N60200.AR.005401
NAS CECIL FIELD, FL
5090.3a

"DESIGN MODIFICATION LETTER REPORT FOR AIR SPARGING, BIOSPARGING AND SOIL VAPOR EXTRACTION SYSTEM AT FORMER NORTH FUEL FARM SITE NAS CECIL FIELD FL"
5/28/2010
TETRA TECH NUS INC

TETRA TECH

PITT-05-10-088

May 28, 2010

Project Number 112G01264

David Grabka
Florida Department of Environmental Protection
Bob Martinez Center
Division of Waste Management
Federal Programs Section
2600 Blairstone Road
Mail Station 4535
Tallahassee, FL 32399-2400

Reference: CLEAN IV Contract Number N62467-04-D-0055
Contract Task Order 0102

Subject: Design Modification for Air Sparging, Biosparging, and Soil Vapor Extraction System at the Former North Fuel Farm Site
Naval Air Station Cecil Field
Jacksonville, Florida

Dear Mr. Grabka:

Tetra Tech, Inc. (Tetra Tech) is pleased to submit this design modification to the air sparging (AS), biosparging (BS), and soil vapor extraction (SVE) system at the former North Fuel Farm (NFF) site. This design modification was prepared for Naval Facilities Engineering Command Southeast (NAVFAC SE) under the Comprehensive Long-Term Environmental Action Navy (CLEAN) IV Contract Number N62467-04-D-0055.

The primary objective of this design modification is to install two additional AS system wells in the vicinity of monitoring well CEF-76-113S, which has not shown any significant reductions in contamination levels since the system began operation in August 2005.

BACKGROUND

AS/BS is being implemented at the NFF to address benzene, toluene, ethylbenzene, and xylenes (BTEX) in groundwater at levels exceeding Florida Department of Environmental Protection (FDEP) Natural Attenuation Default Concentrations (NADCs) and the FDEP Groundwater Cleanup Target Levels (GCTLs). The system was designed to treat three target treatment areas (TTAs) including areas of high benzene concentrations (greater than 1,000 µg/L), areas of lesser benzene contamination (100 to 1,000 µg/L), and areas where benzene concentrations are less than the NADC (100 µg/L) but greater than the GCTL (1 µg/L). The shallow aquifer has been divided into four zones for purposes of this investigation, including (1) the water table zone [approximately 5 to 20 feet below ground surface (bgs)], (2) shallow zone (20 to 50 feet bgs), (3) intermediate zone (50 to 80 feet bgs), and (4) deep zone (80 to 110 feet bgs). The AS and BS wells are screened in shallow (48 to 50 feet bgs) and deep (up to 110 feet bgs) zones of the aquifer.

The AS/BS system, which began operation in August 2005, consists of 68 shallow zone wells and 143 deep zone wells. The system was installed in general accordance with the Remedial Action Plan

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Addendum (TtNUS, 2004), as documented in the Construction Completion Report (AGVIQ-CH2M HILL, 2007a), and groundwater monitoring has been conducted to determine the effectiveness of the remedial system, as presented in the Annual Operations and Maintenance Report (AGVIQ-CH2M HILL, 2007b) and subsequent long-term monitoring (LTM) reports (Solutions-IES, 2008). These reports indicated that the system was effective in reducing contaminant concentrations in monitoring wells within the influence of the AS/BS treatment system; however, two small areas, one surrounding monitoring well CEF-76-113S in the shallow zone (35- to 40-foot screen interval) and the other surrounding monitoring well CEF-76-70I in the lower intermediate zone (65- to 70-foot screen interval), had persistent elevated benzene concentrations based on data through 2008. The locations of these monitoring wells in relationship to the assumed radii of influence of the system wells are provided in the figures provided in Attachment 1.

CH2M Hill performed an optimization study for the Navy to evaluate potential opportunities to optimize operation of the NFF AS/BS system (CH2M HILL, 2008). As documented in the Optimization Study Report, the evaluation of dissolved oxygen levels and microbial analysis data indicated the presence of biological populations and conditions favorable for degradation of petroleum contaminants in groundwater at the site. The report recommended modifying the system to focus operation in areas within the TTAs with remaining concentrations of benzene greater than 100 µg/L (the NADC). These recommended modifications were implemented, and the system is being operated by Solutions-IES.

Subsequent LTM groundwater sampling results (Solutions-IES, 2009b) indicated that benzene concentrations in CEF-76-70I had decreased to less than the NADC; however, monitoring well CEF-076-113S continued not to be impacted by system operations, and the concentrations of benzene and several other contaminants remained greater than their respective NADCs. These results were presented at the May 2010 Base Realignment and Closure (BRAC) Cleanup Team (BCT) meeting (Meeting Minute No. 2622 and Action Item No. 1602), and it was decided that two new AS system wells would be installed in the area of CEF-76-113S to determine if increased treatment in that area would be successful in reducing contaminant levels in this area.

Monitoring well CEF-076-113S is a 2-inch Schedule 40 polyvinyl chloride (PVC) well screened from 35 to 40 feet bgs, as identified in the groundwater sample log sheets provided in Attachment 2. The system wells in the vicinity of this monitoring well are 1-inch Schedule 80 PVC wells screened from 48 to 50 feet bgs, as identified in the well completion diagrams provided in Attachment 3. The air is delivered to the system wells by individual 1-inch flexible high-density polyethylene (HDPE) pipe buried to a depth of approximately 1 foot bgs. The delivery pipe is connected to each system well below the well vault, as identified on the figures provided in Attachment 3. Both the shallow and deep sparging wells are supplied from the same system manifolds, and the system pressure applied to the wells is adequate for either shallow or deep system well operation.

FIELD OPERATIONS

The following section provides information regarding the installation of two AS system wells and the connection of the air supply lines to these new wells. Tetra Tech will complete the system modifications, but operation and monitoring of the system will continue to be conducted by Solutions-IES. The system is to be turned off during all installation activities, and Tetra Tech will work directly with Solutions-IES to coordinate system shut downs to enable the relocation and connection of the air supply lines.

The two AS system wells will be installed at the locations presented on Figure 1. One of the system wells will be shallow and one will be deep. The shallow well will be identified as AS-100, and the deep well will be identified as AS-101. The shallow well will be installed to a total depth 50 feet bgs, and the deep well will be installed to a total depth of 80 feet bgs. The shallow system well (AS-100) will be installed approximately 10 feet to the north of monitoring well CEF-076-113S, and the deep system well (AS-101) will be installed approximately 5 feet to the south of CEF-076-113S. The system wells will have 2-foot screened intervals with the same specifications as the system well that are described in the Construction

Completion Report (AGVIQ-CH2M HILL, 2007a) and as presented in Attachment 3. AS-100 will be installed to the same specifications as system well AS-35, and AS-101 will be installed to the same specifications as system well AD-06, as presented in the well construction log sheets provided in Attachment 3. Well installation will be conducted in accordance with Tetra Tech Standard Operating Procedures (SOP) GH-2.8 entitled Groundwater Monitoring Well Installation provided in Attachment 4.

The air supply lines providing air to system wells AS-44 and AS-35 will be relocated to the new system wells AS-100 and AS-101, respectively. Attachment 5 provides information regarding the actual operating parameters of these system wells. The forms identify that AS-44 is operating at 80 pounds per square inch (psi), and AS-35 has between 100 and 110 psi, which is sufficient pressure for proper operation of the proposed system wells.

Each system well has a dedicated air supply line, as identified in the design drawing provided in Attachment 3. The air supply lines are buried approximately 1 foot bgs and connect to each system well below the well vault, as presented on the figures in Attachment 3. The air supply line from the current system well (AS-44 or AS-35) will be relocated to the new system well (AS-100 or AS-101) as identified above in the same manner as it was connected during the original installation. The relocated lines will be buried as before to prevent any damage that might occur during grass cutting operations in the area. Prior to backfilling operations, the lines will be pressure tested to verify that no air leaks exist, and pressure and flow rates will be recorded.

Tetra Tech will work with Solutions-IES to coordinate restart of the system and to optimize air flow to the newly installed wells, if adjustments at the main headers are needed. Solutions-IES will continue to operate the system in the same manner as before the modification, in accordance with the original design and subsequent optimization recommendations.

REFERENCES

Tetra Tech NUS, Inc. 2004. Remedial Action Plan Addendum for North Fuel Farm, Naval Air Station Cecil Field, Jacksonville, Florida. March.

AGVIQ-CH2M HILL JVLL. 2007a. Construction Completion Report, Installation of Air Sparge, Biosparge, and Soil Vapor Extraction System, Former North Fuel Farm Site, Former Naval Air Station Cecil Field, Jacksonville, Florida, Revision No. 00. August.

AGVIQ-CH2M HILL JVLL. 2007b. Annual Operations and Maintenance Report, Air Sparge, Biosparge, and Soil Vapor Extraction System, Former North Fuel Farm Area Groundwater Remediation Project, Former Naval Air Station Cecil Field, Jacksonville, Florida, July 2005 – September 2006. February.

CH2M HILL. 2007c. Operations and Maintenance Status Report, Air Sparge, Biosparge, and SVE System, Former North Fuel Farm Area Remediation Project, Former Naval Air Station Cecil Field, Jacksonville, Florida, October 2006 – May 2007. November.

CH2M HILL. 2008. Optimization Report for Air Sparging/Biosparging Treatment System, North Fuel Farm Site, Former Naval Air Station Cecil Field, Jacksonville, Florida. June.

Solutions-IES. 2008. Third Quarter 2008 Long-Term Monitoring Report, North Fuel Farm, Former NAS Cecil Field, Jacksonville, FL. December.

Solutions-IES. 2009a. 2008 Annual Long-Term Monitoring Report, North Fuel Farm, Former NAS Cecil Field, Jacksonville, FL. April.

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Solutions-IES. 2009b. First Quarter 2009 Long-Term Monitoring Report, North Fuel Farm, Former NAS Cecil Field, Jacksonville, FL. July.

Solutions-IES. 2009c. Second Quarter 2009 Long-Term Monitoring Report, North Fuel Farm, Former NAS Cecil Field, Jacksonville, FL. December.

If you have any questions regarding this submittal, please feel free to contact me at Robert.Simcik@tetratech.com or (412) 921-8163.

