03/22/11 12:35	SMB	
Total Suspended Solids	mg/L	2	SM 2540D	1	1	03/18/11 11:19	03/18/11 14:49	MMF	

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Project Name		PI	NRS II					
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Ву
Sample Description Matrix SAL Sample Number Date/Time Collected Collected by Date/Time Received		UNSAT-CL2 Wastewater 1102050-17 03/17/11 10:05 Sean Harmon 03/17/11 14:15						
Field Parameters								
рН	SU	7.2	DEP FT1100	0.1	0.1		03/17/11 10:05	SDH
Water Temperature	°C	11.7	DEP FT1400	0.1	0.1		03/17/11 10:05	SDH
Specific conductance	umhos/cm	900	DEP FT1200	0.1	0.1		03/17/11 10:05	SDH
Dissolved Oxygen	mg/L	2.9	DEP FT1500	0.1	0.1		03/17/11 10:05	SDH
Inorganics								
Ammonia as N	mg/L	0.006	EPA 350.1	0.010	0.005		03/21/11 16:38	SMD
Carbonaceous BOD	mg/L	2 U	SM 5210B	2	2	03/18/11 15:07	03/23/11 08:27	MEJ
Chemical Oxygen Demand	mg/L	22	EPA 410.4	25	10		03/22/11 12:30	ARM
Nitrate (as N)	mg/L	36	EPA 300.0	0.04	0.01		03/18/11 10:09	MEJ
Nitrite (as N)	mg/L	0.15	EPA 300.0	0.04	0.01		03/18/11 10:09	MEJ
Orthophosphate as P	mg/L	2.3	EPA 300.0	0.040	0.010		03/18/11 10:09	MEJ
Total Alkalinity	mg/L	150	SM 2320B	8.0	2.0	03/22/11 09:00	03/22/11 15:21	JMK
Total Dissolved Solids	mg/L	620	SM 2540C	10	10	03/22/11 09:36	03/23/11 09:23	MMF
Total Kjeldahl Nitrogen	mg/L	2.8	EPA 351.2	0.20	0.05	03/21/11 11:45	03/22/11 12:35	SMB
Total Suspended Solids	mg/L	1 U	SM 2540D	1	1	03/18/11 11:19	03/18/11 14:49	MMF
Sample Description Matrix SAL Sample Number Date/Time Collected Collected by Date/Time Received		UNSAT-CL3 Wastewater 1102050-18 03/17/11 11:15 Sean Harmon 03/17/11 14:15						
Field Parameters								
pH	SU	7.5	DEP FT1100	0.1	0.1		03/17/11 11:15	SDH
Water Temperature	°C	10.6	DEP FT1400	0.1	0.1		03/17/11 11:15	SDH
Specific conductance	umhos/cm	1,130	DEP FT1200	0.1	0.1		03/17/11 11:15	SDH
Dissolved Oxygen	mg/L	7.5	DEP FT1500	0.1	0.1		03/17/11 11:15	SDH
Inorganics								
Ammonia as N	mg/L	0.033	EPA 350.1	0.010	0.005		03/21/11 16:38	SMD
Carbonaceous BOD	mg/L	2 U	SM 5210B	2	2	03/18/11 15:07	03/23/11 08:27	MEJ
Chemical Oxygen Demand	mg/L	18	EPA 410.4	25	10		03/22/11 12:30	ARM
Nitrate (as N)	mg/L	63	EPA 300.0	0.04	0.01		03/18/11 10:09	MEJ
Nitrite (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		03/18/11 10:09	MEJ
Orthophosphate as P	mg/L	3.0	EPA 300.0	0.040	0.010		03/18/11 10:09	MEJ
Total Alkalinity	mg/L	230	SM 2320B	8.0	2.0	03/22/11 09:00	03/22/11 15:21	JMK

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Project Name		PI	NRS II					
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Ву
Sample Description Matrix SAL Sample Number Date/Time Collected Collected by Date/Time Received		UNSAT-CL3 Wastewater 1102050-18 03/17/11 11:15 Sean Harmon 03/17/11 14:15						
Total Dissolved Solids	mg/L	850	SM 2540C	10	10	03/22/11 09:36	03/23/11 09:23	MMF
Total Kjeldahl Nitrogen	mg/L	3.1	EPA 351.2	0.20	0.05	03/21/11 11:45	03/22/11 12:35	SMB
Total Suspended Solids	mg/L	2	SM 2540D	1	1	03/18/11 11:19	03/18/11 14:49	MMF
Sample Description Matrix SAL Sample Number Date/Time Collected Collected by Date/Time Received		UNSAT-CL4 Wastewater 1102050-19 03/17/11 10:00 Sean Harmon 03/17/11 14:15						
Field Parameters								
pH	SU	8.2	DEP FT1100	0.1	0.1		03/17/11 10:00	SDH
Water Temperature	°C	12.2	DEP FT1400	0.1	0.1		03/17/11 10:00	SDH
Specific conductance	umhos/cm	860	DEP FT1200	0.1	0.1		03/17/11 10:00	SDH
Dissolved Oxygen	mg/L	7.4	DEP FT1500	0.1	0.1		03/17/11 10:00	SDH
Inorganics								
Ammonia as N	mg/L	0.006	EPA 350.1	0.010	0.005		03/21/11 16:38	SMD
Carbonaceous BOD	mg/L	2 U	SM 5210B	2	2	03/18/11 15:07	03/23/11 08:27	MEJ
Chemical Oxygen Demand	mg/L	16	EPA 410.4	25	10		03/22/11 12:30	ARM
Nitrate (as N)	mg/L	33	EPA 300.0	0.04	0.01		03/18/11 10:09	MEJ
Nitrite (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		03/18/11 10:09	MEJ
Orthophosphate as P	mg/L	4.9	EPA 300.0	0.040	0.010		03/18/11 10:09	MEJ
Total Alkalinity	mg/L	110	SM 2320B	8.0	2.0	03/22/11 09:00	03/22/11 15:21	JMK
Total Dissolved Solids	mg/L	600	SM 2540C	10	10	03/22/11 09:36	03/23/11 09:23	MMF
Total Kjeldahl Nitrogen	mg/L	2.7	EPA 351.2	0.20	0.05	03/21/11 11:45	03/22/11 12:35	SMB
Total Suspended Solids	mg/L	1 U	SM 2540D	1	1	03/18/11 11:19	03/18/11 14:49	MMF
Sample Description Matrix SAL Sample Number Date/Time Collected Collected by Date/Time Received		UNSAT-PS1 Wastewater 1102050-20 03/17/11 11:45 Sean Harmon 03/17/11 14:15						
Field Parameters								
рН	SU	7.3	DEP FT1100	0.1	0.1		03/17/11 11:45	SDH
Water Temperature	°C	15.1	DEP FT1400	0.1	0.1		03/17/11 11:45	SDH

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Project Name		PI	NRS II					
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Ву
Sample Description Matrix SAL Sample Number Date/Time Collected Collected by Date/Time Received		UNSAT-PS1 Wastewater 1102050-20 03/17/11 11:45 Sean Harmon 03/17/11 14:15						
Specific conductance	umhos/cm	845	DEP FT1200	0.1	0.1		03/17/11 11:45	SDH
Dissolved Oxygen	mg/L	0.6	DEP FT1500	0.1	0.1		03/17/11 11:45	SDH
Inorganics								
Ammonia as N	mg/L	15	EPA 350.1	0.010	0.005		03/21/11 16:38	SMD
Carbonaceous BOD	mg/L	2 U	SM 5210B	2	2	03/18/11 15:07	03/23/11 08:27	MEJ
Chemical Oxygen Demand	mg/L	51	EPA 410.4	25	10		03/22/11 12:30	ARM
Nitrate (as N)	mg/L	13	EPA 300.0	0.04	0.01		03/18/11 18:56	MEJ
Nitrite (as N)	mg/L	1.7	EPA 300.0	0.04	0.01		03/18/11 18:56	MEJ
Orthophosphate as P	mg/L	2.2	EPA 300.0	0.040	0.010		03/18/11 18:56	MEJ
Total Alkalinity	mg/L	130	SM 2320B	8.0	2.0	03/22/11 09:00	03/22/11 15:21	JMK
Total Dissolved Solids	mg/L	490	SM 2540C	10	10	03/22/11 09:36	03/23/11 09:23	MMF
Total Kjeldahl Nitrogen	mg/L	16	EPA 351.2	0.20	0.05	03/21/11 11:45	03/22/11 12:35	SMB
Total Suspended Solids	mg/L	2	SM 2540D	1	1	03/21/11 10:01	03/22/11 09:28	MMF
Sample Description Matrix SAL Sample Number Date/Time Collected Collected by Date/Time Received		DENIT-SU1 Wastewater 1102050-21 03/17/11 08:16 Sean Harmon 03/17/11 14:15						
Field Parameters								
рН	SU	7.0	DEP FT1100	0.1	0.1		03/17/11 08:16	SDH
Water Temperature	°C	7.2	DEP FT1400	0.1	0.1		03/17/11 08:16	SDH
Specific conductance	umhos/cm	1,254	DEP FT1200	0.1	0.1		03/17/11 08:16	SDH
Dissolved Oxygen	mg/L	0.1 U	DEP FT1500	0.1	0.1		03/17/11 08:16	SDH
Inorganics								
Ammonia as N	mg/L	1.7	EPA 350.1	0.010	0.005		03/24/11 15:20	SMD
Carbonaceous BOD	mg/L	2 U	SM 5210B	2	2	03/18/11 15:07	03/23/11 08:27	MEJ
Chemical Oxygen Demand	mg/L	45	EPA 410.4	25	10		03/22/11 12:30	ARM
Nitrate (as N)	mg/L	0.05	EPA 300.0	0.04	0.01		03/18/11 18:56	MEJ
Nitrite (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		03/18/11 18:56	MEJ
Orthophosphate as P	mg/L	2.9	EPA 300.0	0.040	0.010		03/18/11 18:56	MEJ
Sulfate	mg/L	380	EPA 300.0	0.60	0.20		03/22/11 13:38	MEJ
Total Alkalinity	mg/L	250	SM 2320B	8.0	2.0	03/22/11 09:00	03/22/11 15:21	JMK
Total Dissolved Solids	mg/L	890	SM 2540C	10	10	03/22/11 09:36	03/23/11 09:23	MMF
Total Kjeldahl Nitrogen	mg/L	2.1	EPA 351.2	0.20	0.05	03/21/11 11:45	03/22/11 12:35	SMB

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Project Name		PN	IRS II					
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Ву
Sample Description Matrix SAL Sample Number Date/Time Collected Collected by Date/Time Received		DENIT-SU1 Wastewater 1102050-21 03/17/11 08:16 Sean Harmon 03/17/11 14:15						
Total Suspended Solids	mg/L	2	SM 2540D	1	1	03/21/11 10:01	03/22/11 09:28	MMF
Sample Description Matrix SAL Sample Number Date/Time Collected Collected by Date/Time Received		DENIT-SU2 Wastewater 1102050-22 03/17/11 08:20 Sean Harmon 03/17/11 14:15						
Field Parameters								
рН	SU	7.0	DEP FT1100	0.1	0.1		03/17/11 08:20	SDH
Water Temperature	°C	5.3	DEP FT1400	0.1	0.1		03/17/11 08:20	SDH
Specific conductance	umhos/cm	1,296	DEP FT1200	0.1	0.1		03/17/11 08:20	SDH
Dissolved Oxygen	mg/L	0.5	DEP FT1500	0.1	0.1		03/17/11 08:20	SDH
Inorganics								
Hydrogen Sulfide (Unionized)	mg/L	3.7	SM 4550SF	0.04	0.01	03/21/11 15:54	03/21/11 15:55	MMF
Ammonia as N	mg/L	0.37	EPA 350.1	0.010	0.005		03/24/11 15:20	SMD
Carbonaceous BOD	ma/L	2 U	SM 5210B	2	2	03/18/11 15:07	03/23/11 08:27	MEJ
Chemical Oxygen Demand	ma/L	47	EPA 410.4	25	10		03/22/11 12:30	ARM
Nitrate (as N)	ma/l	0.01	EPA 300.0	0.04	0.01		03/18/11 18:56	MEJ
Nitrite (as N)	ma/l	0.01 11	EPA 300.0	0.04	0.01		03/18/11 18:56	MEJ
Orthophosphate as P	mg/L	20	EPA 300.0	0.040	0.010		03/18/11 18:56	ME.I
Sulfate	mg/L	400	EPA 300.0	0.60	0.20		03/22/11 13:38	ME.
Sulfide	mg/L	7.8	SM 4500SF	0.00	0.10		03/21/11 15:31	MME
Total Alkalinity	mg/L	190	SM 2320B	8.0	2.0	03/22/11 09.00	03/22/11 15:21	IMK
Total Dissolved Solids	mg/L	940	SM 2540C	10	10	03/22/11 09:36	03/23/11 00:23	MME
Total Kieldahl Nitrogen	mg/L	0.80	EPA 351 2	0.20	0.05	03/21/11 11:45	03/22/11 12:35	SMR
Total Suspended Solids	mg/L	2	SM 2540D	1	0.00	03/21/11 10:01	03/22/11 09:28	MMF
				•	•	00,21,11110.01	00,22,11 00.20	
Sample Description Matrix SAL Sample Number Date/Time Collected Collected by Date/Time Received		DENIT-SU3 Wastewater 1102050-23 03/17/11 09:20 Sean Harmon 03/17/11 14:15						
<u>Field Parameters</u> pH	SU	7.6	DEP FT1100	0.1	0.1		03/17/11 09:20	SDH

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Project Name		PI	NRS II					
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Ву
Sample Description Matrix SAL Sample Number Date/Time Collected Collected by Date/Time Received		DENIT-SU3 Wastewater 1102050-23 03/17/11 09:20 Sean Harmon 03/17/11 14:15						
Water Temperature	°C	13.1	DEP FT1400	0.1	0.1		03/17/11 09:20	SDH
Specific conductance	umhos/cm	1,552	DEP FT1200	0.1	0.1		03/17/11 09:20	SDH
Dissolved Oxygen	mg/L	0.1 U	DEP FT1500	0.1	0.1		03/17/11 09:20	SDH
Inorganics								
Ammonia as N	mg/L	1.5	EPA 350.1	0.010	0.005		03/24/11 15:20	SMD
Carbonaceous BOD	mg/L	2 U	SM 5210B	2	2	03/18/11 15:07	03/23/11 08:27	MEJ
Chemical Oxygen Demand	mg/L	39	EPA 410.4	25	10		03/22/11 12:30	ARM
Nitrate (as N)	mg/L	0.01	EPA 300.0	0.04	0.01		03/18/11 18:56	MEJ
Nitrite (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		03/18/11 18:56	MEJ
Orthophosphate as P	mg/L	2.3	EPA 300.0	0.040	0.010		03/18/11 18:56	MEJ
Sulfate	mg/L	650	EPA 300.0	0.60	0.20		03/22/11 13:38	MEJ
Total Alkalinity	mg/L	230	SM 2320B	8.0	2.0	03/22/11 09:00	03/22/11 15:21	JMK
Total Dissolved Solids	mg/L	1,200	SM 2540C	10	10	03/22/11 09:36	03/23/11 09:23	MMF
Total Kjeldahl Nitrogen	mg/L	3.0	EPA 351.2	0.20	0.05	03/21/11 12:05	03/22/11 16:16	SMB
Total Suspended Solids	mg/L	6	SM 2540D	1	1	03/21/11 10:01	03/22/11 09:28	MMF
Sample Description Matrix SAL Sample Number Date/Time Collected Collected by Date/Time Received		DENIT-SU4 Wastewater 1102050-24 03/17/11 09:30 Sean Harmon 03/17/11 14:15						
Field Parameters								
pH	SU	7.4	DEP FT1100	0.1	0.1		03/17/11 09:30	SDH
Water Temperature	°C	14.7	DEP FT1400	0.1	0.1		03/17/11 09:30	SDH
Specific conductance	umhos/cm	1,311	DEP FT1200	0.1	0.1		03/17/11 09:30	SDH
Dissolved Oxygen	mg/L	0.1 U	DEP FT1500	0.1	0.1		03/17/11 09:30	SDH
Inorganics								
Hydrogen Sulfide (Unionized)	mg/L	0.29	SM 4550SF	0.04	0.01	03/21/11 15:54	03/21/11 15:55	MMF
Ammonia as N	mg/L	0.20	EPA 350.1	0.010	0.005		03/24/11 15:20	SMD
Carbonaceous BOD	mg/L	2 U	SM 5210B	2	2	03/18/11 15:07	03/23/11 08:27	MEJ
Chemical Oxygen Demand	mg/L	32	EPA 410.4	25	10		03/22/11 12:30	ARM
Nitrate (as N)	mg/L	0.02	EPA 300.0	0.04	0.01		03/18/11 18:56	MEJ
Nitrite (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		03/18/11 18:56	MEJ
Orthophosphate as P	mg/L	1.3	EPA 300.0	0.040	0.010		03/18/11 18:56	MEJ
Sulfate	mg/L	510	EPA 300.0	0.60	0.20		03/22/11 13:38	MEJ
	-							