Sincerely,

Robert F Simcik, P.E
Task Order Manager

Attachments (5)

c: A. Sanford, NAVFAC SE (1 copy)
M. Halil, CH2M Hill (electronic only)
J. Keener, Solutions-IES (electronic only)
C. Pike, Tetra Tech CTO 102 project file (1 copy, unbound)
D. Humbert, Tetra Tech (letter only)
M. Jonnet, Tetra Tech (1 copy)
J. Johnson, Tetra Tech (1 copy for Information Repository)

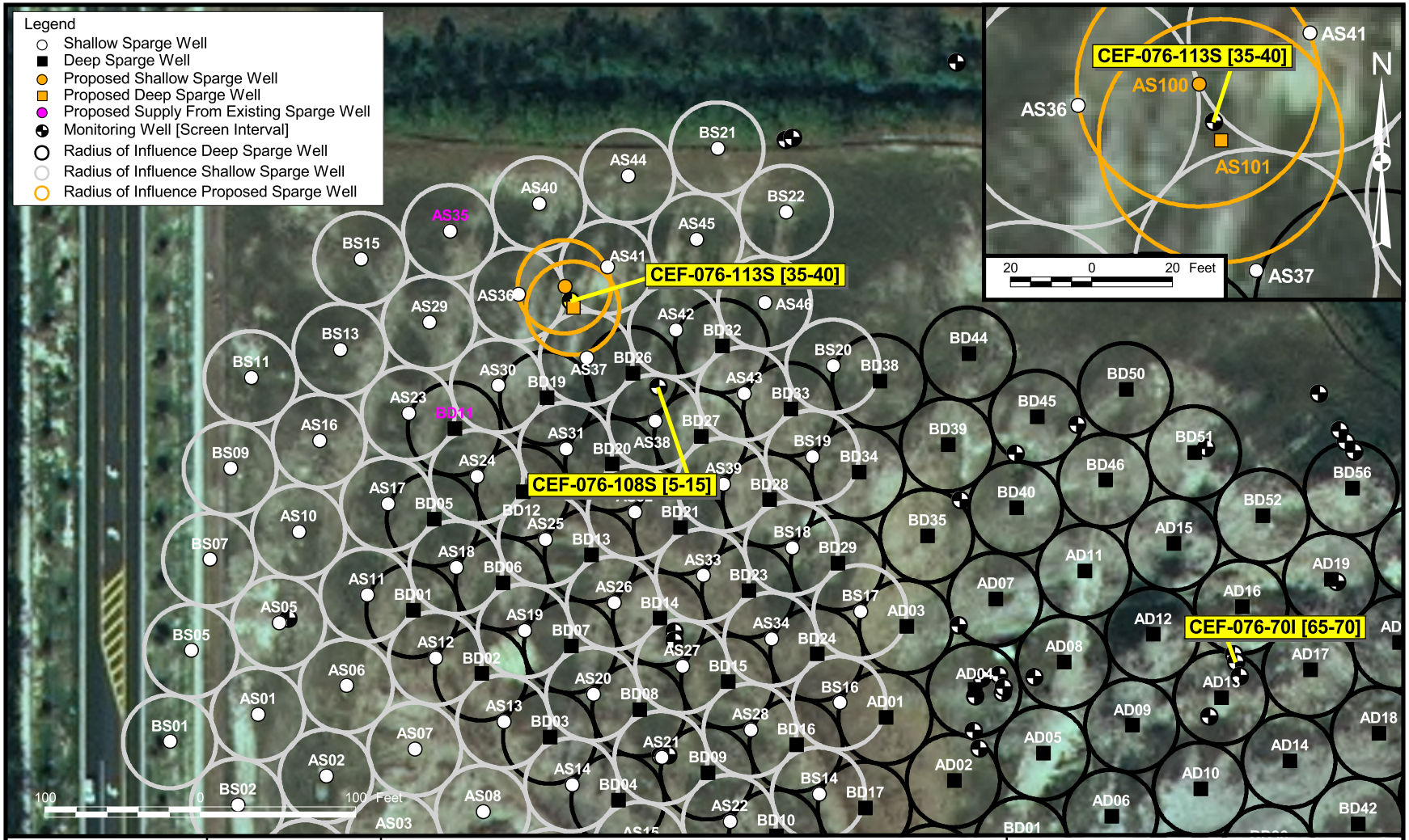
CERTIFICATION

The professional opinions rendered in this document identified as Design Modification for Air Sparging, Biosparging, and Soil Vapor Extraction System at the Former North Fuel Farm Site at Former Naval Air Station Cecil Field, Jacksonville, Florida, were developed in accordance with commonly accepted procedures consistent with applicable standards of practice. The information contained herein is based on the investigation data and information obtained from previously submitted reports. If conditions are determined to exist that differ from those described, the undersigned engineer should be notified to evaluate the effects of any additional information on the information described in this report.

ROBERT FRANK SIMCIK
No. 00061263
STATE OF FLORIDA
PROFESSIONAL ENGINEER

May 28, 2010
Robert F Simcik, P.E.
P.E. License Number 61263

FIGURE 1



MJJ	DATE 12May10	SYSTEM MODIFICATION AT CEF-076-103S NORTH FUEL FARM NAVAL AIR STATION CECIL FIELD JACKSONVILLE, FLORIDA	DRAWN BY / CONTRACT NUMBER 2267
CHECKED BY	DATE		APPROVED BY / DATE
COST/SCHEDULE-AREA			APPROVED BY / DATE
SCALE AS NOTED			DRAWING NO. FIGURE 1 / REV 0

NAVFAC

:\GIS\NAS_CecilField\NFF_20100507.apr 14May10 MJJ Layout02

ATTACHMENT 1

MONITORING WELL CEF-076-113S LOCATION AND SYSTEM WELL LAYOUT FIGURES

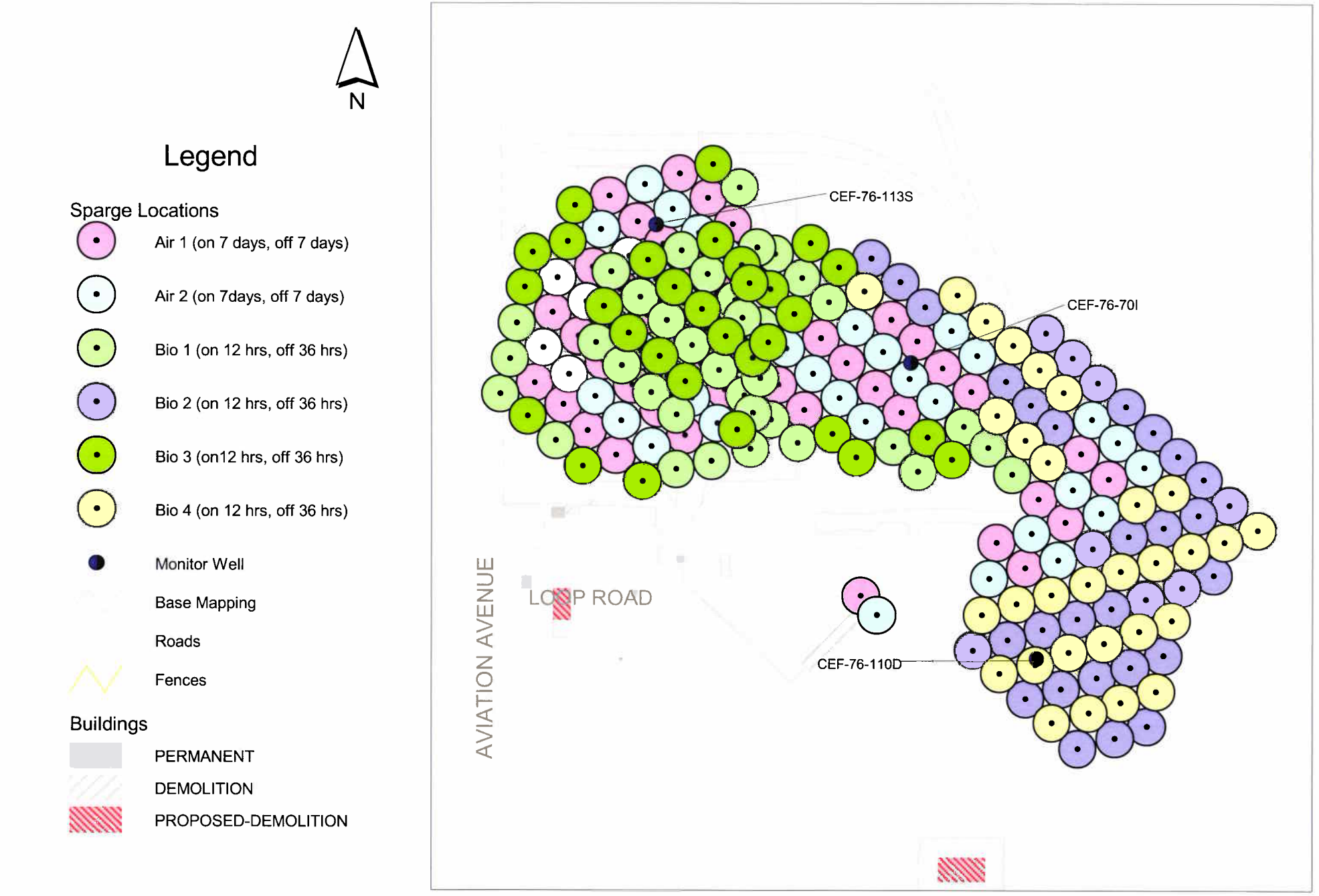
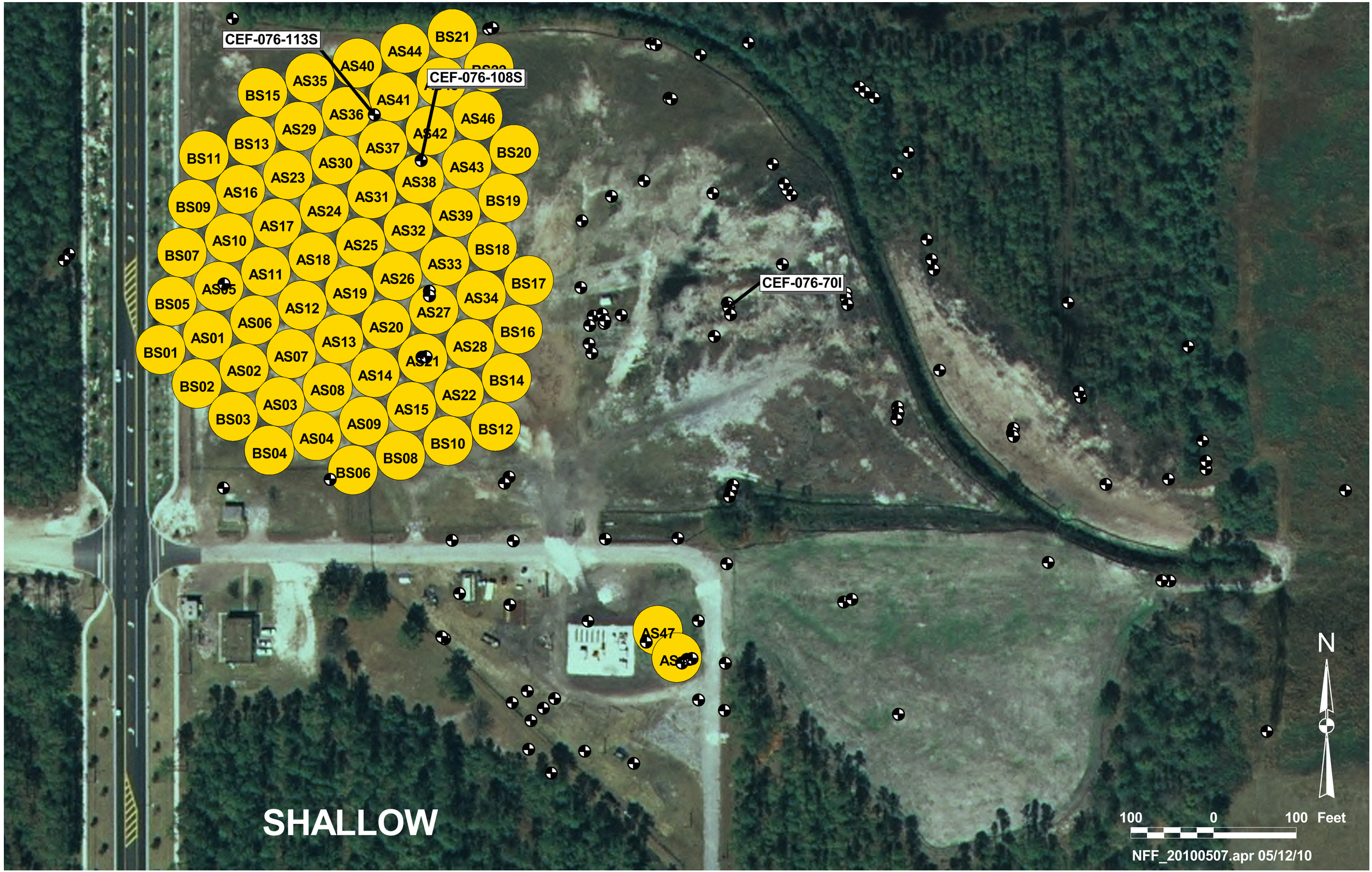


Figure 8
October 2007 Plume and Sparge Influence Areas
North Fuel Farm, Cecil Filed, Florida


CEF-076-113S
CEF-076-108S
CEF-076-70I
BS21
AS44
AS40
AS35
BS15
AS41
AS36
AS46
AS29
AS42
BS13
AS37
BS20
BS11
AS30
AS43
AS23
AS38
AS16
BS19
BS09
AS31
AS24
AS39
AS17
AS32
AS10
BS18
BS07
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AS33
AS11
BS17
AS05
AS26
AS34
BS05
AS19
AS27
AS12
AS06
BS16
AS20
AS01
AS28
BS01
AS13
AS07
AS21
AS02
BS14
BS02
AS14
AS08
AS22
AS03
AS15
BS03
BS12
AS09
AS04
BS10
BS04
BS08
BS06
AS47
N
SHALLOW
100 0 100 Feet
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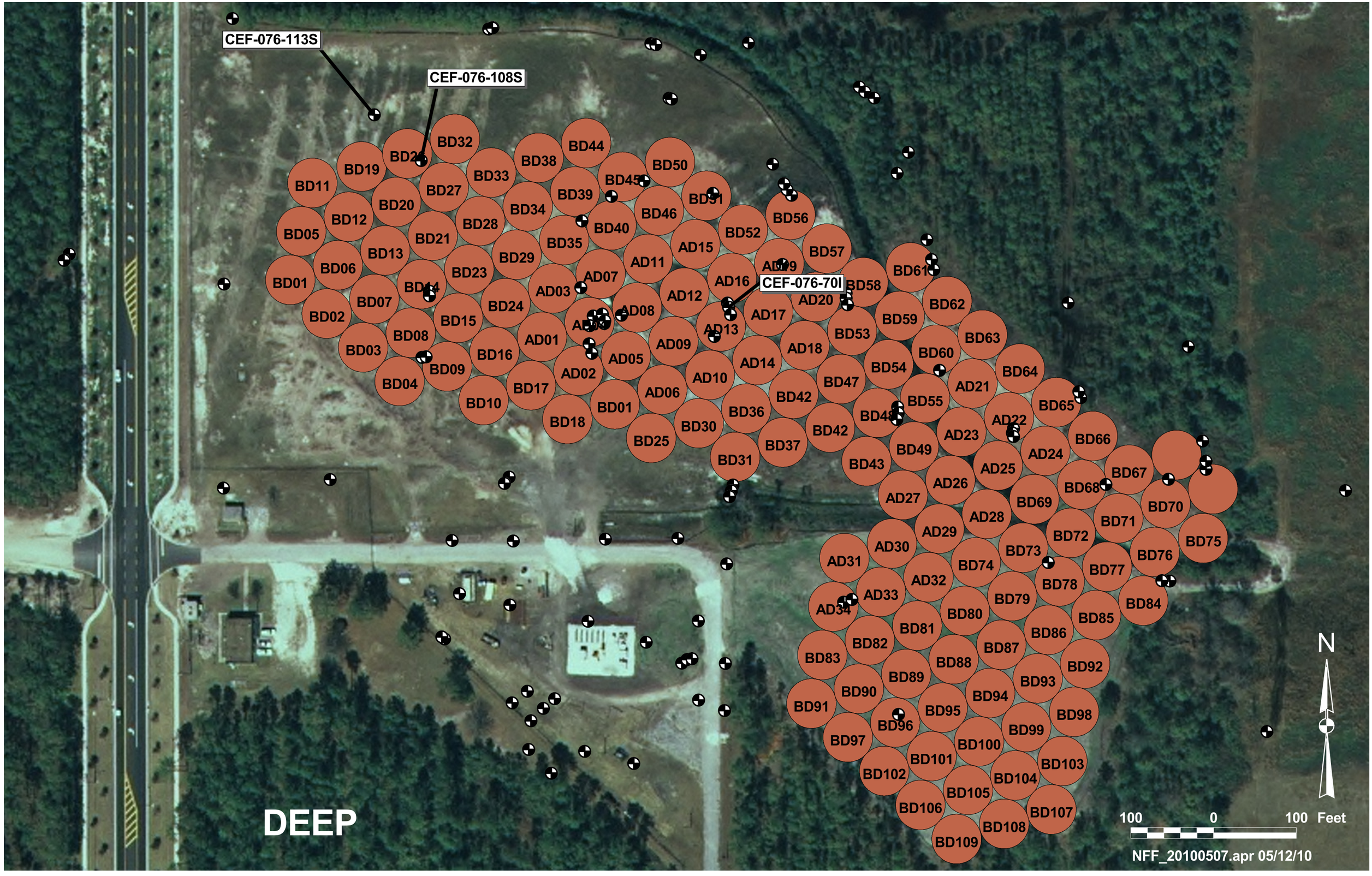
CEF-076-113S
CEF-076-108S
CEF-076-70I
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ATTACHMENT 2

MONITORING WELL CEF-076-113S
GROUNDWATER SAMPLE LOG SHEETS

GROUNDWATER SAMPLING LOG

SITE NAME: GW Sampling at North Fuel Farm Cecil Field		SITE LOCATION: Jacksonville	
WELL NO: CEF-076-113S	SAMPLE ID: 8030.08A2.NAVF/3:CEF-076-113S:10/10/08		DATE: 10/10/2008

PURGING DATA

WELL DIAMETER (inches):	TUBING DIAMETER (inches): 0.13	WELL SCREEN INTERVAL DEPTH (feet): 35 - 40	STATIC DEPTH TO WATER (feet): 6.98	PURGE PUMP TYPE OR SAMPLER: Peristaltic

WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH – STATIC DEPTH TO WATER) X WELL CAPACITY
only fill out if applicable)
= (feet – 6.98 feet) X 0.00 gallons/foot = 0.00 gallons

EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOL. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME
(only fill out if applicable)
=0.00 gallons+(0.00 gallons/foot X 4.00 feet)+ 0.13 gallons = 0.13 gallons

INITIAL PUMP OR TUBING DEPTH IN WELL (feet):	FINAL PUMP OR TUBING DEPTH IN WELL (feet):	PURGING INITIATED AT: 15:12	PURGING ENDED AT: 15:42	TOTAL VOLUME PURGED (gallons): 0.65

TIME	VOLUME PURGED (gallons)	CUMUL. VOLUME PURGED (gallons)	DEPTH TO WATER (feet)	pH (standard units)	ORP	TEMP.(°C)	SEC (uS/cm)	DISSOLVED OXYGEN (mg/L)	TURBIDITY (NTUs)	COLOR (describe)	ODOR (describe)
15:33		0.40	6.99	3.23	37.00	28.30	1,910.00	2.21	8.50	clear	sulfuric
15:36	0.10	0.50	6.99	3.30	26.70	27.12	1,899.00	2.13	6.31	clear	sulfuric
15:38	0.10	0.60	6.99	3.15	22.40	27.11	1,919.00	1.98	7.10	clear	sulfuric