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Laboratory Report

Project Name		IA	NRS II					
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Ву
Sample Description Matrix SAL Sample Number Date/Time Collected Collected by Date/Time Received		DENIT-SU4 Wastewater 1102050-24 03/17/11 09:30 Sean Harmon 03/17/11 14:15						
Sulfide	ma/L	1.0	SM 4500SF	0.40	0.10		03/21/11 15:31	MMF
Total Alkalinity	mg/L	210	SM 2320B	8.0	2.0	03/22/11 09:00	03/22/11 15:21	.IMK
Total Dissolved Solids	mg/L	1 100	SM 2540C	10	10	03/22/11 09:36	03/23/11 09:23	MMF
Total Kieldahl Nitrogen	mg/L	1.3	EPA 351.2	0.20	0.05	03/21/11 12:05	03/22/11 16:16	SMB
Total Suspended Solids	mg/L	1 U	SM 2540D	1	1	03/21/11 10:01	03/22/11 09:28	MMF
Sample Description Matrix SAL Sample Number Date/Time Collected Collected by Date/Time Received		DENIT-LS1 Wastewater 1102050-25 03/17/11 08:30 Sean Harmon 03/17/11 14:15						
Field Parameters								
рН	SU	7.4	DEP FT1100	0.1	0.1		03/17/11 08:30	SDH
Water Temperature	°C	4.6	DEP FT1400	0.1	0.1		03/17/11 08:30	SDH
Specific conductance	umhos/cm	886	DEP FT1200	0.1	0.1		03/17/11 08:30	SDH
Dissolved Oxygen	mg/L	0.1 U	DEP FT1500	0.1	0.1		03/17/11 08:30	SDH
Inorganics								
Ammonia as N	mg/L	0.61	EPA 350.1	0.010	0.005		03/24/11 15:20	SMD
Carbonaceous BOD	mg/L	150	SM 5210B	2	2	03/18/11 15:07	03/23/11 08:27	MEJ
Chemical Oxygen Demand	mg/L	320	EPA 410.4	25	10		03/23/11 08:00	ARM
Nitrate (as N)	mg/L	0.01	EPA 300.0	0.04	0.01		03/18/11 18:56	MEJ
Nitrite (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		03/18/11 18:56	MEJ
Orthophosphate as P	mg/L	2.0	EPA 300.0	0.040	0.010		03/18/11 18:56	MEJ
Total Alkalinity	mg/L	320	SM 2320B	8.0	2.0	03/22/11 09:00	03/22/11 15:21	JMK
Total Dissolved Solids	mg/L	630	SM 2540C	10	10	03/22/11 09:36	03/23/11 09:23	MMF
Total Kjeldahl Nitrogen	mg/L	1.8	EPA 351.2	0.20	0.05	03/21/11 12:05	03/22/11 16:16	SMB
Total Suspended Solids	mg/L	20	SM 2540D	1	1	03/21/11 10:01	03/22/11 09:28	MMF
Sample Description Matrix SAL Sample Number Date/Time Collected Collected by Date/Time Received		DENIT-LS2 Wastewater 1102050-26 03/17/11 09:10 Sean Harmon 03/17/11 14:15						

Field Parameters

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Project Name PNRS II								
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Ву
Sample Description Matrix SAL Sample Number Date/Time Collected Collected by Date/Time Received		DENIT-LS2 Wastewater 1102050-26 03/17/11 09:10 Sean Harmon 03/17/11 14:15						
рН	SU	8.0	DEP FT1100	0.1	0.1		03/17/11 09:10	SDH
Water Temperature	°C	14.3	DEP FT1400	0.1	0.1		03/17/11 09:10	SDH
Specific conductance	umhos/cm	1,077	DEP FT1200	0.1	0.1		03/17/11 09:10	SDH
Dissolved Oxygen	mg/L	3.4	DEP FT1500	0.1	0.1		03/17/11 09:10	SDH
Inorganics								
Ammonia as N	mg/L	1.8	EPA 350.1	0.010	0.005		03/24/11 15:20	SMD
Carbonaceous BOD	mg/L	2 U	SM 5210B	2	2	03/18/11 15:07	03/23/11 08:27	MEJ
Chemical Oxygen Demand	mg/L	39	EPA 410.4	25	10		03/22/11 12:30	ARM
Nitrate (as N)	mg/L	12	EPA 300.0	0.04	0.01		03/18/11 18:56	MEJ
Nitrite (as N)	mg/L	2.5	EPA 300.0	0.04	0.01		03/18/11 18:56	MEJ
Orthophosphate as P	mg/L	2.8	EPA 300.0	0.040	0.010		03/18/11 18:56	MEJ
Total Alkalinity	mg/L	350	SM 2320B	8.0	2.0	03/22/11 09:00	03/22/11 15:21	JMK
Total Dissolved Solids	mg/L	710	SM 2540C	10	10	03/22/11 09:36	03/23/11 09:23	MMF
Total Kjeldahl Nitrogen	mg/L	4.0	EPA 351.2	0.20	0.05	03/21/11 12:05	03/22/11 16:16	SMB
Total Suspended Solids	mg/L	4	SM 2540D	1	1	03/21/11 10:01	03/22/11 09:28	MMF
Sample Description Matrix SAL Sample Number Date/Time Collected Collected by Date/Time Received		DENIT-LS3 Wastewater 1102050-27 03/17/11 09:25 Sean Harmon 03/17/11 14:15						
Field Parameters								
рН	SU	7.4	DEP FT1100	0.1	0.1		03/17/11 09:25	SDH
Water Temperature	°C	17.3	DEP FT1400	0.1	0.1		03/17/11 09:25	SDH
Specific conductance	umhos/cm	1,027	DEP FT1200	0.1	0.1		03/17/11 09:25	SDH
Dissolved Oxygen	mg/L	0.8	DEP FT1500	0.1	0.1		03/17/11 09:25	SDH
Inorganics								
Ammonia as N	mg/L	0.74	EPA 350.1	0.010	0.005		03/24/11 15:20	SMD
Carbonaceous BOD	mg/L	120	SM 5210B	2	2	03/18/11 15:07	03/23/11 08:27	MEJ
Chemical Oxygen Demand	mg/L	320	EPA 410.4	25	10		03/23/11 08:00	ARM
Nitrate (as N)	mg/L	0.06	EPA 300.0	0.04	0.01		03/18/11 18:56	MEJ
Nitrite (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		03/18/11 18:56	MEJ
Orthophosphate as P	mg/L	2.6	EPA 300.0	0.040	0.010		03/18/11 18:56	MEJ
Total Alkalinity	mg/L	410	SM 2320B	8.0	2.0	03/22/11 09:00	03/22/11 15:21	JMK
Total Dissolved Solids	mg/L	720	SM 2540C	10	10	03/22/11 09:36	03/23/11 09:23	MMF

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Laboratory Report

Project Name		PI	NRS II					
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Ву
Sample Description Matrix SAL Sample Number Date/Time Collected Collected by Date/Time Received		DENIT-LS3 Wastewater 1102050-27 03/17/11 09:25 Sean Harmon 03/17/11 14:15						
Total Kjeldahl Nitrogen	mg/L	1.6	EPA 351.2	0.20	0.05	03/21/11 12:05	03/22/11 16:16	SMB
Total Suspended Solids	mg/L	2	SM 2540D	1	1	03/21/11 10:01	03/22/11 09:28	MMF
Sample Description Matrix SAL Sample Number Date/Time Collected Collected by Date/Time Received		DENIT-LS4 Wastewater 1102050-28 03/17/11 09:00 Sean Harmon 03/17/11 14:15						
Field Parameters								
рН	SU	7.7	DEP FT1100	0.1	0.1		03/17/11 09:00	SDH
Water Temperature	°C	16.2	DEP FT1400	0.1	0.1		03/17/11 09:00	SDH
Specific conductance	umhos/cm	835	DEP FT1200	0.1	0.1		03/17/11 09:00	SDH
Dissolved Oxygen	mg/L	0.6	DEP FT1500	0.1	0.1		03/17/11 09:00	SDH
Inorganics								
Ammonia as N	ma/L	14	EPA 350.1	0.010	0.005		03/24/11 15:20	SMD
Carbonaceous BOD	ma/L	2 11	SM 5210B	2	2	03/18/11 15:07	03/23/11 08:27	MEJ
Chemical Oxygen Demand	ma/L	90	EPA 410.4	25	10		03/22/11 12:30	ARM
Nitrate (as N)	ma/l	0.02 1	EPA 300.0	0.04	0.01		03/18/11 18:56	MEJ
Nitrite (as N)	ma/l	0.01 11	EPA 300.0	0.04	0.01		03/18/11 18:56	MEJ
Orthophosphate as P	mg/L	22	EPA 300.0	0.040	0.010		03/18/11 18:56	ME.I
Total Alkalinity	mg/L	250	SM 2320B	8.0	2.0	03/22/11 09:00	03/22/11 15:21	.IMK
Total Dissolved Solids	mg/L	450	SM 2540C	10	10	03/22/11 09:36	03/23/11 09:23	MME
Total Kieldahl Nitrogen	mg/L	14	EPA 351 2	0.20	0.05	03/21/11 12:05	03/22/11 16:16	SMB
Total Suspended Solids	mg/L	10	SM 2540D	1	1	03/21/11 10:01	03/22/11 09:28	MMF
Sample Description Matrix SAL Sample Number Date/Time Collected Collected by Date/Time Received		DENIT-GL1 Wastewater 1102050-29 03/17/11 08:40 Sean Harmon 03/17/11 14:15						
Field Parameters								
<u>рН</u>	SU	7.0	DEP FT1100	0.1	0.1		03/17/11 08:40	SDH
Water Temperature	°C	3.9	DEP FT1400	0.1	0.1		03/17/11 08:40	SDH
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Project Name		PI	NRS II					
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Ву
Sample Description Matrix SAL Sample Number Date/Time Collected Collected by Date/Time Received		DENIT-GL1 Wastewater 1102050-29 03/17/11 08:40 Sean Harmon 03/17/11 14:15						
Dissolved Oxygen	mg/L	0.1 U	DEP FT1500	0.1	0.1		03/17/11 08:40	SDH
Inorganics Ammonia as N Carbonaceous BOD Chemical Oxygen Demand Nitrate (as N) Nitrite (as N) Orthophosphate as P Total Alkalinity Total Dissolved Solids Total Kjeldahl Nitrogen Total Suspended Solids Sample Description Matrix SAL Sample Number	mg/L mg/L mg/L mg/L mg/L mg/L mg/L mg/L	4.1 2 U 36 0.01 I 0.01 U 3.0 340 540 4.9 1 U DFT Wastewater 1102050-30	EPA 350.1 SM 5210B EPA 410.4 EPA 300.0 EPA 300.0 SM 2320B SM 2540C EPA 351.2 SM 2540D	0.010 2 25 0.04 0.04 0.040 8.0 10 0.20 1	0.005 2 10 0.01 0.010 2.0 10 0.05 1	03/18/11 15:07 03/22/11 09:00 03/22/11 09:36 03/21/11 12:05 03/21/11 10:01	03/24/11 15:20 03/23/11 08:27 03/22/11 12:30 03/18/11 18:56 03/18/11 18:56 03/18/11 18:56 03/22/11 15:21 03/23/11 09:23 03/22/11 16:16 03/22/11 09:28	SMD MEJ ARM MEJ MEJ JMK MMF SMB MMF
Date/Time Collected Collected by Date/Time Received		03/17/11 11:05 Sean Harmon 03/17/11 14:15						
Field Parameters								
рН	SU	7.2	DEP FT1100	0.1	0.1		03/17/11 11:05	SDH
Water Temperature	°C	18.8	DEP FT1400	0.1	0.1		03/17/11 11:05	SDH
Specific conductance	umhos/cm	891	DEP FT1200	0.1	0.1		03/17/11 11:05	SDH
Dissolved Oxygen	mg/L	7.5	DEP FT1500	0.1	0.1		03/17/11 11:05	SDH
Inorganics								
Hydrogen Sulfide (Unionized)	mg/L	0.53	SM 4550SF	0.04	0.01	03/21/11 15:54	03/21/11 15:55	MMF
Ammonia as N	mg/L	0.065	EPA 350.1	0.010	0.005		03/24/11 15:20	SMD
Carbonaceous BOD	mg/L	2 U	SM 5210B	2	2	03/18/11 15:07	03/23/11 08:27	MEJ
Chemical Oxygen Demand	mg/L	22	EPA 410.4	25	10		03/22/11 12:30	ARM
Nitrate (as N)	mg/L	38	EPA 300.0	0.04	0.01		03/18/11 10:09	MEJ
Nitrite (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		03/18/11 18:56	MEJ
Orthophosphate as P	mg/L	1.9	EPA 300.0	0.040	0.010		03/18/11 18:56	MEJ
Phosphorous - Total as P	mg/L	9.1	SM 4500P-E	0.040	0.010	03/21/11 11:08	03/24/11 08:53	SMD
Sulfate	mg/L	65	EPA 300.0	0.60	0.20		03/18/11 18:56	MEJ
Sulfide	mg/L	1.4	SM 4500SF	0.40	0.10		03/21/11 15:31	MMF
Total Alkalinity	mg/L	140	SM 2320B	8.0	2.0	03/22/11 09:00	03/22/11 15:21	JMK

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Project Name	roject Name PNRS II									
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Ву		
Sample Description Matrix SAL Sample Number Date/Time Collected Collected by Date/Time Received		DFT Wastewater 1102050-30 03/17/11 11:05 Sean Harmon 03/17/11 14:15								
Total Dissolved Solids	mg/L	610	SM 2540C	10	10	03/22/11 09:36	03/23/11 09:23	MMF		
Total Kjeldahl Nitrogen	mg/L	3.3	EPA 351.2	0.20	0.05	03/21/11 12:05	03/22/11 16:16	SMB		
Total Suspended Solids	mg/L	1 U	SM 2540D	1	1	03/21/11 10:01	03/22/11 09:28	MMF		
Sample Description Matrix SAL Sample Number Date/Time Collected Collected by Date/Time Received		T1-D Wastewater 1102050-31 03/17/11 12:20 Sean Harmon 03/17/11 14:15								
Field Parameters										
pH	SU	7.5	DEP FT1100	0.1	0.1		03/17/11 12:20	SDH		
Water Temperature	°C	21.4	DEP FT1400	0.1	0.1		03/17/11 12:20	SDH		
Specific conductance	umhos/cm	1,099	DEP FT1200	0.1	0.1		03/17/11 12:20	SDH		
Dissolved Oxygen	mg/L	2.8	DEP FT1500	0.1	0.1		03/17/11 12:20	SDH		
Inorganics										
Ammonia as N	mg/L	14	EPA 350.1	0.010	0.005		03/24/11 15:20	SMD		
Carbonaceous BOD	mg/L	61	SM 5210B	2	2	03/18/11 15:07	03/23/11 08:27	MEJ		
Chemical Oxygen Demand	mg/L	430	EPA 410.4	25	10		03/23/11 08:00	ARM		
Nitrate (as N)	mg/L	0.14	EPA 300.0	0.04	0.01		03/18/11 18:56	MEJ		
Nitrite (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		03/18/11 18:56	MEJ		
Orthophosphate as P	mg/L	5.4	EPA 300.0	0.040	0.010		03/18/11 18:56	MEJ		
Total Alkalinity	mg/L	400	SM 2320B	8.0	2.0	03/22/11 09:00	03/22/11 15:21	JMK		
Total Dissolved Solids	mg/L	430	SM 2540C	10	10	03/22/11 09:36	03/23/11 09:23	MMF		
Total Kjeldahl Nitrogen	mg/L	78	EPA 351.2	0.20	0.05	03/21/11 12:05	03/22/11 16:16	SMB		
Total Suspended Solids	mg/L	130	SM 2540D	1	1	03/21/11 10:01	03/22/11 09:28	MMF		
Sample Description Matrix SAL Sample Number Date/Time Collected Collected by Date/Time Received		SU-4D Wastewater 1102050-32 03/17/11 09:35 Sean Harmon 03/17/11 14:15								
Field Parameters										
рН	SU	7.4	DEP FT1100	0.1	0.1		03/17/11 09:35	SDH		
Water Temperature	°C	14.7	DEP FT1400	0.1	0.1		03/17/11 09:35	SDH		

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Project Name		PI	NRS II					
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Ву
Sample Description Matrix SAL Sample Number Date/Time Collected Collected by Date/Time Received		SU-4D Wastewater 1102050-32 03/17/11 09:35 Sean Harmon 03/17/11 14:15						
Specific conductance	umhos/cm	1,311	DEP FT1200	0.1	0.1		03/17/11 09:35	SDH
Dissolved Oxygen	mg/L	0.1 U	DEP FT1500	0.1	0.1		03/17/11 09:35	SDH
Inorganics								
Ammonia as N	mg/L	0.22	EPA 350.1	0.010	0.005		03/24/11 15:20	SMD
Carbonaceous BOD	mg/L	2 U	SM 5210B	2	2	03/18/11 15:07	03/23/11 08:27	MEJ
Chemical Oxygen Demand	mg/L	32	EPA 410.4	25	10		03/22/11 12:30	ARM
Nitrate (as N)	mg/L	0.01	EPA 300.0	0.04	0.01		03/18/11 18:56	MEJ
Nitrite (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		03/18/11 18:56	MEJ
Orthophosphate as P	mg/L	1.3	EPA 300.0	0.040	0.010		03/18/11 18:56	MEJ
Total Alkalinity	mg/L	220	SM 2320B	8.0	2.0	03/22/11 09:00	03/22/11 15:21	JMK
Total Dissolved Solids	mg/L	1,100	SM 2540C	10	10	03/22/11 09:36	03/23/11 09:23	MMF
Total Kjeldahl Nitrogen	mg/L	1.2	EPA 351.2	0.20	0.05	03/21/11 12:05	03/22/11 16:16	SMB
Total Suspended Solids	mg/L	2	SM 2540D	1	1	03/21/11 10:01	03/22/11 09:28	MMF
Sample Description Matrix SAL Sample Number Date/Time Collected Collected by Date/Time Received		LS2-D Wastewater 1102050-33 03/17/11 09:15 Sean Harmon 03/17/11 14:15						
Field Parameters								
рН	SU	8.0	DEP FT1100	0.1	0.1		03/17/11 09:15	SDH
Water Temperature	°C	14.3	DEP FT1400	0.1	0.1		03/17/11 09:15	SDH
Specific conductance	umhos/cm	1,077	DEP FT1200	0.1	0.1		03/17/11 09:15	SDH
Dissolved Oxygen	mg/L	3.4	DEP FT1500	0.1	0.1		03/17/11 09:15	SDH
Inorganics								
Ammonia as N	mg/L	1.7	EPA 350.1	0.010	0.005		03/24/11 15:20	SMD
Carbonaceous BOD	mg/L	2 U	SM 5210B	2	2	03/18/11 15:07	03/23/11 08:27	MEJ
Chemical Oxygen Demand	mg/L	41	EPA 410.4	25	10		03/22/11 12:30	ARM
Nitrate (as N)	mg/L	13	EPA 300.0	0.04	0.01		03/18/11 18:56	MEJ
Nitrite (as N)	mg/L	2.5	EPA 300.0	0.04	0.01		03/18/11 18:56	MEJ
Orthophosphate as P	mg/L	2.4	EPA 300.0	0.040	0.010		03/18/11 18:56	MEJ
Total Alkalinity	mg/L	350	SM 2320B	8.0	2.0	03/22/11 09:00	03/22/11 15:21	JMK
Total Dissolved Solids	mg/L	740	SM 2540C	10	10	03/22/11 16:23	03/24/11 11:54	MMF
Total Kjeldahl Nitrogen	mg/L	4.0	EPA 351.2	0.20	0.05	03/21/11 12:05	03/22/11 16:16	SMB
Total Suspended Solids	mg/L	6	SM 2540D	1	1	03/21/11 10:01	03/22/11 09:28	MMF

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Hazen and Sawyer 10002 Princess Palm Avenue Suite 200 Tampa, FLORIDA 33619

March 25, 2011 Work Order: 1102050

Project Name		PN	IRS II					
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Ву
Sample Description Matrix SAL Sample Number Date/Time Collected Collected by Date/Time Received		LS4-D Wastewater 1102050-34 03/17/11 09:05 Sean Harmon 03/17/11 14:15						
Field Parameters								
рН	SU	7.7	DEP FT1100	0.1	0.1		03/17/11 09:05	SDH
Water Temperature	°C	16.2	DEP FT1400	0.1	0.1		03/17/11 09:05	SDH
Specific conductance	umhos/cm	835	DEP FT1200	0.1	0.1		03/17/11 09:05	SDH
Dissolved Oxygen	mg/L	0.6	DEP FT1500	0.1	0.1		03/17/11 09:05	SDH
Inorganics								
Ammonia as N	mg/L	14	EPA 350.1	0.010	0.005		03/24/11 15:20	SMD
Carbonaceous BOD	mg/L	2 U	SM 5210B	2	2	03/18/11 15:07	03/23/11 08:27	MEJ
Chemical Oxygen Demand	mg/L	76	EPA 410.4	25	10		03/23/11 08:00	ARM
Nitrate (as N)	mg/L	0.02	EPA 300.0	0.04	0.01		03/18/11 18:56	MEJ
Nitrite (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		03/18/11 18:56	MEJ
Orthophosphate as P	mg/L	2.1	EPA 300.0	0.040	0.010		03/18/11 18:56	MEJ
Total Alkalinity	mg/L	260	SM 2320B	8.0	2.0	03/22/11 09:00	03/22/11 15:21	JMK
Total Dissolved Solids	mg/L	420	SM 2540C	10	10	03/22/11 16:23	03/24/11 11:54	MMF
Total Kjeldahl Nitrogen	mg/L	15	EPA 351.2	0.20	0.05	03/21/11 12:05	03/22/11 16:16	SMB
Total Suspended Solids	mg/L	10	SM 2540D	1	1	03/21/11 10:01	03/22/11 09:28	MMF
Sample Description Matrix SAL Sample Number Date/Time Collected Collected by Date/Time Received		FB Wastewater 1102050-35 03/17/11 10:30 Sean Harmon 03/17/11 14:15						
Field Parameters								
рН	SU	7.9	DEP FT1100	0.1	0.1		03/17/11 10:30	SDH
Water Temperature	°C	17.3	DEP FT1400	0.1	0.1		03/17/11 10:30	SDH
Specific conductance	umhos/cm	55	DEP FT1200	0.1	0.1		03/17/11 10:30	SDH
Dissolved Oxygen	mg/L	9.3	DEP FT1500	0.1	0.1		03/17/11 10:30	SDH
Inorganics								
Ammonia as N	mg/L	0.044	EPA 350.1	0.010	0.005		03/24/11 15:20	SMD
Carbonaceous BOD	mg/L	2 U	SM 5210B	2	2	03/18/11 15:07	03/23/11 08:27	MEJ
Chemical Oxygen Demand	mg/L	10 U	EPA 410.4	25	10		03/23/11 08:00	ARM
Nitrate (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		03/18/11 18:56	MEJ
Nitrite (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		03/18/11 18:56	MEJ
Orthophosphate as P	mg/L	0.010 U	EPA 300.0	0.040	0.010		03/18/11 18:56	MEJ
Total Alkalinity	mg/L	2.0 U	SM 2320B	8.0	2.0	03/22/11 09:00	03/22/11 15:21	JMK

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Hazen and Sawyer 10002 Princess Palm Avenue Suite 200 Tampa, FLORIDA 33619

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Project Name		PI	NRS II					
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Ву
Sample Description Matrix SAL Sample Number Date/Time Collected Collected by Date/Time Received		FB Wastewater 1102050-35 03/17/11 10:30 Sean Harmon 03/17/11 14:15						
Total Dissolved Solids	mg/L	20	SM 2540C	10	10	03/22/11 16:23	03/24/11 11:54	MMF
Total Kjeldahl Nitrogen	mg/L	0.07	EPA 351.2	0.20	0.05	03/21/11 12:05	03/22/11 16:16	SMB
Total Suspended Solids	mg/L	1 U	SM 2540D	1	1	03/21/11 10:01	03/22/11 09:28	MMF
Sample Description Matrix SAL Sample Number Date/Time Collected Collected by Date/Time Received		EB Wastewater 1102050-36 03/17/11 10:45 Sean Harmon 03/17/11 14:15						
Field Parameters								
рН	SU	7.6	DEP FT1100	0.1	0.1		03/17/11 10:45	SDH
Water Temperature	°C	17.9	DEP FT1400	0.1	0.1		03/17/11 10:45	SDH
Specific conductance	umhos/cm	52	DEP FT1200	0.1	0.1		03/17/11 10:45	SDH
Dissolved Oxygen	mg/L	9.1	DEP FT1500	0.1	0.1		03/17/11 10:45	SDH
Inorganics								
Ammonia as N	mg/L	0.016	EPA 350.1	0.010	0.005		03/24/11 15:20	SMD
Carbonaceous BOD	mg/L	2 U	SM 5210B	2	2	03/18/11 15:07	03/23/11 08:27	MEJ
Chemical Oxygen Demand	mg/L	10 U	EPA 410.4	25	10		03/23/11 08:00	ARM
Nitrate (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		03/18/11 18:56	MEJ
Nitrite (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		03/18/11 18:56	MEJ
Orthophosphate as P	mg/L	0.010 U	EPA 300.0	0.040	0.010		03/18/11 18:56	MEJ
Total Alkalinity	mg/L	2.0 U	SM 2320B	8.0	2.0	03/22/11 09:00	03/22/11 15:21	JMK
Total Dissolved Solids	mg/L	16	SM 2540C	10	10	03/22/11 16:23	03/24/11 11:54	MMF
Total Kjeldahl Nitrogen	mg/L	0.05 U	EPA 351.2	0.20	0.05	03/21/11 11:45	03/22/11 12:35	SMB
Total Suspended Solids	mg/L	1 U	SM 2540D	1	1	03/21/11 10:01	03/22/11 09:28	MMF

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Work Order: 1102050

Hazen and Sawyer 10002 Princess Palm Avenue Suite 200 Tampa, FLORIDA 33619

					Spike	Source		%REC		RPD
Analyte	Result	PQL	MDL	Units	Level	Result	%REC	Limits	RPD	Limit
Batch BC11732 - Ion Chroma	tography 300.0	Prep								
Blank (BC11732-BLK1)					Prepared 8	Analyzed:	03/18/11			
Sulfate	0.20 U	0.60	0.20	mg/L						
Orthophosphate as P	0.010 U	0.040	0.010	mg/L						
Nitrite (as N)	0.01 U	0.04	0.01	mg/L						
Nitrate (as N)	0.01 U	0.04	0.01	mg/L						
LCS (BC11732-BS1)					Prepared &	Analyzed:	03/18/11			
Sulfate	8.77	0.60	0.20	mg/L	9.0		97	85-115		
Orthophosphate as P	0.904	0.040	0.010	mg/L	0.90		100	85-115		
Nitrite (as N)	1.32	0.04	0.01	mg/L	1.4		94	85-115		
Nitrate (as N)	1.70	0.04	0.01	mg/L	1.7		100	85-115		
LCS Dup (BC11732-BSD1)					Prepared &	Analyzed:	03/18/11			
Nitrate (as N)	1.69	0.04	0.01	mg/L	1.7		99	85-115	0.6	200
Nitrite (as N)	1.32	0.04	0.01	mg/L	1.4		94	85-115	0	200
Orthophosphate as P	0.866	0.040	0.010	mg/L	0.90		96	85-115	4	200
Sulfate	8.58	0.60	0.20	mg/L	9.0		95	85-115	2	200
Matrix Spike (BC11732-MS1)		Source: 1	102050-09		Prepared &	Analyzed:	03/18/11			
Nitrite (as N)	8.98	0.04	0.01	mg/L	1.4	7.59	99	85-115		
Orthophosphate as P	1.50	0.040	0.010	mg/L	0.90	0.679	91	85-115		
Nitrate (as N)	2.33	0.04	0.01	mg/L	1.7	0.719	95	85-115		
Sulfate	119 +O	0.60	0.20	mg/L	9.0	210	NR	85-115		
Matrix Spike (BC11732-MS2)		Source: 1	102050-19		Prepared &	Analyzed:	03/18/11			
Nitrite (as N)	1.42	0.04	0.01	mg/L	1.4	ND	101	85-115		
Orthophosphate as P	5.78	0.040	0.010	mg/L	0.90	4.90	98	85-115		
Sulfate	73.9	0.60	0.20	mg/L	9.0	65.7	91	85-115		
Nitrate (as N)	21.9 +O	0.04	0.01	mg/L	1.7	33.0	NR	85-115		

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Hazen and Sawyer 10002 Princess Palm Avenue Suite 200 Tampa, FLORIDA 33619

					Spike	Source		%REC		RPD
Analyte	Result	PQL	MDL	Units	Level	Result	%REC	Limits	RPD	Limit
Batch BC11733 - Ion Chroma	tography 300.0 I	Prep								
Blank (BC11733-BLK1)					Prepared 8	Analyzed:	03/18/11			
Sulfate	0.20 U	0.60	0.20	mg/L						
Nitrate (as N)	0.01 U	0.04	0.01	mg/L						
Nitrite (as N)	0.01 U	0.04	0.01	mg/L						
Orthophosphate as P	0.010 U	0.040	0.010	mg/L						
LCS (BC11733-BS1)					Prepared &	Analyzed:	03/18/11			
Nitrate (as N)	1.67	0.04	0.01	mg/L	1.7		98	85-115		
Orthophosphate as P	0.901	0.040	0.010	mg/L	0.90		100	85-115		
Sulfate	8.65	0.60	0.20	mg/L	9.0		96	85-115		
Nitrite (as N)	1.31	0.04	0.01	mg/L	1.4		94	85-115		
LCS Dup (BC11733-BSD1)					Prepared &	Analyzed:	03/18/11			
Orthophosphate as P	0.961	0.040	0.010	mg/L	0.90		107	85-115	6	200
Nitrite (as N)	1.29	0.04	0.01	mg/L	1.4		92	85-115	2	200
Nitrate (as N)	1.69	0.04	0.01	mg/L	1.7		99	85-115	1	200
Sulfate	8.77	0.60	0.20	mg/L	9.0		97	85-115	1	200
Matrix Spike (BC11733-MS1)		Source: 1	102050-28		Prepared &	Analyzed:	03/18/11			
Nitrate (as N)	1.56	0.04	0.01	mg/L	1.7	0.0172	91	85-115		
Nitrite (as N)	1.30	0.04	0.01	mg/L	1.4	ND	93	85-115		
Orthophosphate as P	2.38 +O	0.040	0.010	mg/L	0.90	2.20	20	85-115		
Sulfate	60.9	0.60	0.20	mg/L	9.0	51.3	107	85-115		
Matrix Spike (BC11733-MS2)		Source: 1	102378-03		Prepared &	Analyzed:	03/18/11			
Nitrate (as N)	3.59 +O	0.04	0.01	mg/L	1.7	0.0667	207	85-115		
Nitrite (as N)	0.01 U,+O	0.04	0.01	mg/L	1.4	0.0194	NR	85-115		
Orthophosphate as P	12.9 +O	0.040	0.010	mg/L	0.90	15.0	NR	85-115		
Sulfate	125 +O	0.60	0.20	mg/L	9.0	122	33	85-115		



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Hazen and Sawyer 10002 Princess Palm Avenue Suite 200 Tampa, FLORIDA 33619

Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch BC11813 - TSS prep										
Blank (BC11813-BLK1)					Prepared 8	Analyzed:	03/18/11			
Total Suspended Solids	1 U	1	1	mg/L						
LCS (BC11813-BS1)					Prepared &	Analyzed:	03/18/11			
Total Suspended Solids	48.0	1	1	mg/L	50		96	85-115		
Duplicate (BC11813-DUP1)		Source: 1	102050-01		Prepared &	Analyzed:	03/18/11			
Total Suspended Solids	116	1	1	mg/L		110			5	30
Duplicate (BC11813-DUP2)		Source: 1	102050-19		Prepared &	Analyzed:	03/18/11			
Total Suspended Solids	1 U	1	1	mg/L		ND				30
Batch BC11814 - TDS Prep										
Blank (BC11814-BLK1)					Prepared:	03/18/11 Ai	nalyzed: 03	/22/11		
Total Dissolved Solids	10 U	10	10	mg/L						
LCS (BC11814-BS1)					Prepared:	03/18/11 Ai	nalyzed: 03	/22/11		
Total Dissolved Solids	1,020	10	10	mg/L	1000		102	90-110		
Duplicate (BC11814-DUP1)		Source: 1	102388-02		Prepared:	03/18/11 Ai	nalyzed: 03	/22/11		
Total Dissolved Solids	28,000	10	10	mg/L		27700			0.9	24
Duplicate (BC11814-DUP2)		Source: 1	102389-01		Prepared:	03/18/11 Ai	nalyzed: 03	/22/11		
Total Dissolved Solids	1,480	10	10	mg/L		1490			0.7	24
Batch BC11827 - BOD										
Blank (BC11827-BLK1)					Prepared:	03/18/11 Ar	nalyzed: 03	/23/11		
Carbonaceous BOD	2 U	2	2	mg/L						

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Hazen and Sawyer 10002 Princess Palm Avenue Suite 200 Tampa, FLORIDA 33619

Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch BC11827 - BOD										
LCS (BC11827-BS1)					Prepared: 0)3/18/11 A	nalyzed: 03	/23/11		
Carbonaceous BOD	172	2	2	mg/L	200		86	85-115		
LCS Dup (BC11827-BSD1)					Prepared: 0)3/18/11 A	nalyzed: 03	/23/11		
Carbonaceous BOD	175	2	2	mg/L	200		88	85-115	2	200
Duplicate (BC11827-DUP1)		Source: 1	102315-01		Prepared: 0	03/18/11 A	nalyzed: 03	/23/11		
Carbonaceous BOD	100	2	2	mg/L		100			0.3	25
Duplicate (BC11827-DUP2)		Source: 1	102050-20		Prepared: 0)3/18/11 A	nalyzed: 03	/23/11		
Carbonaceous BOD	2 U	2	2	mg/L		ND				25
Batch BC12108 - TSS prep										
Blank (BC12108-BLK1)					Prepared: ()3/21/11 A	nalyzed: 03	/22/11		
Total Suspended Solids	1 U	1	1	mg/L						
LCS (BC12108-BS1)					Prepared: 0)3/21/11 A	nalyzed: 03	/22/11		
Total Suspended Solids	49.5	1	1	mg/L	50		99	85-115		
Duplicate (BC12108-DUP1)		Source: 1	102050-20		Prepared: 0)3/21/11 A	nalyzed: 03	/22/11		
Total Suspended Solids	2.00	1	1	mg/L		2.00			0	30
Duplicate (BC12108-DUP2)		Source: 1	102050-31		Prepared: 0)3/21/11 A	nalyzed: 03	/22/11		
Total Suspended Solids	138	1	1	mg/L		130			6	30
Batch BC12116 - Digestion fe	or TP by EPA 36	65.2/SM450)PE							
Blank (BC12116-BLK1)					Prepared: 0)3/21/11 A	nalyzed: 03	/24/11		
Phosphorous - Total as P	0.010 U	0.040	0.010	mg/L						



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Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch BC12116 - Digestion f	or TP by FPA 3	65.2/SM450	0PF							
Baton Bolizino Bigootioni		00.2/011-000								
Blank (BC12116-BLK2)					Prepared:	03/21/11 Ar	nalyzed: 03	/24/11		
Phosphorous - Total as P	0.0100	0.040	0.010	mg/L						
LCS (BC12116-BS1)					Prepared:	03/21/11 Ar	nalyzed: 03	/24/11		
Phosphorous - Total as P	0.509	0.040	0.010	mg/L	0.50		102	90-110		
LCS (BC12116-BS2)					Prepared:	03/21/11 Ar	nalyzed: 03	/24/11		
Phosphorous - Total as P	0.455	0.040	0.010	mg/L	0.50		91	90-110		
Matrix Spike (BC12116-MS1)		Source: 1	101690-09		Prepared:	03/21/11 Ar	nalyzed: 03	/24/11		
Phosphorous - Total as P	0.527	0.040	0.010	mg/L	0.50	0.0160	102	75-125		
Matrix Spike (BC12116-MS2)		Source: 1	102410-07		Prepared:	03/21/11 Ar	nalyzed: 03	/24/11		
Phosphorous - Total as P	0.544	0.040	0.010	mg/L	0.50	0.0847	92	75-125		
Matrix Spike Dup (BC12116-MS	D1)	Source: 1	101690-09		Prepared:	03/21/11 Ar	nalyzed: 03	/24/11		
Phosphorous - Total as P	0.533	0.040	0.010	mg/L	0.50	0.0160	103	75-125	1	25
Matrix Spike Dup (BC12116-MS	D2)	Source: 1	102410-07		Prepared:	03/21/11 Ar	nalyzed: 03	/24/11		
Phosphorous - Total as P	0.574	0.040	0.010	mg/L	0.50	0.0847	98	75-125	5	25
Batch BC12119 - Digestion f	or TKN by EPA	351.2								
Blank (BC12119-BI K1)	*				Prepared:	03/21/11 Ar	nalvzed: 03	/22/11		
Total Kieldahl Nitrogen	0.05.11	0.20	0.05	ma/l						
	0.05 ()	0.20	0.05	IIIg/L						
Blank (BC12119-BLK2)					Prepared:	03/21/11 Ar	nalyzed: 03	/22/11		
Total Kjeldahl Nitrogen	0.05 U	0.20	0.05	mg/L						