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3" = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47; 12" = 5.88
TUBING INSIDE DIA. CAPACITY (Gal./Ft.): 1/8" = 0.0006; 3/16" = 0.0014; 1/4" = 0.0026; 5/16" = 0.004; 3/8" = 0.006; 1/2" = 0.010; 5/8" = 0.016

FIELD/TEST KIT

Final Purge Readings				Hach Field Data(mg/L)		CHEMetrics Field Data(mg/L)	
DO(mg/L):	1.83	TEMP.(°C):	27.23	DO: 1	CO2:	DO High Range:	DO Low Range:
SEC(uS/cm):	1952	pH:	3.11	Alkalinity:	Ferrous Iron:	CO2 High Range:	DO Low Range:
ORP(mV):	18.9	TURB(NTU):	7.62	H2S:	Maganese:	Alkalinity High Range:	Alkalinity Low Range:
Salinity:				Sulfate: Nitrate:	Sulfide:		

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION: Burke Cathey	SAMPLER(S) SIGNATURES: BC	SAMPLING INITIATED AT: 15:42	SAMPLING ENDED AT: 16:11
PUMP OR TUBING DEPTH IN WELL (feet):	SAMPLE PUMP FLOW RATE (mL per minute): 82.02	TUBING MATERIAL CODE: PPE	

FIELD DECONTAMINATION: ☑ Y ☐ N | FIELD-FILTERED: ☐ Y ☑ N | FILTER SIZE: NA | DUPLICATE: ☐ Y ☑ N
Filtration Equipment Type:

SAMPLE CONTAINER SPECIFICATION				SAMPLE PRESERVATION			INTENDED ANALYSIS AND/OR METHOD	SAMPLING EQUIPMENT CODE
SAMPLE ID CODE	NO. OF CONTAIN.	MAT CODE	VOL	PRESERV USED	TOTAL VOL ADDED IN FIELD (mL)	FINAL pH		
CEF-076-113S	3	CG	40 ml	HCL	40 ml	3.11	VOCs	RFPP
CEF-076-113S	2	AG	1 L	None	1 L	3.11	SVOCs	PP
CEF-076-113S	2	AG	1 L	H2SO4	1 L	3.11	TRPH	PP
CEF-076-113S	1	PE	500 ml	None	500 ml	3.11	Sulfate	PP
CEF-076-113S	2	AG	40 ml	None	40 ml	3.11	TIC	PP
CEF-076-113S	3	PE	250 ml	NaOH ZnAC	250 ml	3.11	Sulfide	PP
CEF-076-113S	2	AG	40 ml	HCL	40 ml	3.11	TOC	PP

MATERIAL CODES: AG = Amber Glass; CG = Clear Glass; PE = Polyethylene; PP = Polypropylene; S = Silicone; T = Teflon; O = Other (Specify)

SAMPLING/PURGING EQUIPMENT CODES: APP = After Peristaltic Pump; B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; PP = Peristaltic Pump; RFPP = Reverse Flow Peristaltic Pump; SM = Straw Method (Tubing Gravity Drain); VT = Vacuum Trap; O = Other

NOTES:

1. The above do not constitute all of the information required by Chapter 62-160, F.A.C.
2. Stabilization Criteria for range of variation of last three consecutive readings (see FS 2212, section 3)

pH: + 0.2 units Temperature: + 0.2 oC Specific Conductance: + 5% Dissolved Oxygen: all readings < 20% saturation (see Table FS 2200-2); optionally, + 0.2 mg/L or + 10% (whichever is greater) Turbidity: all readings < 20 NTU; optionally + 5 NTU or + 10% (whichever is greater)

SOLUTIONS-IES
GROUNDWATER SAMPLING LOG

Site Name: North Fuel Farm - Cecil Field | **Site Location:** Jacksonville, Florida

Well Number: CEF-076-113S** | **Sample ID:** | **Date:** 6/10/09

PURGING DATA

Well Diameter (inches):	Tubing Diameter (inches):	Tubing:	Static Depth to water (feet):	Purge pump type or bailer:	Well Screen Interval Depth:
1 (2) 3 4	(1/4) 3/8 1/2	LDPE Teflon	7.35	Peristaltic Pump	35 to 40 feet

Initial Pump or Tubing Depth in well:	Purging Initiated:	Purging Ended:	Total Volume Purged (Gallons):	Sample Pump Flow Rate (mL/min):
2' from bottom	1750	1805		250mL/min

Time	Volume Purged (gallons)	Cumulative Volume Purged (gallons)	Purge Rate: (mL/min)	Depth to Water (feet)	pH (SU)	Temp (°C)	Cond (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU's)	ORP (m/v)	Color (describe)	Odor (describe)
1755		0.1	250	7.41	3.25	26.10	3104	0.77	9.94	202.1	—	—
1800		0.3	"	7.43	3.26	26.02	3078	0.66	7.58	151.8	—	—
1805		0.5	"	7.43	3.26	26.00	3072	0.61	6.37	127.1	—	—

Well Capacity (Gallons/Foot): **0.75"** = 0.02 **1"** = 0.04 **1.25"** = 0.06 **2"** = 0.16 **3"** = 0.37 **4"** = 0.65 **5"** = 1.02 **6"** = 1.47 **12"** = 5.88

Tubing Inside Diameter Capacity (Gallons/Foot): **1/8"** = 0.0006 **3/16"** = 0.0014 **1/4"** = 0.0026 **5/16"** = 0.004 **3/8"** = 0.006 **1/2"** = 0.010 **5/8"** = 0.016

SAMPLING DATA

Sampled By/Affiliation:	Sampler(s) Signature:	Sampling Initiated:	Sampling Ended:
Joshua Clay Solutions-IES	[signature]	1805	

Field Decontamination:	Field-Filtered:	Filter Size:	Filtration Equipment Type:	Duplicate:
Y (N)	Y (N)	NA µm	NA	Y (N)

SAMPLE CONTAINER INFORMATION

Sample ID Code	# Containers	Material Code	Volume	Preservative Used	Intended Analysis	Sampling Equipment Code
	2	AG	1 L	None	PAHs 8310	PP
	2	AG	1 L	H_2SO_4	TRPH FL-PRO	PP
	3	CG	40 mL	HCl	VOCs 8260B	RFPP

Remarks: DO confirmed @ 0.6 w/ chemetrics kit.

Field Kits:

Material Codes: **AG** = Amber Glass **CG** = Clear Glass **PE** = Polyethylene **PP** = Polypropylene **S** = Silicone **T** = Teflon **O** = Other (Specify)

Sampling/Purging: **APP** = After Peristaltic Pump **B** = Bailer **BP** = Bladder Pump **ESP** = Electric Submersible Pump **PP** = Peristaltic Pump

Equipment Codes: **RFPP** = Reverse Flow Peristaltic Pump **SM** = Straw Method (Tubing Gravity Drain) **VT** = Vacuum Trap **O** = Other (Specify)

Stabilization criteria for range of variation of last three consecutive readings: **pH:** + 0.2 units **Temperature:** + 0.2°C **Specific Conductance:** + 5%
Dissolved Oxygen: all readings < 20% saturation; optionally, + 0.2 mg/L or + 10% (whichever is greater)
Turbidity: all readings < 20 NTU; optionally + 5 NTU or + 10% (whichever is greater)

** Denotes hazardous well

SOLUTIONS-IES
GROUNDWATER SAMPLING LOG

Site Name: North Fuel Farm - Cecil Field	**Site Location:** Jacksonville, Florida
Well Number: CEF-76-113S**	**Sample ID:** CEF-076-1135 **Date:** 3/3/09

PURGING DATA

Well Diameter (inches):	Tubing Diameter (inches):	Tubing:	Static Depth to water (feet):	Purge pump type or bailer:	Well Screen Interval Depth:
1 (2) 3 4	(1/4) 3/8 1/2	LDPE ~~Teflon~~	11.26	Peristaltic Pump	feet to feet

Initial Pump or Tubing Depth in well:	Purging Initiated:	Purging Ended:	Total Volume Purged (Gallons):	Sample Pump Flow Rate (mL/min):
2' off bottom	957	1018	.55	100

Time	Volume Purged (gallons)	Cumulative Volume Purged (gallons)	Purge Rate: (mL/min)	Depth to Water (feet)	pH (SU)	Temp (°C)	Cond (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU's)	ORP (m/v)	Color (describe)	Odor (describe)
1008	0.2	0.2	~~11.29~~	11.29	3.25	21.30	3339	0.68	21	133.7	Clear	Slight HC
1011	0.1	0.3		11.29	3.28	21.46	3360	0.49	14	118.6		
1014	0.1	0.4		11.29	3.29	21.43	3367	0.44	15	124.1		
1017	0.1	0.5		11.29	3.29	21.50	3375	0.39	13	109.3		

Well Capacity (Gallons/Foot): **0.75"** = 0.02 **1"** = 0.04 **1.25"** = 0.06 **2"** = 0.16 **3"** = 0.37 **4"** = 0.65 **5"** = 1.02 **6"** = 1.47 **12"** = 5.88

Tubing Inside Diameter Capacity (Gallons/Foot): **1/8"** = 0.0006 **3/16"** = 0.0014 **1/4"** = 0.0026 **5/16"** = 0.004 **3/8"** = 0.006 **1/2"** = 0.010 **5/8"** = 0.016

SAMPLING DATA

Sampled By/Affiliation:	Sampler(s) Signature:	Sampling Initiated:	Sampling Ended:
Burke Cathey/Terraine	Burke Cathey	1018	1041

Field Decontamination:	Field-Filtered:	Filter Size:	Filtration Equipment Type:	Duplicate:
Y N	Y (N)	µm		Y (N)

SAMPLE CONTAINER INFORMATION

Sample ID Code	# Containers	Material Code	Volume	Preservative Used	Intended Analysis	Sampling Equipment Code
	2	AG	1 L	None	PAHs 8310	PP
	2	AG	1 L	H_2SO_4	TRPH FL-PRO	PP
	3	CG	40 mL	HCl	VOCs 8260B	RFPP

Remarks:
IDW Total = 0.8 gal

Field Kits:

Material Codes: **AG** = Amber Glass **CG** = Clear Glass **PE** = Polyethylene **PP** = Polypropylene **S** = Silicone **T** = Teflon **O** = Other (Specify)

Sampling/Purging: **APP** = After Peristaltic Pump **B** = Bailer **BP** = Bladder Pump **ESP** = Electric Submersible Pump **PP** = Peristaltic Pump

Equipment Codes: **RFPP** = Reverse Flow Peristaltic Pump **SM** = Straw Method (Tubing Gravity Drain) **VT** = Vacuum Trap **O** = Other (Specify)

Stabilization criteria for range of variation of last three consecutive readings: **pH:** + 0.2 units **Temperature:** + 0.2°C **Specific Conductance:** + 5%
Dissolved Oxygen: all readings < 20% saturation; optionally, + 0.2 mg/L or + 10% (whichever is greater)
Turbidity: all readings < 20 NTU; optionally + 5 NTU or + 10% (whichever is greater)

** Denotes hazardous well

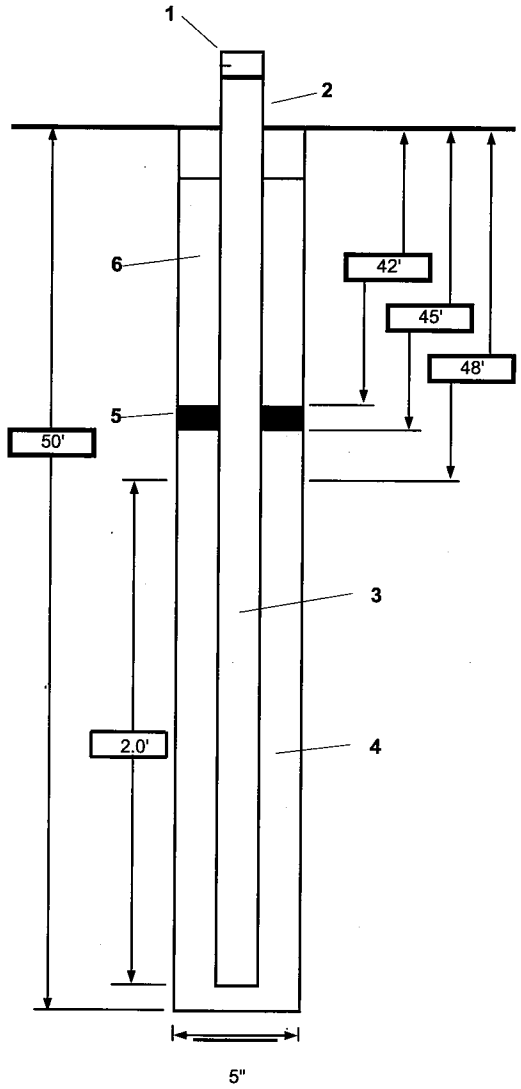
ATTACHMENT 3

SYSTEM WELL COMPLETION DIAGRAMS, SYSTEM WELL VAULT, AND AIR SUPPLY LINE HOOKUP DIAGRAMS

PROJECT NUMBER	WELL NUMBER	
283092	AS-35	SHEET 1 OF 1

WELL COMPLETION DIAGRAM

PROJECT : Cecil Field / NFF
LOCATION : Jacksonville, Florida
DRILLING CONTRACTOR : Prosonic Drilling Corporation, Florida License No. 7091
DRILLING METHOD AND EQUIPMENT USED : Truck-Mounted Rotosonic Rig
WATER LEVELS : Not obtained
START: 0 6/24/2004
END: 6/24/2004
LOGGER : Jim Baker



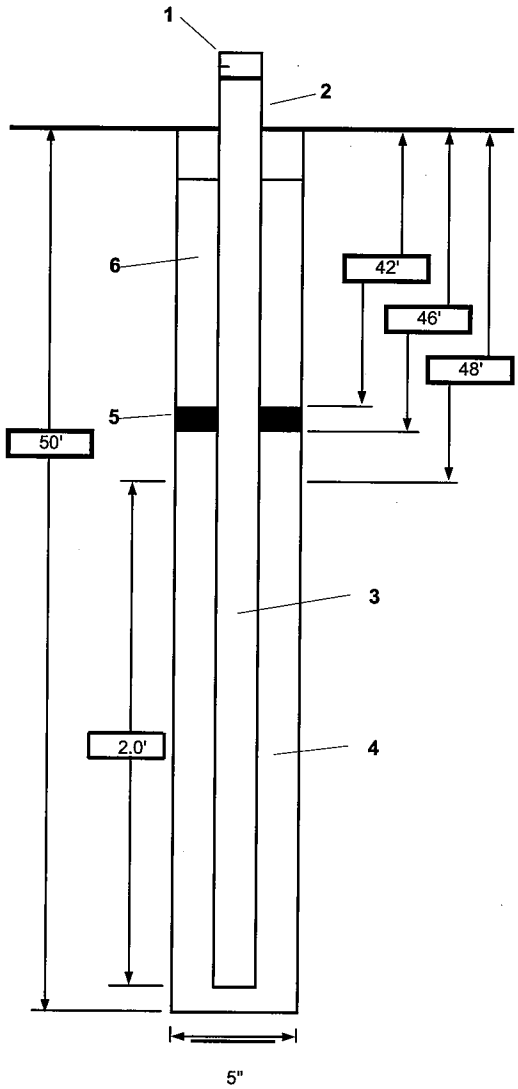
1- Top of casing elevation	Not obtained
2- Dia./type of well casing	1-inch diameter Sch. 80 PVC
3- Type/slot size of screen	0.010-inch machine slotted Sch. 80 PVC
4- Type screen filter	20/30 sieve size silica sand
a) Quantity used	1.5 (50lb bags)
5- Type of seal	3/8-inch barroid bentonite chips
a) Quantity used	25lbs (1/2 50lb bag)
b Hydration time	1.0 hour
6- Grout	Type I/II Portland neat cement
a) Method of placement	1-inch inside diameter tremie pipe
b) Casing grout weight	> 13.2 lbs per gallon
Development method	Waterra Hydrolift II pump
7- Development time	Approx. 60 minutes
Estimated purge volume	Approx. 10 gallons

Comments Well purged until sediment free

PROJECT NUMBER	WELL NUMBER	
283092	AS-44	SHEET 1 OF 1

WELL COMPLETION DIAGRAM

PROJECT : Cecil Field / NFF
LOCATION : Jacksonville, Florida
DRILLING CONTRACTOR : Prosonic Drilling Corporation, Florida License No. 7091
DRILLING METHOD AND EQUIPMENT USED : Truck-Mounted Rotosonic Rig
WATER LEVELS : Not obtained
START: 0 6/25/2004
END: 6/25/2004
LOGGER : Jim Baker



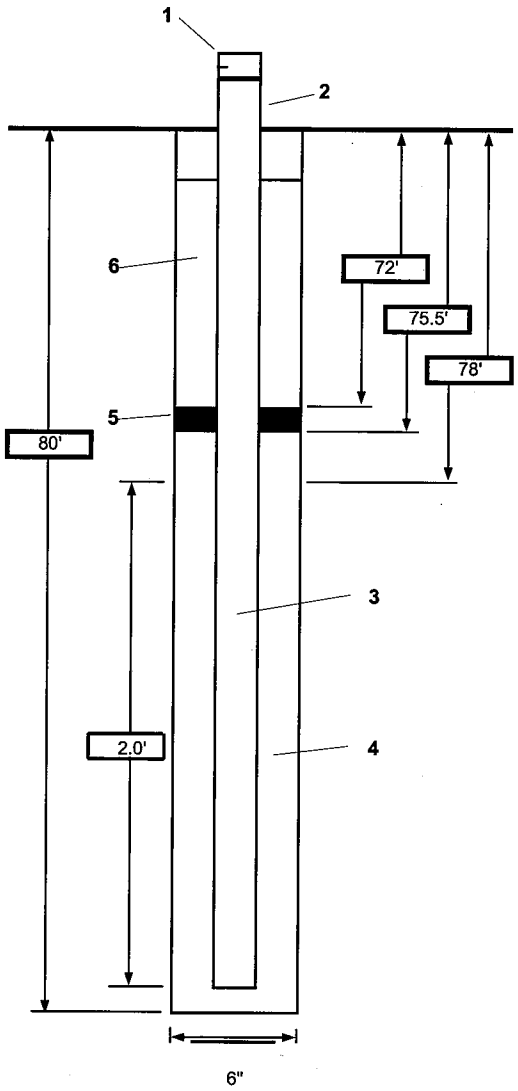
1- Top of casing elevation	Not obtained
2- Dia./type of well casing	1-inch diameter Sch. 80 PVC
3- Type/slot size of screen	0.010-inch machine slotted Sch. 80 PVC
4- Type screen filter	20/30 sieve size silica sand
a) Quantity used	1.5 (50lb bags)
5- Type of seal	3/8-inch barroid bentonite chips
a) Quantity used	25lbs (1/2 50lb bag)
b Hydration time	1.0 hour
6- Grout	Type I/II Portland neat cement
a) Method of placement	1-inch inside diameter tremie pipe
b) Casing grout weight	> 13.2 lbs per gallon
Development method	Waterra Hydrolift II pump
7- Development time	Approx. 60 minutes
Estimated purge volume	Approx. 10 gallons

Comments Well purged until sediment free

PROJECT NUMBER	WELL NUMBER	
283092	AD-06	SHEET 1 OF 1

WELL COMPLETION DIAGRAM

PROJECT : Cecil Field / NFF
LOCATION : Jacksonville, Florida
DRILLING CONTRACTOR : Prosonic Drilling Corporation, Florida License No. 7091
DRILLING METHOD AND EQUIPMENT USED : Truck-Mounted Rotosonic Rig
WATER LEVELS : Not obtained
START: 7/23/2004
END: 7/23/2004
LOGGER : Jim Baker