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Analyte	Result	POL	MDI	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
	Rooun	1 42		Child	20101	rtoout	/01120	Linito		Linit
Batch BC12119 - Digestion for	or TKN by EPA	351.2								
LCS (BC12119-BS1)					Prepared:	03/21/11 Ar	nalyzed: 03	/22/11		
Total Kjeldahl Nitrogen	2.68	0.20	0.05	mg/L	2.5		106	90-110		
LCS (BC12119-BS2)					Prepared:	03/21/11 Ar	nalyzed: 03	/22/11		
Total Kjeldahl Nitrogen	2.39	0.20	0.05	mg/L	2.5		94	90-110		
Matrix Spike (BC12119-MS1)		Source: 1	101690-09		Prepared:	03/21/11 Ar	nalyzed: 03	/22/11		
Total Kjeldahl Nitrogen	2.50	0.20	0.05	mg/L	2.5	ND	99	80-120		
Matrix Spike (BC12119-MS2)		Source: 1	102050-36		Prepared:	03/21/11 Ai	nalyzed: 03	/22/11		
Total Kjeldahl Nitrogen	2.55	0.20	0.05	mg/L	2.5	ND	100	80-120		
Matrix Spike Dup (BC12119-MSD	1)	Source: 1	101690-09		Prepared:	03/21/11 Aı	nalyzed: 03	/22/11		
Total Kjeldahl Nitrogen	2.56	0.20	0.05	mg/L	2.5	ND	101	80-120	2	20
Matrix Spike Dup (BC12119-MSD	2)	Source: 1	102050-36		Prepared:	03/21/11 Ar	nalyzed: 03	/22/11		
Total Kjeldahl Nitrogen	2.42	0.20	0.05	mg/L	2.5	ND	96	80-120	5	20
Batch BC12120 - Digestion fo	or TKN by EPA	351.2								
Blank (BC12120-BLK1)					Prepared:	03/21/11 Aı	nalyzed: 03	/22/11		
Total Kjeldahl Nitrogen	0.05 U	0.20	0.05	mg/L						
LCS (BC12120-BS1)					Prepared:	03/21/11 Aı	nalyzed: 03	/22/11		
Total Kjeldahl Nitrogen	2.52	0.20	0.05	mg/L	2.5		100	90-110		
Matrix Spike (BC12120-MS1)		Source: 1	102315-02		Prepared:	03/21/11 Ar	nalyzed: 03	/22/11		
Total Kjeldahl Nitrogen	3.60	0.20	0.05	mg/L	2.5	0.943	105	80-120		



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Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch BC12120 - Digestion fo	r TKN by EPA (351.2								
Matrix Spike Dup (BC12120-MSD	1)	Source: 1	102315-02		Prepared:	03/21/11 Ai	nalyzed: 03	/22/11		
Total Kjeldahl Nitrogen	3.36	0.20	0.05	mg/L	2.5	0.943	95	80-120	7	20
Batch BC12121 - Ion Chromat	ography 300.0	Prep								
Blank (BC12121-BLK1)					Prepared 8	Analyzed:	03/21/11			
Nitrate (as N)	0.01 U	0.04	0.01	mg/L						
Sulfate	0.20 U	0.60	0.20	mg/L						
LCS (BC12121-BS1)					Prepared 8	Analyzed:	03/21/11			
Nitrate (as N)	1.72	0.04	0.01	mg/L	1.7		101	85-115		
Sulfate	8.79	0.60	0.20	mg/L	9.0		98	85-115		
LCS Dup (BC12121-BSD1)					Prepared 8	Analyzed:	03/21/11			
Nitrate (as N)	1.73	0.04	0.01	mg/L	1.7		102	85-115	0.6	200
Sulfate	8.81	0.60	0.20	mg/L	9.0		98	85-115	0.2	200
Matrix Spike (BC12121-MS1)		Source: 1	102050-19		Prepared &	Analyzed:	03/21/11			
Nitrate (as N)	17.2 +O	0.04	0.01	mg/L	17	33.3	NR	85-115		
Sulfate	87.6 +O	0.60	0.20	mg/L	90	61.4	29	85-115		
Matrix Spike (BC12121-MS2)		Source: 1	102033-09		Prepared &	Analyzed:	03/21/11			
Sulfate	19.7 +O	0.60	0.20	mg/L	90	62.2	NR	85-115		
Nitrate (as N)	0.161 +O	0.04	0.01	mg/L	17	37.9	NR	85-115		
Batch BC12130 - Sulfide prep										
Blank (BC12130-BLK1)					Prepared 8	Analyzed:	03/21/11			
Sulfide	0.10 U	0.40	0.10	mg/L						

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March 25, 2011

Work Order: 1102050

Hazen and Sawyer 10002 Princess Palm Avenue Suite 200 Tampa, FLORIDA 33619

					Spike	Source		%REC		RPD
Analyte	Result	PQL	MDL	Units	Level	Result	%REC	Limits	RPD	Limit
Batch BC12130 - Sulfide prep)									
LCS (BC12130-BS1)					Prepared &	Analyzed:	03/21/11			
Sulfide	5.04	0.40	0.10	mg/L	5.0		101	85-115		
Matrix Spike (BC12130-MS1)		Source: 1	102391-01		Prepared &	Analyzed:	03/21/11			
Sulfide	4.84	0.40	0.10	mg/L	5.0	0.440	88	85-115		
Matrix Spike Dup (BC12130-MSD	1)	Source: 1	102391-01		Prepared &	Analyzed:	03/21/11			
Sulfide	4.84	0.40	0.10	mg/L	5.0	0.440	88	85-115	0	14
Batch BC12135 - Ammonia by	/ SEAL									
Blank (BC12135-BLK1)					Prepared &	Analyzed:	03/21/11			
Ammonia as N	0.005 U	0.010	0.005	mg/L						
Blank (BC12135-BLK2)					Prepared &	Analyzed:	03/21/11			
Ammonia as N	0.005 U	0.010	0.005	mg/L						
LCS (BC12135-BS1)					Prepared &	Analyzed:	03/21/11			
Ammonia as N	0.48	0.010	0.005	mg/L	0.50		97	90-110		
LCS (BC12135-BS2)					Prepared &	Analyzed:	03/21/11			
Ammonia as N	0.50	0.010	0.005	mg/L	0.50		99	90-110		
Matrix Spike (BC12135-MS1)		Source: 1	102363-07		Prepared &	Analyzed:	03/21/11			
Ammonia as N	0.55	0.010	0.005	mg/L	0.50	0.077	94	90-110		
Matrix Spike (BC12135-MS2)		Source: 1	101690-09		Prepared &	Analyzed:	03/21/11			
Ammonia as N	0.51	0.010	0.005	mg/L	0.50	0.010	100	90-110		

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Hazen and Sawyer 10002 Princess Palm Avenue Suite 200 Tampa, FLORIDA 33619

Analyte	Result	POI	MDL	Units	Spike Level	Source Result	%RFC	%REC Limits	RPD	RPD Limit
Batch BC12135 - Ammonia by S	SFAI			••••••	2010.	rtoodiit	701.120			
Matrix Spike Dup (BC12135-MSD1)		Source: 1	102363-07		Prepared &	Analyzed:	03/21/11			
Ammonia as N	0.53	0.010	0.005	mg/L	0.50	0.077	91	90-110	3	10
Matrix Spike Dup (BC12135-MSD2)		Source: 1	101690-09		Prepared 8	Analyzed:	03/21/11			
Ammonia as N	0.53	0.010	0.005	mg/L	0.50	0.010	104	90-110	4	10
Batch BC12203 - Ion Chromato	graphy 300.0	Prep								
Blank (BC12203-BLK1)					Prepared &	Analyzed:	03/22/11			
Sulfate	0.20 U	0.60	0.20	mg/L						
LCS (BC12203-BS1)					Prepared &	Analyzed:	03/22/11			
Sulfate	8.77	0.60	0.20	mg/L	9.0		97	85-115		
LCS Dup (BC12203-BSD1)					Prepared &	Analyzed:	03/22/11			
Sulfate	8.76	0.60	0.20	mg/L	9.0		97	85-115	0.1	200
Matrix Spike (BC12203-MS1)		Source: 1	102050-10		Prepared &	Analyzed:	03/22/11			
Sulfate	180	0.60	0.20	mg/L	90	98.1	91	85-115		
Orthophosphate as P	12.2	0.040	0.010	mg/L	9.0	3.54	96	85-115		
Nitrite (as N)	12.7	0.04	0.01	mg/L	14	ND	91	85-115		
Nitrate (as N)	22.1	0.04	0.01	mg/L	17	5.90	95	85-115		
Matrix Spike (BC12203-MS2)		Source: 1	102388-01		Prepared &	Analyzed:	03/22/11			
Sulfate	9,300	0.60	0.20	mg/L	9000	838	94	85-115		
Batch BC12207 - TDS Prep										
Blank (BC12207-BLK1)					Prepared:	03/22/11 Ar	nalyzed: 03	/23/11		
Total Dissolved Solids	10 U	10	10	mg/L						

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March 25, 2011

Work Order: 1102050

Hazen and Sawyer 10002 Princess Palm Avenue Suite 200 Tampa, FLORIDA 33619

	Desult	DOI		1.1 14	Spike	Source		%REC		RPD
Analyte	Result	PQL	MDL	Units	Level	Result	%REC	Limits	RPD	Limit
Batch BC12207 - TDS Prep										
LCS (BC12207-BS1)					Prepared:	03/22/11 A	nalyzed: 03	/23/11		
Total Dissolved Solids	1,010	10	10	mg/L	1000		101	90-110		
Duplicate (BC12207-DUP1)		Source: 1	102050-15	;	Prepared:	03/22/11 A	nalyzed: 03	/23/11		
Total Dissolved Solids	612	10	10	mg/L		590			4	24
Duplicate (BC12207-DUP2)		Source: 1	102050-16	;	Prepared:	03/22/11 A	nalyzed: 03	/23/11		
Total Dissolved Solids	862	10	10	mg/L		850			1	24
Batch BC12210 - COD prep										
Blank (BC12210-BLK1)					Prepared &	Analyzed:	03/22/11			
Chemical Oxygen Demand	10 U	25	10	mg/L						
LCS (BC12210-BS1)					Prepared &	Analyzed:	03/22/11			
Chemical Oxygen Demand	49	25	10	mg/L	50		98	90-110		
Matrix Spike (BC12210-MS1)		Source: 1	101680-01		Prepared &	Analyzed:	03/22/11			
Chemical Oxygen Demand	92	25	10	mg/L	50	49	86	85-115		
Matrix Spike Dup (BC12210-MSD1)		Source: 1	101680-01		Prepared &	Analyzed:	03/22/11			
Chemical Oxygen Demand	96	25	10	mg/L	50	49	94	85-115	4	32
Batch BC12220 - alkalinity										
Blank (BC12220-BLK1)					Prepared 8	Analyzed:	03/22/11			
Total Alkalinity	2.0 U	8.0	2.0	mg/L						
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Analyte	Result	POI	MDI	l Inite	Spike	Source	%PEC	%REC	PPD	RPD Limit
Analyte	Result	FQL	NIDL	Units	Levei	Result	/0RLC	LIIIIIIS	NF D	LITIIL
Batch BC12220 - alkalinity										
Blank (BC12220-BLK2)					Prepared 8	Analyzed:	03/22/11			
Total Alkalinity	2.0 U	8.0	2.0	mg/L						
Blank (BC12220-BLK3)					Prepared &	Analyzed:	03/22/11			
Total Alkalinity	2.0 U	8.0	2.0	mg/L						
LCS (BC12220-BS1)					Prepared &	Analyzed:	03/22/11			
Total Alkalinity	130	8.0	2.0	mg/L	120		101	90-110		
LCS (BC12220-BS2)					Prepared &	Analyzed:	03/22/11			
Total Alkalinity	140	8.0	2.0	mg/L	120		110	90-110		
LCS (BC12220-BS3)					Prepared &	Analyzed:	03/22/11			
Total Alkalinity	130	8.0	2.0	mg/L	120		101	90-110		
Matrix Spike (BC12220-MS1)		Source: 1	101680-01		Prepared &	Analyzed:	03/22/11			
Total Alkalinity	400	8.0	2.0	mg/L	120	290	90	80-120		
Matrix Spike (BC12220-MS2)		Source: 1	102050-18		Prepared &	Analyzed:	03/22/11			
Total Alkalinity	350	8.0	2.0	mg/L	120	230	101	80-120		
Matrix Spike (BC12220-MS3)		Source: 1	102378-07		Prepared &	Analyzed:	03/22/11			
Total Alkalinity	340	8.0	2.0	mg/L	120	230	92	80-120		
Matrix Spike Dup (BC12220-MSD1)		Source: 1	101680-01		Prepared &	Analyzed:	03/22/11			
Total Alkalinity	400	8.0	2.0	mg/L	120	290	90	80-120	0	26
Matrix Spike Dup (BC12220-MSD2)		Source: 1	102050-18		Prepared &	Analyzed:	03/22/11			
Total Alkalinity	350	8.0	2.0	mg/L	120	230	101	80-120	0	26



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Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch BC12220 - alkalinity										
Matrix Spike Dup (BC12220-MSD3)		Source: 1	102378-07		Prepared &	Analyzed:	03/22/11			
Total Alkalinity	340	8.0	2.0	mg/L	120	230	92	80-120	0	26
Batch BC12221 - COD prep										
Blank (BC12221-BLK1)					Prepared &	Analyzed:	03/22/11			
Chemical Oxygen Demand	10 U	25	10	mg/L						
LCS (BC12221-BS1)					Prepared &	Analyzed:	03/22/11			
Chemical Oxygen Demand	49	25	10	mg/L	50		98	90-110		
Matrix Spike (BC12221-MS1)		Source: 1	102050-17		Prepared &	Analyzed:	03/22/11			
Chemical Oxygen Demand	69	25	10	mg/L	50	22	94	85-115		
Matrix Spike Dup (BC12221-MSD1)		Source: 1	102050-17		Prepared &	Analyzed:	03/22/11			
Chemical Oxygen Demand	67	25	10	mg/L	50	22	90	85-115	3	32
Batch BC12229 - TDS Prep										
Blank (BC12229-BLK1)					Prepared:	03/22/11 Ai	nalyzed: 03	/24/11		
Total Dissolved Solids	10 U	10	10	mg/L						
LCS (BC12229-BS1)					Prepared:	03/22/11 A	nalyzed: 03	/24/11		
Total Dissolved Solids	1,010	10	10	mg/L	1000		101	90-110		
Duplicate (BC12229-DUP1)		Source: 1	102474-01		Prepared:	03/22/11 A	nalyzed: 03	/24/11		
Total Dissolved Solids	1,230	10	10	mg/L		1250			1	24



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Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch BC12229 - TDS Prep										
Duplicate (BC12229-DUP2)		Source: 1	102474-02		Prepared:	03/22/11 A	nalyzed: 03	/24/11		
Total Dissolved Solids	1,350	10	10	mg/L		1370			1	24
Batch BC12310 - COD prep										
Blank (BC12310-BLK1)					Prepared &	& Analyzed:	03/23/11			
Chemical Oxygen Demand	10 U	25	10	mg/L						
LCS (BC12310-BS1)					Prepared &	Analyzed:	03/23/11			
Chemical Oxygen Demand	53	25	10	mg/L	50		106	90-110		
Matrix Spike (BC12310-MS1)		Source: 1	102394-01		Prepared &	Analyzed:	03/23/11			
Chemical Oxygen Demand	2,400	25	10	mg/L	1000	1400	99	85-115		
Matrix Spike Dup (BC12310-MSD1	I)	Source: 1	102394-01		Prepared &	Analyzed:	03/23/11			
Chemical Oxygen Demand	2,400	25	10	mg/L	1000	1400	99	85-115	0	32
Batch BC12419 - Ammonia by	SEAL									
Blank (BC12419-BLK1)					Prepared 8	Analyzed:	03/24/11			
Ammonia as N	0.005 U	0.010	0.005	mg/L						
Blank (BC12419-BLK2)					Prepared &	& Analyzed:	03/24/11			
Ammonia as N	0.005 U	0.010	0.005	mg/L						
LCS (BC12419-BS1)					Prepared &	Analyzed:	03/24/11			
Ammonia as N	0.50	0.010	0.005	mg/L	0.50		99	90-110		

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					Spike	Source		%REC		RPD	
Analyte	Result	PQL	MDL	Units	Level	Result	%REC	Limits	RPD	Limit	
Batch BC12419 - Ammonia	by SEAL										
LCS (BC12419-BS2)					Prepared &	& Analyzed:	03/24/11				
Ammonia as N	0.50	0.010	0.005	mg/L	0.50		100	90-110			
Matrix Spike (BC12419-MS1)		Source: 1	102050-36		Prepared &	& Analyzed:	03/24/11				
Ammonia as N	0.52	0.010	0.005	mg/L	0.50	0.016	101	90-110			
Matrix Spike (BC12419-MS2)		Source: 1	102429-07		Prepared &	& Analyzed:	03/24/11				
Ammonia as N	0.51	0.010	0.005	mg/L	0.50	0.012	99	90-110			
Matrix Spike Dup (BC12419-MS	SD1)	Source: 1	102050-36		Prepared &	& Analyzed:	03/24/11				
Ammonia as N	0.54	0.010	0.005	mg/L	0.50	0.016	104	90-110	3	10	
Matrix Spike Dup (BC12419-MS	SD2)	Source: 1	102429-07		Prepared &	& Analyzed:	03/24/11				
Ammonia as N	0.52	0.010	0.005	mg/L	0.50	0.012	101	90-110	2	10	



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* 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 limts and the laboratory practical quantitation limit.