1- Top of casing elevation	Not obtained
2- Dia./type of well casing	1-inch diameter Sch. 80 PVC
3- Type/slot size of screen	0.010-inch machine slotted Sch. 80 PVC
4- Type screen filter	20/30 sieve size silica sand
a) Quantity used	1.5 (50lb bags)
5- Type of seal	3/8-inch barroid bentonite chips
a) Quantity used	25lbs (1/2 50lb bag)
b Hydration time	1.0 hour
6- Grout	Type I/II Portland neat cement
a) Method of placement	1-inch inside diameter tremie pipe
b) Casing grout weight	> 13.2 lbs per gallon
Development method	Waterra Hydrolift II pump
7- Development time	Approx. 60 minutes
Estimated purge volume	Approx. 10 gallons

Comments: Well purged until sediment free

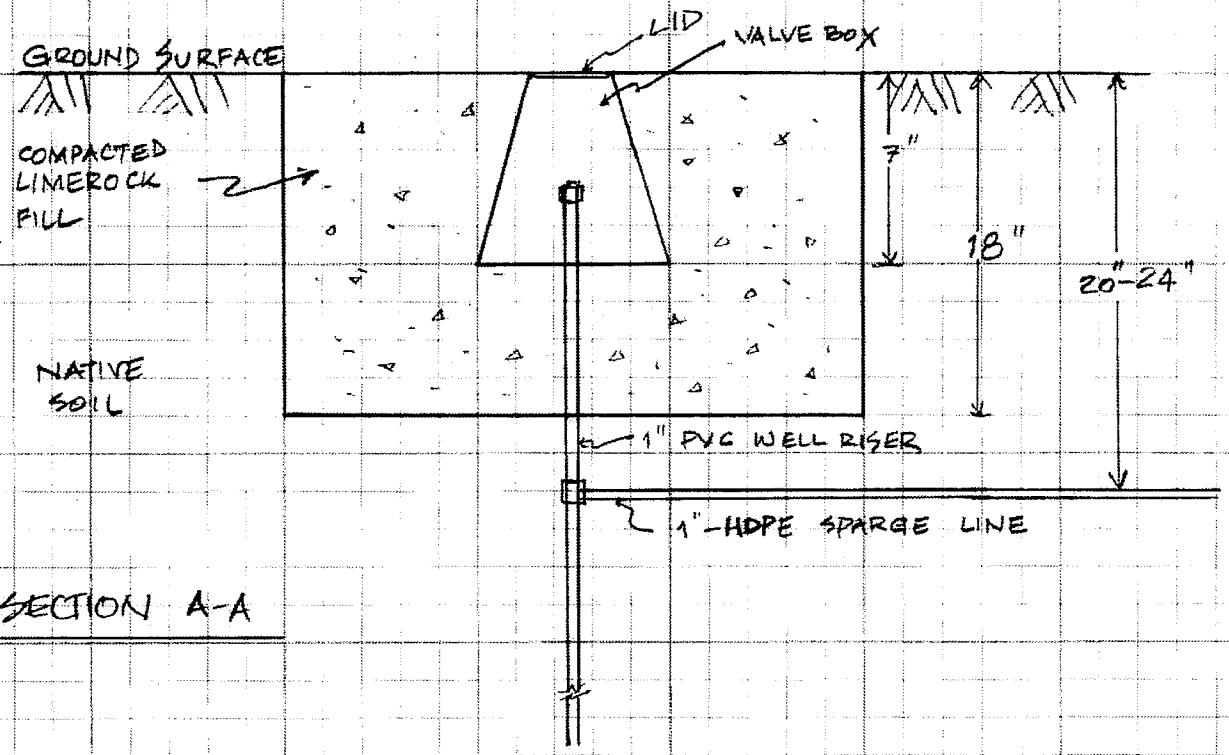
CH2MHILL

SUBJECT: VALVE-BOX INSTALLATION DETAIL

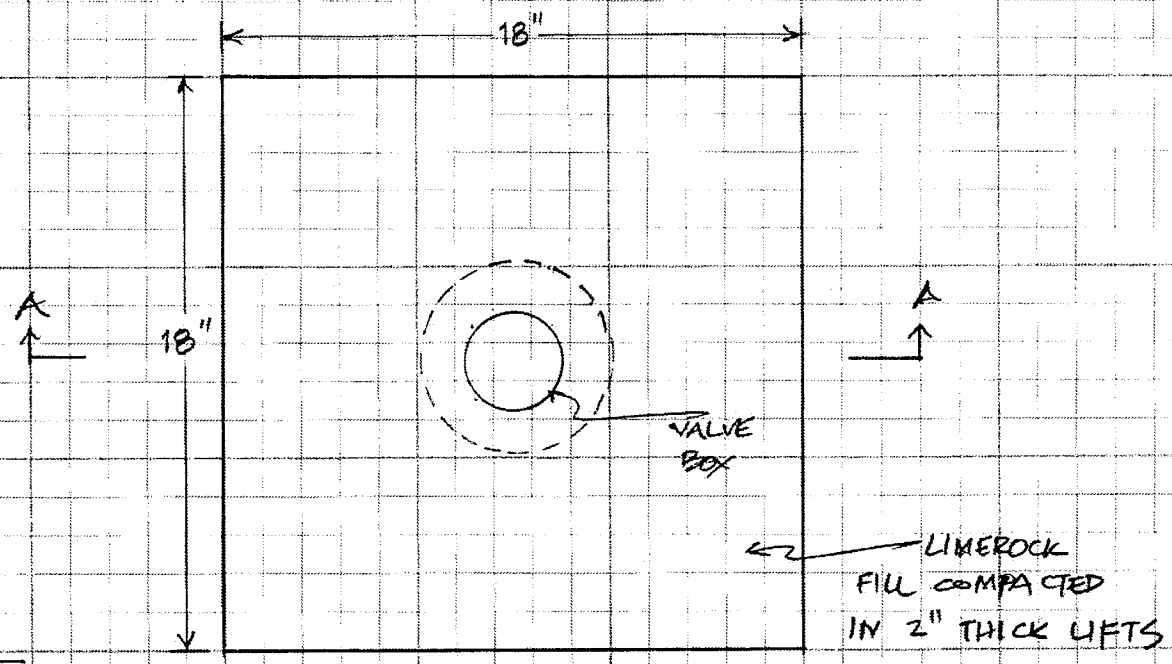
BY: S. NAIK

SHEET NO. 1 of 1 DATE 10/27/04

PROJECT NO. 283092 NFF-CECIL FIELD



SECTION A-A



PLAN

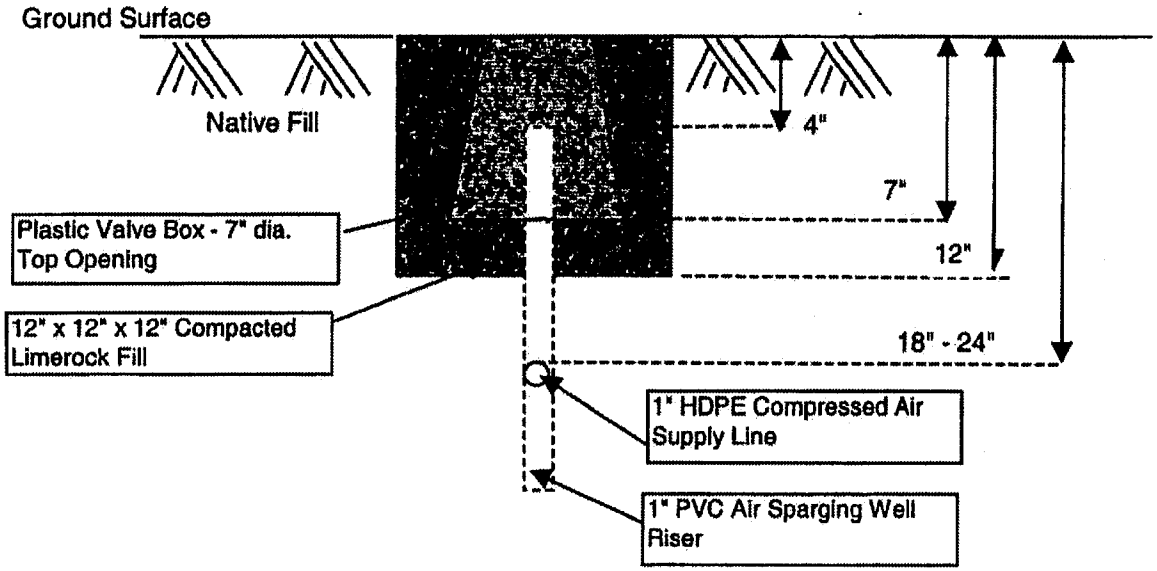


Exhibit B - Cross-Sectional Detail of Valve Box at Air Sparge Well Head

AGVQ ENVIRONMENTAL SERVICES LLC
CH2MHILL JOINT VENTURE II

SPLICE/VALVE BOX
S1010

Greenbelt Application G
Load: Static, 3,000 lbs

Applications:

Greenbelt areas for telephony, power, CATV, DOT and other applications. Turf and irrigation for residential, commercial, golf courses, and parks and recreation.

Features & Benefits:

- Built tough to last long. Heavy-duty construction minimizes side wall deflection, increasing product life.
- Easy grip twist lock cover, won't fall off. Keeps debris out for clutter-free access.
- HDPE is U.V. stabilized for greater strength and life through a wide range of temperature extremes.
- All splice/valve boxes have a base flange to reduce tilting and frost heaving.
- Box and lid shipped fully assembled.
- Product palletized for easy off-loading and storage.
- Stainless steel hardware won't rust.