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

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

Test results in this report meet all the requirements of the NELAC standards. Any applicable qualifiers are shown below. Questions regarding this report should be directed to Client Services at 813-855-1844.

+O Matrix spike source sample was over the reccommended range for the method.



Francis I. Daniels, Laboratory Director Leslie C. Boardman, Q.A. Manager

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

SAL Predect No. 110205C

,00 Field DO \bigotimes Ú9 UNSOF - JSI, JS2, TS3, IS4 0,18 و۔ و ORP and Do to & collected by Josephin 3 പ് Ö 0 9 6601 900 975 999 1269 Say 1687 1048 234 977 901 88 Field Cond and emailed Instructions/ Remarks 1102050 4.9 patty 3 0.7 9.0 Q 1.1 8 29 6 18 10 C N ى include sulfate 9 qmaT blai7 ~ Q 9 7 Chain of Custody Ν ى 5 7. | 5.7 5 N S Ź 3 Ň Josephin Edeback-Hirst 813-630-4498 Hq blei7 Ĺ 5 L 1 5 ٢ L L jedeback@hazanandsawyer.com e8. e 47.7 731.7 ٢ M ٢ t25.7 Ś S. -69 -67. **ORP** (Client meter) \sim PARAMETER / CONTAINER DESCRIPTION ₹ N N N NA N NA γ N N X N NA © z ≻ N NA TKN, NH3, COD, TP Contact / Phone 125ml P, H₂SO4 ^{'E}ON * AIK, CBOD, TSS, TDS, NO₂, 500mL P, Cool иО³' ОЬ' 20 Volatiles rec'd w /out headspace? AIK, CBOD, TSS, TDS, NO2, Proper preservatives indicated? 500mL P, Cool Samples intact upon arrival? Rec'd within holding time? Proper containers used? Received on ice? Temp No Headspace Hydrogen Sulfide HOEN/etstectate/NaOH Seal intact? тки, ин₃, сор, 125ml P, H2SO4 -03-15-11 Date/Time: 40 'EON ate/Time: 1360 AIK, CBOD, TSS, TDS, NO2, 1000, P, Cool Date/Time Date/Time Date/Time Grab × × × × × × × × × × × × Somposite Ň Ŵ Ŵ ₹ WM WM Ŵ Ŵ ≷ Ž Ž ₹ xinteM PNRS II Wastewater System Analyses 1230 5 0721 0021 1150 1100 1235 1130 0511 5 421 1155 əmiT 20 5 03/7/1 031711 03(71) 031711 031711 631711 031711 03711 03 1111 Hazan and Sawyer 1120 031711 II LEO eceived: eceived: eceived Received Date Date/Time: 1400 N N N DW-Drinking Water WW-Wastewater SW-SurfaceWater SL-Sludge SO-Soil GW-Groundwater SA-Saline Water O-Other R-Reagent Water 63-11-11 Date/Time: 0317 Date/Time: late/Time ate/Tim∈ Sample Description Matrix Codes Project Name / Location ЧS UNSAT-IS4 - SP PNRS II STE-T1 Samplers: (Signature) UNSAT-IS3 -12 UNSAT-EC1 UNSAT-IS2 UNSAT-IS1 Containers Prepared P15-T Chain of Custody.xts Rev.Date 11/19/01 Client Name RC2 RC5 RC3 R04 RC Relinquished: elinquished elinquished Sample No. SAL Use Only 2 33 8 8 60 9 7 8 ട് 90 02

SOUTHERN ANALYTICAL LABORATORIES, INC. 110 BAYVIEW BOULEVARD, OLDSMAR, FL 34577 813-855-1844 fax 813-855-2218

SAL Project No. 110205

0.09 0,08 Pield DO 5 な 7.37 ていっ 01 0.0 8,12 õ 0,61 j, ق 9621 /30 860 900 845 1254 1552 0 311 8 9 Field Cond 5 Je. 0 nstructions / Remarks 1102050 ل ٢ σ Q. 3 3 ∞ \sim qmeT blei? õ 7 C S Ξ 5 2 5 2 ۍ Chain of Custody 거 002 482 -0 0 7.4 Ø С 3 Hq bləi7 Ĺ 1 ٢ 1 ٢ Ĺ \$ ľ 1 7 -231,6 2 0 1-268.4 3 2.12-Ņ 2.754 2 7 -98 5-02-- 48 S85 Contact / Phone: Josephin Edeback-Hirst 813-630-4498 ORP (Client meter) ō 01 PARAMETER / CONTAINER DESCRIPTION edeback@hazanandsawyer.com -281.4 TKN, NH3, COD, TP 125ml P, H2SO4 S Z Z ИО⁵[,] ИО³' ОЬ' 20⁴ ЫК' СВОD' 122' 1D2' ٨N Ì 1000 ,9 Jm000 ^{°E}ON ⁴⁷ON Volatiles rec'd w /out headspace? AIK, CBOD, TSS, TDS, Proper preservatives indicated? 500mL P, Cool Samples intact upon arrival? Rec'd within holding time? Proper containers used? Received on ice? Temp No Headspace Hydrogen Sulfide HOsN/etstectate/Na0H Seal intact? TKN, NH3, COD, ٣ 125ml P, H2SO4 1300 dO 'EON 'ZON AIK, CBOD, TSS, TDS, -1000 P, Cool ate/Time: Date/Time Date/Time: Date/Time: Date/Time: Grab × × × × × × × × × × × × 5 **Omposite** WW WW WM WM Ž WM WM WM WM Ŵ WM WW xinteM PNRS II Wastewater System Analyses 0210110930 0260 1025 0820 0001 0101 0211 0816 211 Š O O əmiT Hazan and Sawyer 03171 63 111 03171 031111 03/711 031711 03171 031711 03711 03171 031711 Date eceived: Received sceived A CLA SIM Date/Time: 1400 0317 Date/Time: DW-Drinking Water WW-Wastewater SW-SurfaceWater SL-Sludge SO-Soil GW-Groundwater SA-Sailine Water O-Other 03-11-11 late/Time: ate/Time: Date/Time: C Sample Description Sev R-Reagent Water Matrix Codes: Project Name / Location Samplers: (Signature) **UNSAT-EC3** UNSAT-SA2 **UNSAT-EC4** UNSAT-CL2 UNSAT-CL3 UNSAT-CL1 **UNSAT-CL4** UNSAT-PS1 DENIT-SU1 DENIT-SU2 **DENIT-SU3** DENIT-SU4 Containers Prepared/ ٣ Client Name Chain of Custody.xts Rev.Date 11/19/01 elinquished: elinquished elinquished Sample No. SAL Use Only β 42 16 24 4 8 19 2 33 17 3 3

110 BAYVIEW BOULEVARD, OLDSIMAR, FL 34677 B13-855-1844 fax 813-855-2218 SOUTHERN ANALYTICAL LABORATORIES, INC.

SAL Project No. 1102050

Client Name	-									Contact / F	hone: dehack-Hi	ret 813-63	0-4498			
	Hazan	and sawyer														
Project Name / Location	SANG	II Wastewate	ar Svetem Ans	lvees						Jedeback(o	<u>unazanano</u>	sawyer.con				
Samplers: (Signature)	X							PARA	METER / (CONTAINE	R DESCRI	PTION				
Matrix Codes: DW-Drinking Water WW- SW-SurfaceWater SL-Slu GW-Groundwater SA-Saline \ R-Reagent Wate	Wastewater dge SO-Soil Mater O-Other er					، SS: ۲DS) ا	'ac *0	Acetate/NaOH Mde 56	, SO, SO, SS, TDS, סו	ol SGT , 225,	о, ТР	meter)				
SAL Use Only Sample Desc	ription	Date	əmiT	Xatrix	Grab Grab	500mL P, Cor Alk, CBOD, T AO2, NO3, OF	126ml P, H2C 126ml P, H2C	Hydrogen Sul Hydrogen Sul Boden Sul	иО ^{s,} иО ^{3,} ОF Aik, CBOD, T 500mL P, Coi	400°, ИО3, Т Ак, Свор, Т 200mL Р, Со	125ml P, H2S 125ml P, H2S	I freit) 990	Hq bl s if	qməT bləi7	bno O bl ei I	Field DO
25 DENIT-LS1		031711	0830	ww	×	1	1					271.5	7.4	4.6	886	0,09
26 DENIT-LS2		031711	0110	ww	×	1	1					-99.1	8.0	14.3	1077	2 V Z
27 DENIT-LS3		031711	0925	MM	× .	1	٢					-794.6	7.4	17.3	1027	0,81
28 DENIT-LS4		031711	0400	ww	×	-	-					-195,5	7.7	16.2	235	0.56
29 DENIT-GL1		031711	0840	ww	×	1	+					-759.0	7,0	3.9	927	0.07
30 DFT		03/7/1	1105	ww	×			1	1		1	+5,6	7,2	18.8	891 -	7.54
31 T1-D		031711	1220	ww	×	+	+					-731,7	7.5	412	1099	2,83
32 SU-4D		031711	0935	ww	×	4	4					-231.6	7,4	L' NI	1311 (2.08
33 LS2-D		031711	0915	ww	×		-					-99.1	8,0	14.3	1077	242
34 LS4-D		031711	2060	ww	×	٢	+					195.5	7.7	16.2	835	0,56
35 FB		071711	1030	νw	×	+	+					-39.8	7,9	11.3	55.3	9,29
36 EB		031711	1045	MM	×	-	-					-26.0	7,6	17.9	52,2	9.09
Containers Prepared/ Relinquished:	Date/Time: 400	Received	r		Date/Time	\$ 1500	Seal intact	~			Q z		Instructio	ns / Remar	ks	
Relinquished	03-//-// Date/Time:	Received:			Date/Time	12	Samples ir	ntact upon ar	rival?	`	AN NA					
J J	011/20			-			Received o	on ice? Tem	9	0	AN NO					
Relinquished	Date/Time:	Received:	1		Date/Time		Proper pre Rec'd with	servatives ir in holding tin	ndicated? ne?	SC	DN NA DN NA	$\overline{\mathbf{x}}$				
Relinquished:	Date/Time:	Received:			Date/Time		Volatiles re Proper cor	ec'd w /out he	eadspace?) (at)						
Reinquished:	Date/Time:	Received:	1		Date/Time						N NA			102050	0	
Chain of Custody.xts Rev.Date 11/19/01												С Ч	ain of Custo	ybo		

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



Hazen and Sawyer 10002 Princess Palm Avenue Suite 200 Tampa, FLORIDA 33619

March 28, 2011 Work Order: 1102042

Laboratory Report

Project Name		PN	IRS II					
Parameters	Units	Results *	Method	PQL	MDL	Prepared	Analyzed	Ву
Sample Description Matrix SAL Sample Number Date/Time Collected Collected by Date/Time Received		UNSAT-IS3 Wastewater 1102042-01 03/15/11 07:50 Client 03/15/11 10:16						
Inorganics								
Ammonia as N	mg/L	1.7	EPA 350.1	0.010	0.005		03/17/11 13:58	SMD
Carbonaceous BOD	mg/L	3	SM 5210B	2	2	03/16/11 15:43	03/21/11 12:49	MEJ
Chemical Oxygen Demand	mg/L	96	EPA 410.4	25	10		03/17/11 11:00	ARM
Nitrate (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		03/16/11 10:57	MEJ
Nitrite (as N)	mg/L	0.01 U	EPA 300.0	0.04	0.01		03/16/11 10:57	MEJ
Orthophosphate as P	mg/L	2.3	EPA 300.0	0.040	0.010		03/16/11 10:57	MEJ
Sulfate	mg/L	200	EPA 300.0	0.60	0.20		03/21/11 14:03	MEJ
Total Alkalinity	mg/L	380	SM 2320B	8.0	2.0	03/22/11 09:00	03/22/11 15:21	JMK
Total Dissolved Solids	mg/L	990	SM 2540C	10	10	03/18/11 11:22	03/22/11 15:03	MMF
Total Kjeldahl Nitrogen	mg/L	2.5	EPA 351.2	0.20	0.05	03/24/11 13:25	03/26/11 07:20	SMD
Total Suspended Solids	mg/L	1 U	SM 2540D	1	1	03/21/11 10:01	03/22/11 09:28	MMF
Sample Description Matrix SAL Sample Number Date/Time Collected Collected by Date/Time Received		UNSAT-IS4 Wastewater 1102042-02 03/15/11 07:45 Client 03/15/11 10:16						
Inorganics								
Ammonia as N	mg/L	0.038	EPA 350.1	0.010	0.005		03/17/11 13:58	SMD
Carbonaceous BOD	mg/L	10	SM 5210B	2	2	03/16/11 15:43	03/21/11 12:49	MEJ
Chemical Oxygen Demand	mg/L	88	EPA 410.4	25	10		03/17/11 11:00	ARM
Nitrate (as N)	mg/L	4.6	EPA 300.0	0.04	0.01		03/16/11 10:57	MEJ
Nitrite (as N)	mg/L	1.2	EPA 300.0	0.04	0.01		03/16/11 10:57	MEJ
Orthophosphate as P	mg/L	0.018	EPA 300.0	0.040	0.010		03/16/11 10:57	MEJ
Sulfate	mg/L	170	EPA 300.0	0.60	0.20		03/21/11 14:03	MEJ
Total Alkalinity	mg/L	460	SM 2320B	8.0	2.0	03/22/11 09:00	03/22/11 15:21	JMK
Total Dissolved Solids	mg/L	870	SM 2540C	10	10	03/18/11 11:22	03/22/11 15:03	MMF
Total Kjeldahl Nitrogen	mg/L	4.8	EPA 351.2	0.20	0.05	03/17/11 11:30	03/18/11 15:44	SMB
Total Suspended Solids	mg/L	44	SM 2540D	1	1	03/21/11 10:01	03/22/11 09:28	MMF

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Inorganics - Quality Control

					Spike	Source		%REC		RPD
Analyte	Result	PQL	MDL	Units	Level	Result	%REC	Limits	RPD	Limit
Batch BC11607 - Ion Chroma	tography 300.0	Prep								
Blank (BC11607-BLK1)					Prepared &	& Analyzed:	03/16/11			
Orthophosphate as P	0.010 U	0.040	0.010	mg/L						
Nitrite (as N)	0.01 U	0.04	0.01	mg/L						
Nitrate (as N)	0.01 U	0.04	0.01	mg/L						
LCS (BC11607-BS1)					Prepared &	& Analyzed:	03/16/11			
Nitrate (as N)	1.72	0.04	0.01	mg/L	1.7		101	85-115		
Nitrite (as N)	1.28	0.04	0.01	mg/L	1.4		91	85-115		
Orthophosphate as P	0.914	0.040	0.010	mg/L	0.90		102	85-115		
LCS Dup (BC11607-BSD1)					Prepared &	& Analyzed:	03/16/11			
Nitrate (as N)	1.72	0.04	0.01	mg/L	1.7		101	85-115	0	200
Orthophosphate as P	0.932	0.040	0.010	mg/L	0.90		104	85-115	2	200
Nitrite (as N)	1.33	0.04	0.01	mg/L	1.4		95	85-115	4	200
Matrix Spike (BC11607-MS1)		Source: 1	102345-07		Prepared &	& Analyzed:	03/16/11			
Orthophosphate as P	8.37	0.040	0.010	mg/L	9.0	ND	93	85-115		
Nitrite (as N)	13.2	0.04	0.01	mg/L	14	ND	94	85-115		
Nitrate (as N)	17.2	0.04	0.01	mg/L	17	0.898	96	85-115		
Matrix Spike (BC11607-MS2)		Source: 1	102223-02		Prepared &	& Analyzed:	03/16/11			
Nitrate (as N)	4.10	0.04	0.01	mg/L	1.7	2.52	93	85-115		
Orthophosphate as P	2.62	0.040	0.010	mg/L	0.90	1.75	97	85-115		
Nitrite (as N)	1.42	0.04	0.01	mg/L	1.4	ND	101	85-115		
Batch BC11624 - BOD										
Blank (BC11624-BLK1)					Prepared:	03/16/11 A	nalyzed: 03	/21/11		
	a	•	•							

Carbonaceous BOD 2 U 2 2 mg/L

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					Spike	Source		%REC		RPD
Analyte	Result	PQL	MDL	Units	Level	Result	%REC	Limits	RPD	Limit
Batch BC11624 - BOD										
LCS (BC11624-BS1)					Prepared:	03/16/11 Ai	nalyzed: 03	/21/11		
Carbonaceous BOD	174	2	2	mg/L	200		87	85-115		
LCS Dup (BC11624-BSD1)					Prepared:	03/16/11 Ai	nalyzed: 03	/21/11		
Carbonaceous BOD	174	2	2	mg/L	200		87	85-115	0.3	200
Duplicate (BC11624-DUP1)		Source: 1	102342-03		Prepared:	03/16/11 Ai	nalyzed: 03	/21/11		
Carbonaceous BOD	2 U	2	2	mg/L		ND				25
Batch BC11705 - COD prep										
Blank (BC11705-BLK1)					Prepared &	Analyzed:	03/17/11			
Chemical Oxygen Demand	10 U	25	10	mg/L						
LCS (BC11705-BS1)					Prepared &	Analyzed:	03/17/11			
Chemical Oxygen Demand	55	25	10	mg/L	50		110	90-110		
Matrix Spike (BC11705-MS1)		Source: 1	102275-01		Prepared &	Analyzed:	03/17/11			
Chemical Oxygen Demand	2,300	25	10	mg/L	1000	1400	95	85-115		
Matrix Spike Dup (BC11705-MSD	1)	Source: 1	102275-01		Prepared &	Analyzed:	03/17/11			
Chemical Oxygen Demand	2,300	25	10	mg/L	1000	1400	87	85-115	4	32
Batch BC11706 - Ammonia by	/ SEAL									
Blank (BC11706-BLK1)					Prepared &	Analyzed:	03/17/11			
Ammonia as N	0.005 U	0.010	0.005	mg/L						