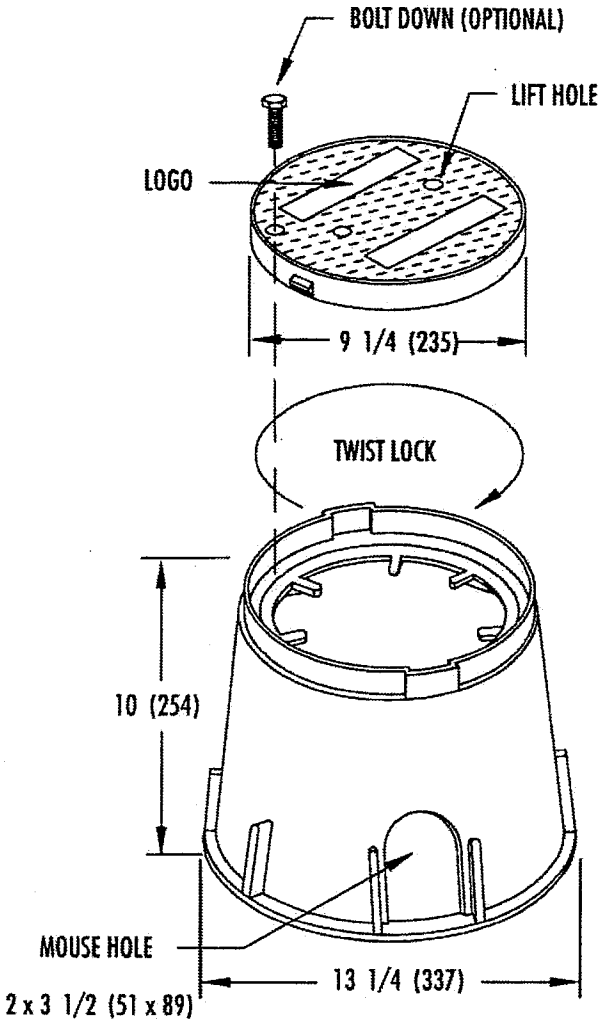
Options:

- EMS marker for quick and easy identification.
- OEM labeling available on request (molded-in identification).

Ordering Information:

Specify part number in table below. Standard cover and box color is green. Purple, grey and sand colors are also available. Consult factory for more information.

Pallet Quantity: 100



Dimensions: Inches (mm)
Weight: lbs (kg)

Part No.	Description	Material	Weight
SGB100010C20	Box, 10"X10"	HDPE	2.5 (1.1)
SGC100000EH0	Cover	HDPE	1.0 (0.5)
PCC100000E01	Cover	PC	7.0 (3.2)
0414	Extension, 20"	HDPE	6.0 (2.7)
SGA100010Y000	Box & Cover Assy.	HDPE	3.5 (1.6)

newbasis
Building Solutions for the Americas

2626 Kansas Avenue, Riverside, CA 92507 • Tel 909-787-0600 • Fax 909-787-0632 • www.newbasis.com

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NDS
One source. Many solutions.

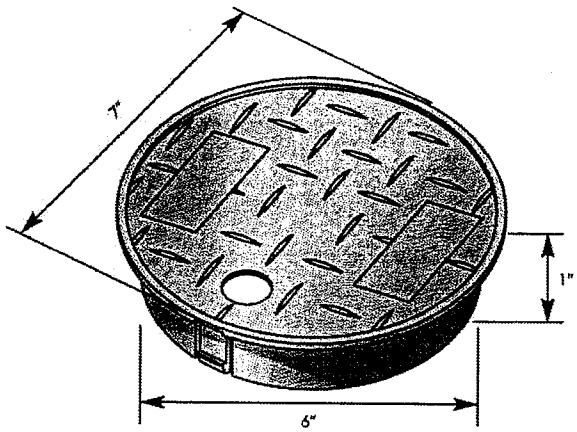
TECHNICAL SPECIFICATIONS

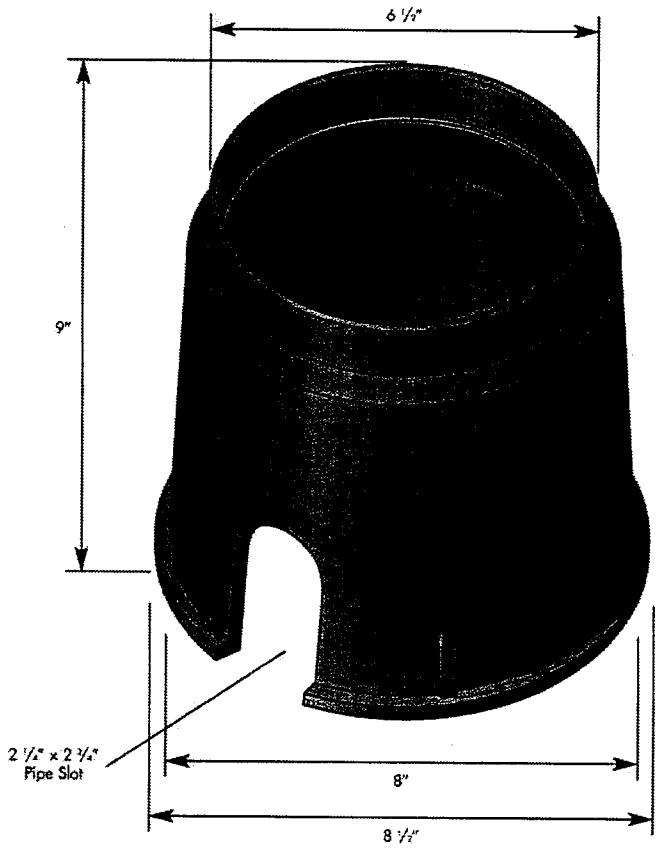
DFW by NDS D109 Meter Boxes

DFW BY NDS METER BOX SPEC **Standard Commercial Grade**

DFW by NDS 6" round meter boxes and covers are injection molded of recycled polyolefin material with a melt index between 10-12. Coloring and UV stabilizers are added, along with processing lubricants when needed.

The 6" round body shall be tapered and have a minimum wall thickness of .13". The body shall have a double wall at the top cover seat area with a minimum thickness of .125". The bottom of the body shall have a .25" flange. The 6" round cover shall have an average thickness of .15".





Product is not to be installed in concrete and is not to be used in vehicular applications. Weights and dimensions are nominal.

NDS **Please call NDS customer service for availability of different options: 1-800-726-1994**

S-T DFWVMB-02-003

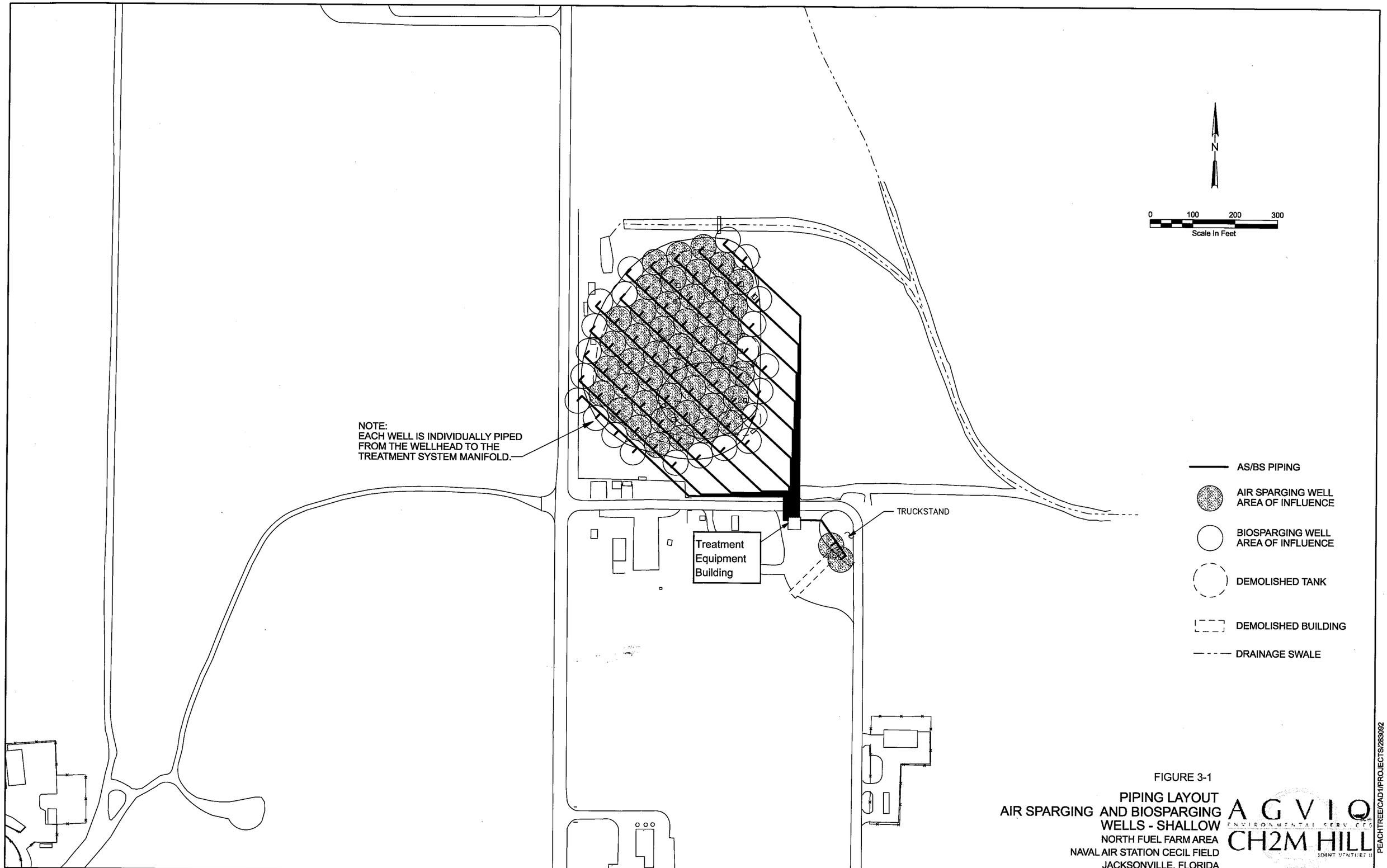


FIGURE 3-1

PIPING LAYOUT
AIR SPARGING AND BIOSPARGING
WELLS - SHALLOW
NORTH FUEL FARM AREA
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