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Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch BC11706 - Ammonia by	SFAL									
					Dranarad	Apolyzodi	02/17/11			
Blank (BC11706-BLK2)					Prepared a	x Analyzeo:	03/17/11			
Ammonia as N	0.008	0.010	0.005	mg/L						
LCS (BC11706-BS1)					Prepared &	Analyzed:	03/17/11			
Ammonia as N	0.48	0.010	0.005	mg/L	0.50		97	90-110		
LCS (BC11706-BS2)					Prepared 8	Analyzed:	03/17/11			
Ammonia as N	0.52	0.010	0.005	mg/L	0.50		104	90-110		
Matrix Spike (BC11706-MS1)		Source: 1	102319-07		Prepared &	Analyzed:	03/17/11			
Ammonia as N	0.53	0.010	0.005	mg/L	0.50	0.046	97	90-110		
Matrix Spike (BC11706-MS2)		Source: 1	102345-01		Prepared &	Analyzed:	03/17/11			
Ammonia as N	0.55	0.010	0.005	mg/L	0.50	0.035	103	90-110		
Matrix Spike Dup (BC11706-MSD	I)	Source: 1	102319-07		Prepared &	Analyzed:	03/17/11			
Ammonia as N	0.55	0.010	0.005	mg/L	0.50	0.046	100	90-110	3	10
Matrix Spike Dup (BC11706-MSD2	2)	Source: 1	102345-01		Prepared &	Analyzed:	03/17/11			
Ammonia as N	0.54	0.010	0.005	mg/L	0.50	0.035	102	90-110	0.9	10
Batch BC11710 - Digestion fo	r TKN by EPA	351.2								
Blank (BC11710-BLK1)					Prepared:	03/17/11 A	nalyzed: 03	/18/11		
Total Kjeldahl Nitrogen	0.05 U	0.20	0.05	mg/L						
Blank (BC11710-BLK2)				-	Prepared:	03/17/11 Ai	nalyzed: 03	/18/11		
Total Kjeldahl Nitrogen	0.05 U	0.20	0.05	mg/L			-			



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Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch BC11710 - Digestion for	TKN by EPA	351.2								
LCS (BC11710-BS1)					Prepared:	03/17/11 Ar	nalyzed: 03	/18/11		
Total Kjeldahl Nitrogen	2.47	0.20	0.05	mg/L	2.5		97	90-110		
LCS (BC11710-BS2)					Prepared:	03/17/11 Ar	nalyzed: 03	/18/11		
Total Kjeldahl Nitrogen	2.41	0.20	0.05	mg/L	2.5		95	90-110		
Matrix Spike (BC11710-MS1)		Source: 1	102291-06		Prepared:	03/17/11 Ar	nalyzed: 03	/18/11		
Total Kjeldahl Nitrogen	3.04	0.20	0.05	mg/L	2.5	0.376	105	80-120		
Matrix Spike (BC11710-MS2)		Source: 1	101684-17		Prepared:	03/17/11 Ar	nalyzed: 03	/18/11		
Total Kjeldahl Nitrogen	2.43	0.20	0.05	mg/L	2.5	ND	96	80-120		
Matrix Spike Dup (BC11710-MSD1)		Source: 1	102291-06		Prepared:	03/17/11 Ar	nalyzed: 03	/18/11		
Total Kjeldahl Nitrogen	2.85	0.20	0.05	mg/L	2.5	0.376	98	80-120	7	20
Matrix Spike Dup (BC11710-MSD2)		Source: 1	101684-17		Prepared:	03/17/11 Ar	nalyzed: 03	/18/11		
Total Kjeldahl Nitrogen	2.60	0.20	0.05	mg/L	2.5	ND	103	80-120	7	20
Batch BC11814 - TDS Prep										
Blank (BC11814-BLK1)					Prepared:	03/18/11 Ar	nalyzed: 03	/22/11		
Total Dissolved Solids	10 U	10	10	mg/L			-			
LCS (BC11814-BS1)					Prepared:	03/18/11 Ar	nalyzed: 03	/22/11		
Total Dissolved Solids	1,020	10	10	mg/L	1000		102	90-110		
Duplicate (BC11814-DUP1)		Source: 1	102388-02		Prepared:	03/18/11 Ar	nalyzed: 03	/22/11		
Total Dissolved Solids	28,000	10	10	mg/L		27700			0.9	24



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Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch BC11814 - TDS Prep										
Duplicate (BC11814-DUP2)		Source: 1	102389-01		Prepared:	03/18/11 Ai	nalyzed: 03	/22/11		
Total Dissolved Solids	1,480	10	10	mg/L		1490			0.7	24
Batch BC12108 - TSS prep										
Blank (BC12108-BLK1)					Prepared:	03/21/11 A	nalyzed: 03	/22/11		
Total Suspended Solids	1 U	1	1	mg/L						
LCS (BC12108-BS1)					Prepared:	03/21/11 Ai	nalyzed: 03	/22/11		
Total Suspended Solids	49.5	1	1	mg/L	50		99	85-115		
Duplicate (BC12108-DUP1)		Source: 1	102050-20)	Prepared:	03/21/11 Ai	nalyzed: 03	/22/11		
Total Suspended Solids	2.00	1	1	mg/L		2.00			0	30
Duplicate (BC12108-DUP2)		Source: 1	102050-31		Prepared:	03/21/11 A	nalyzed: 03	/22/11		
Total Suspended Solids	138	1	1	mg/L		130			6	30
Batch BC12121 - Ion Chroma	tography 300.0	Prep								
Blank (BC12121-BLK1)					Prepared &	Analyzed:	03/21/11			
Sulfate	0.20 U	0.60	0.20	mg/L						
LCS (BC12121-BS1)					Prepared &	Analyzed:	03/21/11			
Sulfate	8.79	0.60	0.20	mg/L	9.0		98	85-115		
LCS Dup (BC12121-BSD1)					Prepared &	Analyzed:	03/21/11			
Sulfate	8.81	0.60	0.20	mg/L	9.0		98	85-115	0.2	200

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Analyte	Result	PQL	MDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch BC12121 - Ion Chromat	ography 300.0	Prep								
Matrix Spike (BC12121-MS1)		Source: 1	102050-19		Prepared 8	Analyzed:	03/21/11			
Sulfate	87.6 +O	0.60	0.20	mg/L	90	65.7	24	85-115		
Matrix Spike (BC12121-MS2)		Source: 1	102033-09		Prepared 8	Analyzed:	03/21/11			
Sulfate	19.7 +O	0.60	0.20	mg/L	90	62.2	NR	85-115		
Batch BC12220 - alkalinity										
Blank (BC12220-BLK1)					Prepared 8	Analyzed:	03/22/11			
Total Alkalinity	2.0 U	8.0	2.0	mg/L						
Blank (BC12220-BLK2)					Prepared 8	Analyzed:	03/22/11			
Total Alkalinity	2.0 U	8.0	2.0	mg/L						
Blank (BC12220-BLK3)					Prepared 8	Analyzed:	03/22/11			
Total Alkalinity	2.0 U	8.0	2.0	mg/L						
LCS (BC12220-BS1)					Prepared 8	Analyzed:	03/22/11			
Total Alkalinity	130	8.0	2.0	mg/L	120		101	90-110		
LCS (BC12220-BS2)					Prepared 8	Analyzed:	03/22/11			
Total Alkalinity	140	8.0	2.0	mg/L	120		110	90-110		
LCS (BC12220-BS3)					Prepared 8	Analyzed:	03/22/11			
Total Alkalinity	130	8.0	2.0	mg/L	120		101	90-110		
Matrix Spike (BC12220-MS1)		Source: 1	101680-01		Prepared 8	Analyzed:	03/22/11			
Total Alkalinity	400	8.0	2.0	mg/L	120	290	90	80-120		

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					Spike	Source		%REC		RPD
Analyte	Result	PQL	MDL	Units	Level	Result	%REC	Limits	RPD	Limit
Batch BC12220 - alkalinity										
Matrix Spike (BC12220-MS2)		Source: 1	102050-18		Prepared 8	Analyzed:	03/22/11			
Total Alkalinity	350	8.0	2.0	mg/L	120	230	101	80-120		
Matrix Spike (BC12220-MS3)		Source: 1102378-07		Prepared & Analyzed: 03/22/11						
Total Alkalinity	340	8.0	2.0	mg/L	120	230	92	80-120		
Matrix Spike Dup (BC12220-MSD1)		Source: 1	101680-01		Prepared & Analyzed: 03/22/11					
Total Alkalinity	400	8.0	2.0	mg/L	120	290	90	80-120	0	26
Matrix Spike Dup (BC12220-MSD2)		Source: 1	102050-18		Prepared & Analyzed: 03/22/11					
Total Alkalinity	350	8.0	2.0	mg/L	120	230	101	80-120	0	26
Matrix Spike Dup (BC12220-MSD3)		Source: 1	102378-07		Prepared & Analyzed: 03/22/11					
Total Alkalinity	340	8.0	2.0	mg/L	120	230	92	80-120	0	26
Batch BC12417 - Digestion for 1	FKN by EPA	351.2								
Blank (BC12417-BLK1)					Prepared:	03/24/11 Analyzed: 03/25/11				
Total Kjeldahl Nitrogen	0.05 U	0.20	0.05	mg/L						
Blank (BC12417-BLK2)					Prepared: 03/24/11 Analyzed: 03/25/11					
Total Kjeldahl Nitrogen	0.05 U	0.20	0.05	mg/L						
LCS (BC12417-BS1)					Prepared: 03/24/11 Analyzed: 03/25/11					
Total Kjeldahl Nitrogen	2.67	0.20	0.05	mg/L	2.5		107	90-110		
LCS (BC12417-BS2)					Prepared: 03/24/11 Analyzed: 03/25/11					
Total Kjeldahl Nitrogen	2.69	0.20	0.05	mg/L	2.5		108	90-110		

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					Spike	Source		%REC		RPD
Analyte	Result	PQL	MDL	Units	Level	Result	%REC	Limits	RPD	Limit
Batch BC12417 - Digestion fo	r TKN by EPA	351.2								
Matrix Spike (BC12417-MS1)		Source: 1	102497-01		Prepared:	03/24/11 A	nalyzed: 03	/25/11		
Total Kjeldahl Nitrogen	2.46	0.20	0.05	mg/L	2.5	ND	98	80-120		
Matrix Spike (BC12417-MS2)	pike (BC12417-MS2) Source: 1102544-07		,	Prepared: 03/24/11 Analyzed: 03/25/11						
Total Kjeldahl Nitrogen	3.38	0.20	0.05	mg/L	2.5	0.716	107	80-120		
Matrix Spike Dup (BC12417-MSD1) Source: 1102497-01			Prepared: 03/24/11 Analyzed: 03/25/11							
Total Kjeldahl Nitrogen	2.69	0.20	0.05	mg/L	2.5	ND	108	80-120	9	20
Matrix Spike Dup (BC12417-MSD2) Source: 1102544-07		,	Prepared: 03/24/11 Analyzed: 03/25/11							
Total Kjeldahl Nitrogen	3.31	0.20	0.05	mg/L	2.5	0.716	104	80-120	2	20



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* 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 limts and the laboratory practical quantitation limit.

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

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

Test results in this report meet all the requirements of the NELAC standards. Any applicable qualifiers are shown below. Questions regarding this report should be directed to Client Services at 813-855-1844.

+O Matrix spike source sample was over the reccommended range for the method.



Francis I. Daniels, Laboratory Director Leslie C. Boardman, Q.A. Manager

ABORATORIES, INC.	813-855-1844 fax 813-855-2218
SOUTHERN ANALYTICAL L	110 BAWIEW BOULEVARD, OLDSMAR, FL 34677

SAL Project No. 1102042

OO PIPIJ JHEI Field Cond 142 Instructions / Remarks 12.2 5 qmaT blai7 5 7.34 6.99 Contact / Phone: Josephin Edeback-Hirst 813-630-4498 Hq bisi7 edeback@hazanandsawyer.com ھ 1.61 **ORP (Client meter)** 5 PARAMETER / CONTAINER DESCRIPTION N N N Volatiles rec'd w /out headspace? Proper preservatives indicated? Received on ice? Temp 0.0Samples intact upon arrival? Rec'd w ithin holding time? Proper containers used? Seal intact? тки, ин₃, сор, 125ml P, H2SO4 иО^{2,} ОБ, *SO*, Alk, CBOD, TSS, TDS, NO₂, 500mL P, Cool Date/Time: 5-15-11 091: 20 1-1-8 3-14-11 HH 17501 Date/Time: Date/Time. Date/Time: Date/Time Grab × × Composite Ŵ \mathbb{N} xinteM PNRS II Wastewater System Analyses Ret 7:4 Yeur 7: 50au mill essent əmiT Ś <u>-| ייכן ויי</u>)/12/11 | Hazan and Sawyer əteO *feived* eceived Received: Receive Date/Time: 041.00 Date/Time: /5³0 1.0 ° (G Date/Time: Date/Time - (/ 3 - (5 - (/ 11-6-5 DW-Drinking Water WW-Wastewater SW-SurfaceWater SL-Studge SO-Soil GW-Groundwater SA-Saline Water O-Other 3-12-11 Date/Time: Sample Description **R-Reagent Water** Matrix Codes: ING Project Name / Location Lev 2 Samplers: (Signature) UNSAT-IS3 UNSAT-IS4 Client Name Chain of Custody.xds Rev.Date 11/19/01 Containers Prep Relinquished: inquished Sample No. SAL Use Only 5 8

Chain of Custody

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Pace Analytical Services, Inc. 8 East Tower Circle Ormond Beach, FL 32174 (386)672-5668

March 25, 2011

Ms. Josefin Edebeck-Hirst Hazen and Sawyer, P.C 10002 Princess Palm Avenue Suite 200 Tampa, FL 33619

RE: Project: 44237-001/FDOH PNRS II SE #5 Pace Project No.: 3527866

Dear Ms. Edebeck-Hirst:

Enclosed are the analytical results for sample(s) received by the laboratory on March 18, 2011. The results relate only to the samples included in this report. Results reported herein conform to the most current NELAC standards, where applicable, unless otherwise narrated in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

San m. ma

Sakina Mckenzie

sakina.mckenzie@pacelabs.com Project Manager

Enclosures

REPORT OF LABORATORY ANALYSIS

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CERTIFICATIONS

Project: 44237-001/FDOH PNRS II SE #5

Pace Project No.: 3527866

Ormond Beach Certification IDs

8 East Tower Circle, Ormond Beach, FL 32174 Alabama Certification #: 41320 Arizona Certification #: A20735 Colorado Certification: FL NELAC Reciprocity Connecticut Certification #: PH 0216 Florida Certification #: B3079 Georgia Certification #: 955 Guam Certification: FL NELAC Reciprocity Hawaii Certification: FL NELAC Reciprocity Kansas Certification #: E-10383 Kentucky Certification #: 90050 Louisiana Certification #: LA090012 Louisiana Environmental Certificate #: 05007 Maine Certification #: FL1264 Michigan Certification #: 9911 Mississippi Certification: FL NELAC Reciprocity Montana Certification #: Cert 0074 Nevada Certification: FL NELAC Reciprocity New Hampshire Certification #: 2958 New Jersey Certification #: FL765 New York Certification #: 11608 North Carolina Environmental Certificate #: 667 North Carolina Certification #: 12710 Pennsylvania Certification #: 68-547 Puerto Rico Certification #: FL01264 Tennessee Certification #: FL01264 Texas Certification: FL NELAC Reciprocity Virginia Certification #: 00432 Wyoming Certification: FL NELAC Reciprocity

REPORT OF LABORATORY ANALYSIS





SAMPLE SUMMARY

 Project:
 44237-001/FDOH PNRS II SE #5

 Pace Project No.:
 3527866

Lab ID	Sample ID	Matrix	Date Collected	Date Received
3527866001	PNRS STE-TI	Water	03/17/11 12:20	03/18/11 07:30
3527866002	UNSAT-IS2	Water	03/17/11 12:45	03/18/11 07:30

REPORT OF LABORATORY ANALYSIS





SAMPLE ANALYTE COUNT

 Project:
 44237-001/FDOH PNRS II SE #5

 Pace Project No.:
 3527866

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
3527866001	PNRS STE-TI		SMM	3	PASI-O
		SM 2320B	HEA	1	PASI-O
		SM 2540C	AIS	1	PASI-O
		SM 2540D	AIS	1	PASI-O
		SM 4500-S2F	LAJ	1	PASI-O
		SM 5210B	KHC	1	PASI-O
		EPA 300.0	KDM	3	PASI-O
		EPA 300.0	KDM	1	PASI-O
		EPA 350.1	AMD	1	PASI-O
		EPA 351.2	AMD	1	PASI-O
		EPA 365.4	AMD	1	PASI-O
		EPA 410.4	MMD	1	PASI-O
3527866002	UNSAT-IS2		SMM	3	PASI-O
		SM 2320B	HEA	1	PASI-O
		SM 2540C	AIS	1	PASI-O
		SM 2540D	AIS	1	PASI-O
		SM 4500-S2F	LAJ	1	PASI-O
		SM 5210B	KHC	1	PASI-O
		EPA 300.0	KDM	3	PASI-O
		EPA 300.0	KDM	1	PASI-O
		EPA 350.1	AMD	1	PASI-O
		EPA 351.2	AMD	1	PASI-O
		EPA 365.4	AMD	1	PASI-O

REPORT OF LABORATORY ANALYSIS





Project: 44237-001/FDOH PNRS II SE #5

Pace Project No.: 3527866

Method:

Description:Field DataClient:Hazen and Sawyer, P.CDate:March 25, 2011

General Information:

2 samples were analyzed for . All samples were received in acceptable condition with any exceptions noted below.

Hold Time:

The samples were analyzed within the method required hold times with any exceptions noted below.

Initial Calibrations (including MS Tune as applicable): All criteria were within method requirements with any exceptions noted below.

Continuing Calibration:

All criteria were within method requirements with any exceptions noted below.

Internal Standards:

All internal standards were within QC limits with any exceptions noted below.

Surrogates:

All surrogates were within QC limits with any exceptions noted below.

Method Blank:

All analytes were below the report limit in the method blank with any exceptions noted below.

Laboratory Control Spike:

All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:

All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Duplicate Sample:

All duplicate sample results were within method acceptance criteria with any exceptions noted below.

Additional Comments:

REPORT OF LABORATORY ANALYSIS





Project: 44237-001/FDOH PNRS II SE #5

Pace Project No.: 3527866

Method: SM 2320B

Description:2320B AlkalinityClient:Hazen and Sawyer, P.CDate:March 25, 2011

General Information:

2 samples were analyzed for SM 2320B. All samples were received in acceptable condition with any exceptions noted below.

Hold Time:

The samples were analyzed within the method required hold times with any exceptions noted below.

Method Blank:

All analytes were below the report limit in the method blank with any exceptions noted below.

Laboratory Control Spike:

All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:

All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

QC Batch: WET/7786

A matrix spike and matrix spike duplicate (MS/MSD) were performed on the following sample(s): 3527102025,3527801002

- J(M1): Estimated Value. Matrix spike recovery exceeded QC limits. Batch accepted based on laboratory control sample (LCS) recovery.
 - MS (Lab ID: 183428)
 - Alkalinity, Total as CaCO3

Duplicate Sample:

All duplicate sample results were within method acceptance criteria with any exceptions noted below.

Additional Comments:

REPORT OF LABORATORY ANALYSIS





Project: 44237-001/FDOH PNRS II SE #5

Pace Project No.: 3527866

Method: SM 2540C

Description:2540C Total Dissolved SolidsClient:Hazen and Sawyer, P.CDate:March 25, 2011

General Information:

2 samples were analyzed for SM 2540C. All samples were received in acceptable condition with any exceptions noted below.

Hold Time:

The samples were analyzed within the method required hold times with any exceptions noted below.

Method Blank:

All analytes were below the report limit in the method blank with any exceptions noted below.

Laboratory Control Spike:

All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:

All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Duplicate Sample:

All duplicate sample results were within method acceptance criteria with any exceptions noted below.

Additional Comments:

REPORT OF LABORATORY ANALYSIS





Project: 44237-001/FDOH PNRS II SE #5

Pace Project No.: 3527866

Method: SM 2540D

Description:2540D Total Suspended SolidsClient:Hazen and Sawyer, P.CDate:March 25, 2011

General Information:

2 samples were analyzed for SM 2540D. All samples were received in acceptable condition with any exceptions noted below.

Hold Time:

The samples were analyzed within the method required hold times with any exceptions noted below.

Method Blank:

All analytes were below the report limit in the method blank with any exceptions noted below.

Laboratory Control Spike:

All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:

All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Duplicate Sample:

All duplicate sample results were within method acceptance criteria with any exceptions noted below.

Additional Comments:

REPORT OF LABORATORY ANALYSIS





Project: 44237-001/FDOH PNRS II SE #5

Pace Project No.: 3527866

Method: SM 4500-S2F

Description:4500S2F Hydrogen SulfideClient:Hazen and Sawyer, P.CDate:March 25, 2011

General Information:

2 samples were analyzed for SM 4500-S2F. All samples were received in acceptable condition with any exceptions noted below.

Hold Time:

The samples were analyzed within the method required hold times with any exceptions noted below.

Method Blank:

All analytes were below the report limit in the method blank with any exceptions noted below.

Laboratory Control Spike:

All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:

All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Duplicate Sample:

All duplicate sample results were within method acceptance criteria with any exceptions noted below.

Additional Comments:

REPORT OF LABORATORY ANALYSIS





Project: 44237-001/FDOH PNRS II SE #5

Pace Project No.: 3527866

Method: SM 5210B

Description:5210B cBOD, 5 dayClient:Hazen and Sawyer, P.CDate:March 25, 2011

General Information:

2 samples were analyzed for SM 5210B. All samples were received in acceptable condition with any exceptions noted below.

Hold Time:

The samples were analyzed within the method required hold times with any exceptions noted below.

Sample Preparation:

The samples were prepared in accordance with SM 5210B with any exceptions noted below.

Method Blank:

All analytes were below the report limit in the method blank with any exceptions noted below.

Laboratory Control Spike:

All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:

All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Duplicate Sample:

All duplicate sample results were within method acceptance criteria with any exceptions noted below.

Additional Comments:

Analyte Comments:

QC Batch: WET/7734

- L: Off-scale high. Actual value is known to be greater than value given.
 - DUP (Lab ID: 182271)
 - Carbonaceous BOD, 5 day

REPORT OF LABORATORY ANALYSIS

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Project: 44237-001/FDOH PNRS II SE #5

Pace Project No.: 3527866

Method: EPA 300.0

Description:300.0 IC AnionsClient:Hazen and Sawyer, P.CDate:March 25, 2011

General Information:

2 samples were analyzed for EPA 300.0. All samples were received in acceptable condition with any exceptions noted below.

Hold Time:

The samples were analyzed within the method required hold times with any exceptions noted below.

Initial Calibrations (including MS Tune as applicable):

All criteria were within method requirements with any exceptions noted below.

Continuing Calibration:

All criteria were within method requirements with any exceptions noted below.

Method Blank:

All analytes were below the report limit in the method blank with any exceptions noted below.

Laboratory Control Spike:

All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:

All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Duplicate Sample:

All duplicate sample results were within method acceptance criteria with any exceptions noted below.

Additional Comments:

Analyte Comments:

QC Batch: WETA/9208

1p: The recovery of the analyte in the CRDL standard (also known as the reporting limit verification) did not meet the acceptance criteria.

- BLANK (Lab ID: 182578)
 - Nitrogen, NO2 plus NO3
 - Nitrite as N
 - Nitrate as N
 - Orthophosphate as P

REPORT OF LABORATORY ANALYSIS





Project: 44237-001/FDOH PNRS II SE #5

Pace Project No.: 3527866

Method: EPA 300.0

Description:300.0 IC Anions 28 DaysClient:Hazen and Sawyer, P.CDate:March 25, 2011

General Information:

2 samples were analyzed for EPA 300.0. All samples were received in acceptable condition with any exceptions noted below.

Hold Time:

The samples were analyzed within the method required hold times with any exceptions noted below.

Initial Calibrations (including MS Tune as applicable):

All criteria were within method requirements with any exceptions noted below.

Continuing Calibration:

All criteria were within method requirements with any exceptions noted below.

Method Blank:

All analytes were below the report limit in the method blank with any exceptions noted below.

Laboratory Control Spike:

All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:

All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

QC Batch: WETA/9209

A matrix spike and matrix spike duplicate (MS/MSD) were performed on the following sample(s): 3527866001,3527880001 J(M1): Estimated Value. Matrix spike recovery exceeded QC limits. Batch accepted based on laboratory control sample (LCS) recovery. • MS_(lab ID: 182586)

MS (Lab ID: 182586)
Sulfate
MSD (Lab ID: 182587)

Sulfate

Duplicate Sample:

All duplicate sample results were within method acceptance criteria with any exceptions noted below.

Additional Comments:

Analyte Comments:

QC Batch: WETA/9209

1p: The recovery of the analyte in the CRDL standard (also known as the reporting limit verification) did not meet the acceptance criteria.

• BLANK (Lab ID: 182582)

Fluoride

REPORT OF LABORATORY ANALYSIS





Project: 44237-001/FDOH PNRS II SE #5

Pace Project No.: 3527866

Method: EPA 350.1

Description:350.1 AmmoniaClient:Hazen and Sawyer, P.CDate:March 25, 2011

General Information:

2 samples were analyzed for EPA 350.1. All samples were received in acceptable condition with any exceptions noted below.

Hold Time:

The samples were analyzed within the method required hold times with any exceptions noted below.

Initial Calibrations (including MS Tune as applicable):

All criteria were within method requirements with any exceptions noted below.

Continuing Calibration:

All criteria were within method requirements with any exceptions noted below.

Method Blank:

All analytes were below the report limit in the method blank with any exceptions noted below.

Laboratory Control Spike:

All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:

All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

QC Batch: WETA/9216

A matrix spike and matrix spike duplicate (MS/MSD) were performed on the following sample(s): 3527866001

J(M1): Estimated Value. Matrix spike recovery exceeded QC limits. Batch accepted based on laboratory control sample (LCS) recovery.

- MS (Lab ID: 182739)
 - Nitrogen, Ammonia

Duplicate Sample:

All duplicate sample results were within method acceptance criteria with any exceptions noted below.

Additional Comments:

REPORT OF LABORATORY ANALYSIS





Project: 44237-001/FDOH PNRS II SE #5

Pace Project No.: 3527866

Method: EPA 351.2

Description:351.2 Total Kjeldahl NitrogenClient:Hazen and Sawyer, P.CDate:March 25, 2011

General Information:

2 samples were analyzed for EPA 351.2. All samples were received in acceptable condition with any exceptions noted below.

Hold Time:

The samples were analyzed within the method required hold times with any exceptions noted below.

Sample Preparation:

The samples were prepared in accordance with EPA 351.2 with any exceptions noted below.

Initial Calibrations (including MS Tune as applicable):

All criteria were within method requirements with any exceptions noted below.

Continuing Calibration:

All criteria were within method requirements with any exceptions noted below.

Method Blank:

All analytes were below the report limit in the method blank with any exceptions noted below.

Laboratory Control Spike:

All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:

All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Duplicate Sample:

All duplicate sample results were within method acceptance criteria with any exceptions noted below.

Additional Comments:

REPORT OF LABORATORY ANALYSIS





Project: 44237-001/FDOH PNRS II SE #5

Pace Project No.: 3527866

Method: EPA 365.4

Description:365.4 Phosphorus, TotalClient:Hazen and Sawyer, P.CDate:March 25, 2011

General Information:

2 samples were analyzed for EPA 365.4. All samples were received in acceptable condition with any exceptions noted below.

Hold Time:

The samples were analyzed within the method required hold times with any exceptions noted below.

Sample Preparation:

The samples were prepared in accordance with EPA 365.4 with any exceptions noted below.

Initial Calibrations (including MS Tune as applicable):

All criteria were within method requirements with any exceptions noted below.

Continuing Calibration:

All criteria were within method requirements with any exceptions noted below.

Method Blank:

All analytes were below the report limit in the method blank with any exceptions noted below.

Laboratory Control Spike:

All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:

All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Duplicate Sample:

All duplicate sample results were within method acceptance criteria with any exceptions noted below.

Additional Comments:

REPORT OF LABORATORY ANALYSIS





Project: 44237-001/FDOH PNRS II SE #5

Pace Project No.: 3527866

Method: EPA 410.4

Description:410.4 CODClient:Hazen and Sawyer, P.CDate:March 25, 2011

General Information:

1 sample was analyzed for EPA 410.4. All samples were received in acceptable condition with any exceptions noted below.

Hold Time:

The samples were analyzed within the method required hold times with any exceptions noted below.

Initial Calibrations (including MS Tune as applicable):

All criteria were within method requirements with any exceptions noted below.

Continuing Calibration:

All criteria were within method requirements with any exceptions noted below.

Method Blank:

All analytes were below the report limit in the method blank with any exceptions noted below.

Laboratory Control Spike:

All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:

All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Duplicate Sample:

All duplicate sample results were within method acceptance criteria with any exceptions noted below.

Additional Comments:

This data package has been reviewed for quality and completeness and is approved for release.

REPORT OF LABORATORY ANALYSIS





ANALYTICAL RESULTS

Project: 44237-001/FDOH PNRS II SE #5

Pace Project No.: 3527866

Received: 03/18/11 07:30 Sample: PNRS STE-TI Lab ID: 3527866001 Collected: 03/17/11 12:20 Matrix: Water PQL MDL DF Parameters Results Units Prepared CAS No. Analyzed Qual **Field Data** Analytical Method: Field pH 7.5 Std. Units 03/18/11 09:53 1 **Field Temperature** 21.4 deg C 1 03/18/11 09:53 03/18/11 09:53 Field Specific Conductance 1099 umhos/cm 1 Analytical Method: SM 2320B 2320B Alkalinity Alkalinity, Total as CaCO3 387 mg/L 5.0 5.0 03/22/11 17:50 1 2540C Total Dissolved Solids Analytical Method: SM 2540C **Total Dissolved Solids** 10.0 10.0 03/21/11 08:29 456 mg/L 1 2540D Total Suspended Solids Analytical Method: SM 2540D **Total Suspended Solids** 60.0 mg/L 10.0 10.0 1 03/21/11 08:11 4500S2F Hydrogen Sulfide Analytical Method: SM 4500-S2F Un-ionized Hydrogen Sulfide 3.1 mg/L 1.0 1.0 1 03/22/11 12:15 5210B cBOD, 5 day Analytical Method: SM 5210B Preparation Method: SM 5210B Carbonaceous BOD, 5 day 88.8 mg/L 2.0 2.0 03/18/11 11:13 03/23/11 08:37 1 300.0 IC Anions Analytical Method: EPA 300.0 Nitrate as N 0.050U mg/L 0.10 0.050 2 03/18/11 12:50 14797-55-8 Nitrite as N 0.050U mg/L 0.10 0.050 2 03/18/11 12:50 14797-65-0 Orthophosphate as P 5.7 mg/L 0.20 0.10 2 03/18/11 12:50 Analytical Method: EPA 300.0 300.0 IC Anions 28 Days Sulfate 28.5 mg/L 10.0 5.0 2 03/18/11 12:50 14808-79-8 350.1 Ammonia Analytical Method: EPA 350.1 57.5 mg/L 0.25 0.10 Nitrogen, Ammonia 5 03/21/11 10:30 7664-41-7 J(M1) 351.2 Total Kjeldahl Nitrogen Analytical Method: EPA 351.2 Preparation Method: EPA 351.2 Nitrogen, Kjeldahl, Total 71.3 mg/L 1.0 0.50 03/22/11 09:30 03/24/11 08:04 7727-37-9 1 365.4 Phosphorus, Total Analytical Method: EPA 365.4 Preparation Method: EPA 365.4 Phosphorus, Total (as P) 8.2 mg/L 0.20 0.10 03/22/11 09:30 03/24/11 08:04 7723-14-0 1 410.4 COD Analytical Method: EPA 410.4 25.0 03/22/11 17:59 Chemical Oxygen Demand 372 mg/L 12.5 1

Date: 03/25/2011 09:33 AM

REPORT OF LABORATORY ANALYSIS




ANALYTICAL RESULTS

Project: 44237-001/FDOH PNRS II SE #5

Pace Project No.:

No.: 3527866

Sample: UNSAT-IS2	Lab ID: 3527866002		Collecte	d: 03/17/11	12:45	Received: 03/18/11 07:30 Matrix: Water				
Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual	
Field Data	Analytical	Method:								
Field pH	7.4 S	Std. Units			1		03/18/11 09:54			
Field Temperature	11.8 d	leg C			1		03/18/11 09:54			
Field Specific Conductance	977 u	imhos/cm			1		03/18/11 09:54			
2320B Alkalinity	Analytical	Method: SM 2	320B							
Alkalinity, Total as CaCO3	204 n	ng/L	5.0	5.0	1		03/22/11 17:56			
2540C Total Dissolved Solids	Analytical	Method: SM 2	540C							
Total Dissolved Solids	682 n	ng/L	10.0	10.0	1		03/21/11 08:30			
2540D Total Suspended Solids	Analytical	Method: SM 2	540D							
Total Suspended Solids	6.0 n	ng/L	5.0	5.0	1		03/21/11 08:11			
4500S2F Hydrogen Sulfide	Analytical	Method: SM 4	500-S2F							
Un-ionized Hydrogen Sulfide	1.0U n	ng/L	1.0	1.0	1		03/22/11 12:15			
5210B cBOD, 5 day	Analytical	Method: SM 5	210B Prepa	aration Meth	nod: SN	1 5210B				
Carbonaceous BOD, 5 day	3.9 n	ng/L	2.0	2.0	1	03/18/11 11:13	03/23/11 08:37			
300.0 IC Anions	Analytical	Method: EPA	300.0							
Nitrate as N	0.83 n	ng/L	0.10	0.050	2		03/18/11 13:27	14797-55-8		
Nitrite as N	8.1 n	ng/L	0.10	0.050	2		03/18/11 13:27	14797-65-0		
Orthophosphate as P	1.5 n	ng/L	0.20	0.10	2		03/18/11 13:27			
300.0 IC Anions 28 Days	Analytical	Method: EPA	300.0							
Sulfate	185 n	ng/L	25.0	12.5	5		03/21/11 17:07	14808-79-8		
350.1 Ammonia	Analytical	Method: EPA	350.1							
Nitrogen, Ammonia	0.38 n	ng/L	0.050	0.020	1		03/21/11 10:34	7664-41-7		
351.2 Total Kjeldahl Nitrogen	Analytical	Method: EPA	351.2 Prepa	aration Meth	nod: EP	PA 351.2				
Nitrogen, Kjeldahl, Total	3.2 n	ng/L	0.50	0.25	1	03/22/11 09:30	03/24/11 08:06	7727-37-9		
365.4 Phosphorus, Total	Analytical	Method: EPA	365.4 Prepa	aration Meth	nod: EP	PA 365.4				
Phosphorus, Total (as P)	2.5 n	ng/L	0.10	0.050	1	03/22/11 09:30	03/24/11 08:06	7723-14-0		

Date: 03/25/2011 09:33 AM

REPORT OF LABORATORY ANALYSIS

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Project:	44237-001/FDOI	H PNRS II SE #5						
Pace Project No.:	3527866							
QC Batch:	WET/7786		Analysis Me	thod:	SM 2320B			
QC Batch Method:	SM 2320B		Analysis De	scription:	2320B Alkalinit	y		
Associated Lab Sam	ples: 3527866	6001, 3527866002						
METHOD BLANK:	183423		Matrix	: Water				
Associated Lab Sam	ples: 3527866	001, 3527866002						
			Blank	Reporting	I			
Param	neter	Units	Result	Limit	Analyze	d Qual	ifiers	
Alkalinity, Total as Ca	aCO3	mg/L	5.0U		5.0 03/22/11 15	5:51		
LABORATORY CON	ITROL SAMPLE:	183424						
			Spike	LCS	LCS	% Rec		
Param	neter	Units	Conc.	Result	% Rec	Limits	Qualifiers	
Alkalinity, Total as Ca	aCO3	mg/L	250	246	98	90-110		
MATRIX SPIKE SAM	IPLE:	183426						
			3527102025	Spike	MS	MS	% Rec	
Param	eter	Units	Result	Conc.	Result	% Rec	Limits	Qualifiers
Alkalinity, Total as Ca	aCO3	mg/L	8	0.0 25	0 329) 1	00 90-11	0
MATRIX SPIKE SAM	IPLE:	183428						
			3527801002	Spike	MS	MS	% Rec	
Param	neter	Units	Result	Conc.	Result	% Rec	Limits	Qualifiers
Alkalinity, Total as Ca	aCO3	mg/L	8	1.4 25	0 276	3	78 90-11	0 J(M1)
SAMPLE DUPLICAT	E: 183425							
Param	eter	Units	3527102025 Result	Dup Result	RPD	Max RPD	Qualifiers	5
Alkalinity, Total as Ca	aCO3	mg/L	80.0	7	9.1	1	20	
	- 400 - 27							
SAMPLE DUPLICAT	E: 183427		0507004000	Dur		N/		
			3527801002	Dup		Max		
Param	leter	Units	Result	Result	RPD	RPD	Qualifiers	S

Date: 03/25/2011 09:33 AM

REPORT OF LABORATORY ANALYSIS

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Project: 442	237-001/FDOH	I PNRS II SE #5								
Pace Project No.: 352	27866									
QC Batch: W	/ET/7756		Analysis M	ethod:	SN	A 2540C				
QC Batch Method: S	M 2540C		Analysis Description: 2			2540C Total Dissolved Solids				
Associated Lab Sample	s: 35278660	001, 3527866002								
METHOD BLANK: 182	2776		Matrix	k: Water						
Associated Lab Sample	s: 35278660	001, 3527866002								
			Blank	Reporting	9					
Paramete	r	Units	Result	Limit		Analyzed	Quali	fiers	_	
Total Dissolved Solids		mg/L	5.0L	J	5.0	03/21/11 08:2	4			
	<u></u>									
LABORATORY CONTR	OL SAMPLE:	182777		1.00		1.00	0/ D			
Paramete	r	Units	Spike Conc.	Result	9	LCS % Rec	% Rec Limits	Qua	alifiers	
Total Dissolved Solids		mg/L	300	290		97	90-110			
SAMPLE DUPLICATE:	182779									
			3527866001	Dup			Max			
Paramete	r	Units	Result	Result		RPD	RPD		Qualifiers	
Total Dissolved Solids		mg/L	456	3 .	456	.0000000007	,	20		
SAMPLE DUPLICATE:	182780									
			3527887001	Dup			Max			
Paramete	r	Units	Result	Result		RPD	RPD		Qualifiers	
Total Dissolved Solids		mg/L		1	020					

REPORT OF LABORATORY ANALYSIS





Project:	44237-001/FDOH	I PNRS II SE #5							
Pace Project No .:	3527866								
QC Batch:	WET/7758		Analysis M	ethod:	SM 2540D				
QC Batch Method:	SM 2540D		Analysis D	escription:	2540D Total Suspended Solids				
Associated Lab Sar	nples: 3527866	001, 3527866002							
METHOD BLANK:	182785		Matri	x: Water					
Associated Lab Sar	nples: 3527866	001, 3527866002							
			Blank	Reporting					
Paran	neter	Units	Result	Limit	Analyze	d Quali	fiers		
Total Suspended So	olids	mg/L	5.0L	J	5.0 03/21/11 0	B:11			
LABORATORY CON	NTROL SAMPLE:	182786							
			Spike	LCS	LCS	% Rec			
Paran	neter	Units	Conc.	Result	% Rec	Limits	Qualifiers		
Total Suspended So	blids	mg/L	80	86.0	108	90-110			
	TE. 400707								
SAMPLE DUPLICA	IE. 102707		2527854001	Dun		Мах			
Paran	neter	Units	Result	Result	RPD	RPD	Qualifiers		
Total Suspended So	olids	mg/L	5.01	5.0	00		20		
SAMPLE DUPLICA	TE: 182788								
_			3527934001	Dup		Max	0		
Paran	neter	Units	Result	Result	RPD	RPD	Qualifiers		
Total Suspended So	blids	mg/L	32.0) 3'	1.0	3	20		

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REPORT OF LABORATORY ANALYSIS

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Project: 44237-001/FDOH	H PNRS II SE #5						
Pace Project No.: 3527866							
QC Batch: WET/7734		Analysis M	ethod:	SM 5210B			
QC Batch Method: SM 5210B		Analysis De	escription:	5210B cBOD, \$	5 day		
Associated Lab Samples: 3527866	001, 3527866002						
METHOD BLANK: 182269		Matriz	x: Water				
Associated Lab Samples: 3527866	001, 3527866002						
		Blank	Reporting				
Parameter	Units	Result	Limit	Analyze	d Quali	ifiers	
Carbonaceous BOD, 5 day	mg/L	2.00	J 2	2.0 03/23/11 08	8:37		
LABORATORY CONTROL SAMPLE:	182270						
_		Spike	LCS	LCS	% Rec		
Parameter	Units	Conc.	Result	% Rec	Limits	Qualifiers	
Carbonaceous BOD, 5 day	mg/L	198	169	85			
SAMPLE DUPLICATE: 182271							
		3527787001	Dup		Max		
Parameter	Units	Result	Result	RPD	RPD	Qualifiers	
Carbonaceous BOD, 5 day	mg/L	11.3	3 1'	1.3	.09	L	

REPORT OF LABORATORY ANALYSIS

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EPA 300.0

300.0 IC Anions

44237-001/FDOH PNRS II SE #5 Project:

Pace Project No.:	3527866	
QC Batch:	WETA/9208	Analysis Method:
QC Batch Method:	EPA 300.0	Analysis Description:
Associated Lab Sam	ples: 3527866001, 3527866002	
METHOD BLANK:	182578	Matrix: Water

Associated Lab Samples: 3527866001, 3527866002 Blank Reporting Limit Qualifiers Parameter Units Result Analyzed Nitrate as N mg/L 0.025U 0.050 03/18/11 09:36 1р 0.025U Nitrite as N mg/L 0.050 03/18/11 09:36 1р Orthophosphate as P mg/L 0.050U 0.10 03/18/11 09:36 1р

LABORATORY CONTROL SAMPLE: 182579

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Nitrate as N	mg/L	5	4.8	95	90-110	
Nitrite as N	mg/L	5	4.8	97	90-110	
Orthophosphate as P	mg/L	10	9.4	94	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 182580					182581							
			MS	MSD								
	352	27866001	Spike	Spike	MS	MSD	MS	MSD	% Rec		Max	
Parameter	Units	Result	Conc.	Conc.	Result	Result	% Rec	% Rec	Limits	RPD	RPD	Qual
Nitrate as N	mg/L	0.050U	10	10	10	9.9	100	99	90-110	.2	20	
Nitrite as N	mg/L	0.050U	10	10	10.1	10.1	101	101	90-110	.04	20	
Orthophosphate as P	mg/L	5.7	20	20	26.0	26.1	102	102	90-110	.6	20	

REPORT OF LABORATORY ANALYSIS

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Project:	44237-001/F	DOH PNRS I	I SE #5										
Pace Project No.:	3527866												
QC Batch:	WETA/9209)		Analys	sis Method:	E	PA 300.0						
QC Batch Method:	EPA 300.0			Analysis Description:			300.0 IC Anions						
Associated Lab Sar	mples: 3527	866001, 352	7866002										
METHOD BLANK:	182582			١	Matrix: Wat	er							
Associated Lab Sar	mples: 3527	866001, 352	7866002										
				Blank	K R	eporting							
Parar	neter	ا ا	Jnits	Resu	t	Limit	Analyz	zed	Qualifiers				
Sulfate		mg/L			2.5U	5.0	03/18/11	09:36					
LABORATORY CO	NTROL SAMP	LE: 18258	3										
				Spike	LCS	i	LCS	% Rec	;				
Parar	meter	I	Jnits	Conc.	Resu	lt	% Rec	Limits	Qı	ualifiers			
Sulfate		mg/L		50		46.5	93	90	-110				
MATRIX SPIKE & N	ATRIX SPIKE		: 18258	4		182585							
				MS	MSD								
		35	27866001	Spike	Spike	MS	MSD	MS	MSD	% Rec		Max	
Parame	ter	Units	Result	Conc.	Conc.	Result	Result	% Rec	% Rec	Limits	RPD	RPD	Qual
Sulfate		mg/L	28.5	100	100	136	136	107	107	90-110	.3	20	
MATRIX SPIKE & N	ATRIX SPIKE	DUPLICATE	: 18258	6		182587							
				MS	MSD	'							
		35	27880001	Spike	Spike	MS	MSD	MS	MSD	% Rec		Max	
Parame	ter	Units	Result	Conc.	Conc.	Result	Result	% Rec	% Rec	Limits	RPD	RPD	Qual
Sulfate		mg/L	61.5	100	100	175	175	113	113	90-110	.1	20	J(M1)

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REPORT OF LABORATORY ANALYSIS





Project: 4	4237-001/FDOH	PNRS II SE #5									
Pace Project No.: 3	3527866										
QC Batch:	WETA/9216		Analysis M	ethod:	EPA 350.1						
QC Batch Method:	EPA 350.1		Analysis De	Analysis Description: 350.1 Ammonia							
Associated Lab Samp	oles: 35278660	001, 3527866002									
METHOD BLANK: 1	82736		Matrix	: Water							
Associated Lab Samp	oles: 35278660	001, 3527866002									
			Blank	Reporting							
Parame	eter	Units	Result	Limit	Analyzed	Qualifi	ers				
Nitrogen, Ammonia		mg/L	0.020L	0.05	0 03/21/11 10:	24					
LABORATORY CONT	ROL SAMPLE:	182737									
_			Spike	LCS	LCS	% Rec					
Parame	eter	Units	Conc.	Result	% Rec	Limits	Qualifiers				
Nitrogen, Ammonia		mg/L	1	1.0	104	90-110					
MATRIX SPIKE SAMI	PLE:	182739									
			352786600	1 Spike	MS	MS	% Rec				
Parame	eter	Units	Result	Conc.	Result	% Rec	Limits	Qualifiers			
Nitrogen, Ammonia		mg/L	5	57.5 5	63.6	12'	90-110	J(M1)			
SAMPLE DUPLICATE	: 182738										
			3527866001	Dup		Max					
Parame	eter	Units	Result	Result	RPD	RPD	Qualifiers				
Nitrogen, Ammonia		mg/L	57.5	59.	8	4	20				

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REPORT OF LABORATORY ANALYSIS

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Project: 44	4237-001/FDOH	PNRS II SE #5						
Pace Project No.: 35	527866							
QC Batch:	WETA/9244		Analysis M	ethod:	EPA 351.2			
QC Batch Method:	EPA 351.2		Analysis De	escription:	351.2 TKN			
Associated Lab Sample	es: 35278660	001, 3527866002						
METHOD BLANK: 18	33215		Matrix	k: Water				
Associated Lab Sample	es: 35278660	001, 3527866002						
			Blank	Reporting				
Paramete	er	Units	Result	Limit	Analyzed	Qualifi	ers	
Nitrogen, Kjeldahl, Tota	al	mg/L	0.25	J 0.5	50 03/24/11 07:	55		
LABORATORY CONTR	ROL SAMPLE:	183216						
Paramete	er	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers	
Nitrogen, Kjeldahl, Tota	al	mg/L	20	21.0	105	90-110		
MATRIX SPIKE SAMP	LE:	183218						
			352778900	1 Spike	MS	MS	% Rec	
Paramete	er	Units	Result	Conc.	Result	% Rec	Limits	Qualifiers
Nitrogen, Kjeldahl, Tota	al	mg/L		4.1 20	25.4	10	7 90-110	
SAMPLE DUPLICATE:	183217							
Paramete	er	Units	3527789001 Result	Dup Result	RPD	Max RPD	Qualifiers	
Nitrogen, Kjeldahl, Tota	al	mg/L	4.1	4	.1	1	20	

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Project:	44237-001/FDOH	I PNRS II SE #5								
Pace Project No.:	3527866									
QC Batch:	WETA/9245		Analysis Me	ethod:	EPA 365.4					
QC Batch Method:	EPA 365.4		Analysis De	Analysis Description: 365.4 Phosphorus						
Associated Lab Sam	ples: 35278660	001, 3527866002								
METHOD BLANK:	183219		Matrix	: Water						
Associated Lab Sam	ples: 35278660	001, 3527866002								
			Blank	Reporting						
Param	eter	Units	Result	Limit	Analyzed	I Qualif	iers			
Phosphorus, Total (a	s P)	mg/L	0.050U	0.1	0 03/24/11 08	:29				
LABORATORY CON	TROL SAMPLE:	183220								
			Spike	LCS	LCS	% Rec				
Param	eter	Units	Conc.	Result	% Rec	Limits	Qualifiers			
Phosphorus, Total (a	s P)	mg/L	4	4.0	100	90-110				
MATRIX SPIKE SAM	1PLE:	183222								
			3527789001	Spike	MS	MS	% Rec			
Param	eter	Units	Result	Conc.	Result	% Rec	Limits	Qualifiers		
Phosphorus, Total (a	s P)	mg/L	0	.59 4	4.5	9	7 80-120			
SAMPLE DUPLICAT	E: 183221									
			3527789001	Dup		Max				
Param	eter	Units	Result	Result	RPD	RPD	Qualifiers	_		
Phosphorus, Total (a	s P)	mg/L	0.59	0.5	9	1	20			

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REPORT OF LABORATORY ANALYSIS

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Project: 44237-001/FDOH	I PNRS II SE #5						
Pace Project No.: 3527866							
QC Batch: WETA/9254		Analysis Me	thod: E	PA 410.4			
QC Batch Method: EPA 410.4		Analysis Des	scription: 4	10.4 COD			
Associated Lab Samples: 35278660	001						
METHOD BLANK: 183487		Matrix:	Water				
Associated Lab Samples: 35278660	001						
Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifi	ers	
Chemical Oxygen Demand	mg/L	12.5U	25.0	03/22/11 17:	59		
LABORATORY CONTROL SAMPLE:	183488						
Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers	
Chemical Oxygen Demand	mg/L	500	503	101	90-110		
MATRIX SPIKE SAMPLE:	183490						
		3527580001	Spike	MS	MS	% Rec	
Parameter	Units	Result	Conc.	Result	% Rec	Limits	Qualifiers
Chemical Oxygen Demand	mg/L	2	24 500	704	9	6 90-110	
SAMPLE DUPLICATE: 183489							
Parameter	Units	3527580001 Result	Dup Result	RPD	Max RPD	Qualifiers	
Chemical Oxygen Demand	mg/L	224	222	2	1	20	-

REPORT OF LABORATORY ANALYSIS





QUALIFIERS

Project: 44237-001/FDOH PNRS II SE #5

Pace Project No.: 3527866

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to changes in sample preparation, dilution of the sample aliquot, or moisture content.

ND - Not Detected at or above adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

S - Surrogate

1,2-Diphenylhydrazine (8270 listed analyte) decomposes to Azobenzene.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is NELAP accredited. Contact your Pace PM for the current list of accredited analytes.

LABORATORIES

PASI-O Pace Analytical Services - Ormond Beach

ANALYTE QUALIFIERS

- 1p The recovery of the analyte in the CRDL standard (also known as the reporting limit verification) did not meet the acceptance criteria.
- J(M1) Estimated Value. Matrix spike recovery exceeded QC limits. Batch accepted based on laboratory control sample (LCS) recovery.
- L Off-scale high. Actual value is known to be greater than value given.

REPORT OF LABORATORY ANALYSIS





QUALITY CONTROL DATA CROSS REFERENCE TABLE

 Project:
 44237-001/FDOH PNRS II SE #5

 Pace Project No.:
 3527866

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
3527866001 3527866002	PNRS STE-TI UNSAT-IS2		FLD/ FLD/		
3527866001 3527866002	PNRS STE-TI UNSAT-IS2	SM 2320B SM 2320B	WET/7786 WET/7786		
3527866001 3527866002	PNRS STE-TI UNSAT-IS2	SM 2540C SM 2540C	WET/7756 WET/7756		
3527866001 3527866002	PNRS STE-TI UNSAT-IS2	SM 2540D SM 2540D	WET/7758 WET/7758		
3527866001 3527866002	PNRS STE-TI UNSAT-IS2	SM 4500-S2F SM 4500-S2F	WET/7780 WET/7780		
3527866001 3527866002	PNRS STE-TI UNSAT-IS2	SM 5210B SM 5210B	WET/7734 WET/7734	SM 5210B SM 5210B	WET/7819 WET/7819
3527866001 3527866002	PNRS STE-TI UNSAT-IS2	EPA 300.0 EPA 300.0	WETA/9208 WETA/9208		
3527866001 3527866002	PNRS STE-TI UNSAT-IS2	EPA 300.0 EPA 300.0	WETA/9209 WETA/9209		
3527866001 3527866002	PNRS STE-TI UNSAT-IS2	EPA 350.1 EPA 350.1	WETA/9216 WETA/9216		
3527866001 3527866002	PNRS STE-TI UNSAT-IS2	EPA 351.2 EPA 351.2	WETA/9244 WETA/9244	EPA 351.2 EPA 351.2	WETA/9281 WETA/9281
3527866001 3527866002	PNRS STE-TI UNSAT-IS2	EPA 365.4 EPA 365.4	WETA/9245 WETA/9245	EPA 365.4 EPA 365.4	WETA/9282 WETA/9282
3527866001	PNRS STE-TI	EPA 410.4	WETA/9254		

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CHAIN-OF-CUSTODY / Analytical Request Document

Sample Condition Upon Rece	ipt Form (SCUR) Table Number:
	Sikly Project # 3527866
Pace Analytical Client Name	
rier: 🔲 Fed Ex 🛄 UPS 🗍 USPS 🗍 Client 🗹 Commerc	cial Pace B&B Other
king #	
tody Seal on Cooler/Box Present: 🔲 yes 🎦 no Se	eals intact: Lives Lino Date and Initials of person examining
king Material: 🔲 Bubble Wrap 🔤 Bubble Bags 📄 None	e Other
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Ner Temperature (), 2 (Actual) (Temp should be	e above freezing to 6°C)
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es, then all conditions below were more	
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ntainers Intact	
mple Labels match COC (sample ibs & date time of contents)	No Labels: 🔲 No Time/Date on Labels:
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