AGVIQ ENVIRONMENTAL SERV CO
CH2M HILL JOINT VENTURE II

PEACHTREE/CAD1/PROJECTS/283092

15-JAN-2004 fig4-283092.dgn

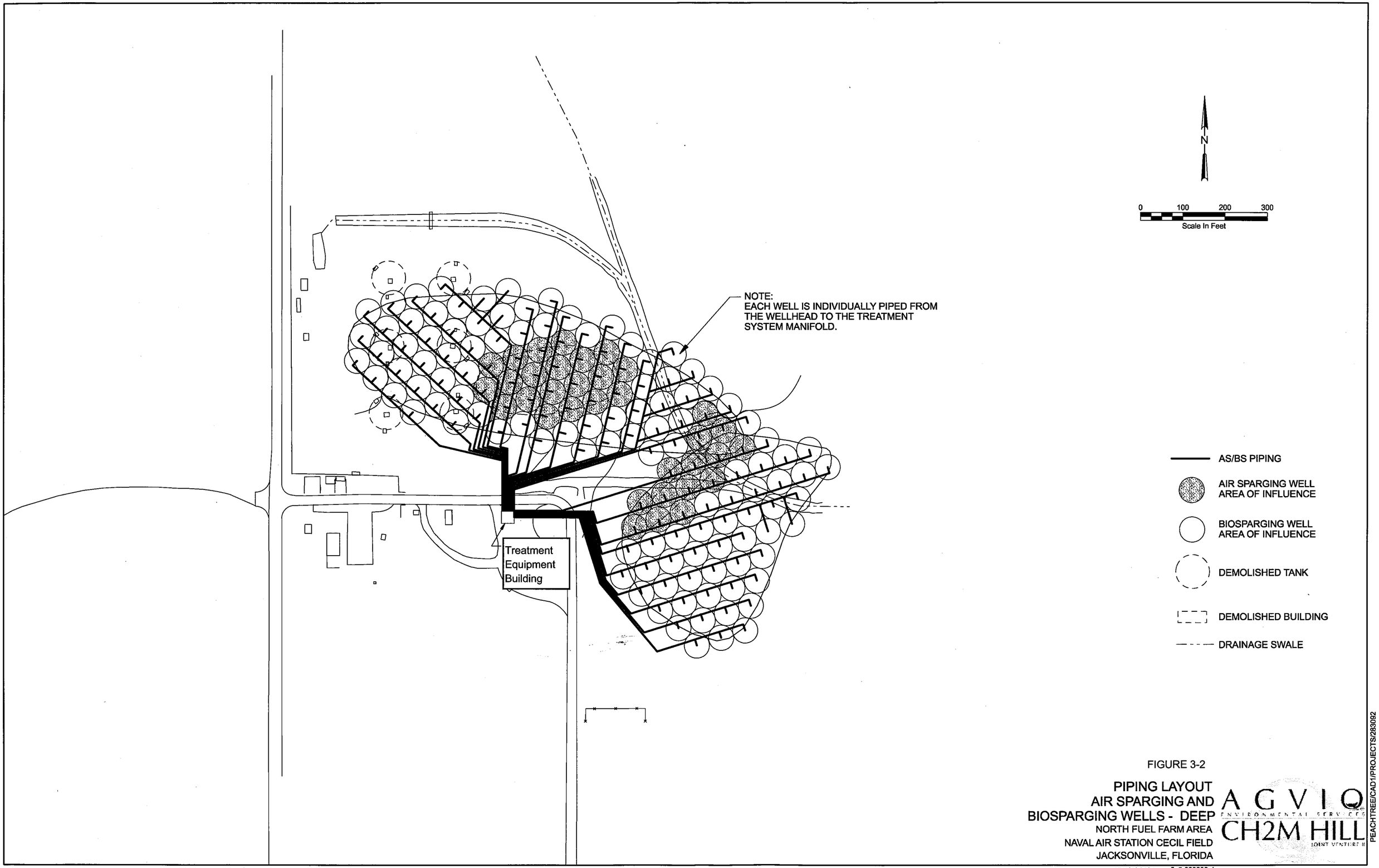


FIGURE 3-2

PIPING LAYOUT
AIR SPARGING AND
BIOSPARGING WELLS - DEEP
NORTH FUEL FARM AREA
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

AGVIQ ENVIRONMENTAL SERVICES
CH2M HILL JOINT VENTURE

PEACHTREE/CAD1/PROJECTS/283092

15-JAN-2004 fig5-283092.dgn

ATTACHMENT 4

STANDARD OPERATING PROCEDURE GH-2.8

GROUNDWATER MONITORIING WELL INSTALLATION

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1.0 PURPOSE

This procedure provides general guidance and information pertaining to proper monitoring well design, installation, and development.

2.0 SCOPE

This procedure is applicable to the construction of monitoring wells. The methods described herein may be modified by project-specific requirements for monitoring well construction. In addition, many regulatory agencies have specific regulations pertaining to monitoring well construction and permitting. These requirements must be determined during the project planning phases of the investigation, and any required permits must be obtained before field work begins. Innovative monitoring well installation techniques, which typically are not used, will be discussed only generally in this procedure.

3.0 GLOSSARY

Monitoring Well - A well which is screened, cased, and sealed which is capable of providing a groundwater level and groundwater sample representative of the zone being monitored. Some monitoring wells may be constructed as open boreholes.

Piezometer - A pipe or tube inserted into the water bearing zone, typically open to water flow at the bottom and to the atmosphere at the top, and used to measure water level elevations. Piezometers may range in size from 1/2-inch-diameter plastic tubes to well points or monitoring wells.

Potentiometric Surface - The surface representative of the level to which water will rise in a well cased to the screened aquifer.

Well Point (Drive Point) - A screened or perforated tube (Typically 1-1/4 or 2 inches in diameter) with a solid, conical, hardened point at one end, which is attached to a riser pipe and driven into the ground with a sledge hammer, drop weight, or mechanical vibrator. Well points may be used for groundwater injection and recovery, as piezometers (i.e., to measure water levels) or to provide groundwater samples for water quality data.

4.0 RESPONSIBILITIES

Driller - The driller provides adequate and operable equipment, sufficient quantities of materials, and an experienced and efficient labor force capable of performing all phases of proper monitoring well installation and construction. The driller may also be responsible for obtaining, in advance, any required permits for monitoring well installation and construction.

Field Geologist - The field geologist supervises and documents well installation and construction performed by the driller, and insures that well construction is adequate to provide representative groundwater data from the monitored interval. Geotechnical engineers, field technicians, or other suitable trained personnel may also serve in this capacity.

5.0 PROCEDURES

5.1 Equipment/Items Needed

Below is a list of items that may be needed when installing a monitoring well or piezometer:

- Health and safety equipment (hard hats, safety glasses, etc.) as required by the Site Safety Officer.
- Well drilling and installation equipment with associated materials (typically supplied by the driller).
- Hydrogeologic equipment (weighted engineer's tape, water level indicator, retractable engineers rule, electronic calculator, clipboard, mirror and flashlight - for observing downhole activities, paint and ink marker for marking monitoring wells, sample jars, well installation forms, and a field notebook).
- Drive point installation tools (sledge hammer, drop hammer, or mechanical vibrator; tripod, pipe wrenches, drive points, riser pipe, and end caps).

5.2 Well Design

The objectives and intended use for each monitoring well must be clearly defined before the monitoring system is designed. Within the monitoring system, different monitoring wells may serve different purposes and, therefore, require different types of construction. During all phases of the well design, attention must be given to clearly documenting the basis for design decisions, the details of well construction, and the materials used. The objectives for installing the monitoring wells may include:

- Determining groundwater flow directions and velocities.
- Sampling or monitoring for trace contaminants.
- Determining aquifer characteristics (e.g., hydraulic conductivity).

Siting of monitoring wells shall be performed after a preliminary estimation of the groundwater flow direction. In most cases, groundwater flow directions and potential well locations can be determined by an experienced hydrogeologist through the review of geologic data and the site terrain. In addition, data from production wells or other monitoring wells in the area may be used to determine the groundwater flow direction. If these methods cannot be used, piezometers, which are relatively inexpensive to install, may have to be installed in a preliminary investigative phase to determine groundwater flow direction.

5.2.1 Well Depth, Diameter, and Monitored Interval

The well depth, diameter, and monitored interval must be tailored to the specific monitoring needs of each investigation. Specification of these items generally depends on the purpose of the monitoring system and the characteristics of the hydrogeologic system being monitored. Wells of different depth, diameter, and monitored interval can be employed in the same groundwater monitoring system. For instance, varying the monitored interval in several wells, at the same location (cluster wells) can help to determine the vertical gradient and the depths at which contaminants are present. Conversely, a fully penetrating well is usually not used to quantify or vertically locate a contaminant plume, since groundwater samples collected in wells that are screened over the full thickness of the water-bearing zone will be representative of average conditions across the entire monitored interval. However, fully penetrating wells can be used to establish the existence of contamination in the water-bearing zone. The well diameter desired depends upon the hydraulic characteristics of the water-bearing zone, sampling requirements, drilling method and cost.

The decision concerning the monitored interval and well depth is based on the following (and possibly other) information:

- The vertical location of the contaminant source in relation to the water-bearing zone.
- The depth, thickness and uniformity of the water-bearing zone.
- The anticipated depth, thickness, and characteristics (e.g., density relative to water) of the contaminant plume.
- Fluctuation in groundwater levels (due to pumping, tidal influences, or natural recharge/discharge events).
- The presence and location of contaminants encountered during drilling.
- Whether the purpose of the installation is for determining existence or non-existence of contamination or if a particular stratigraphic zone is being investigated.
- The analysis of borehole geophysical logs.

In most situations where groundwater flow lines are horizontal, depending on the purpose of the well and the site conditions, monitored intervals are 20 feet or less. Shorter screen lengths (5 feet or less) are usually required where flow lines are not horizontal, (i.e., if the wells are to be used for accurate measurement of the potentiometric head at a specific point).

Many factors influence the diameter of a monitoring well. The diameter of the monitoring well depends on the application. In determining well diameter, the following needs must be considered:

- Adequate water volume for sampling.
- Drilling methodology.
- Type of sampling device to be used.
- Costs.

Standard monitoring well diameters are 2, 4, 6, or 8 inches. Drive points are typically 1-1/4 or 2 inches in diameter. For monitoring programs which require screened monitoring wells, either a 2-inch or 4-inch-diameter well is preferred. Typically, well diameters greater than 4 inches are used in monitoring programs in which open-hole bedrock monitoring wells are used. With smaller diameter wells, the volume of stagnant water in the well is minimized, and well construction costs are reduced; however, the sampling devices that can be used are limited.

In specifying well diameter, sampling requirements must be considered (up to a total of 4 gallons of water may be required for a single sample to account for full organic and inorganic analyses, and split samples), particularly if the monitored formation is known to be a low-yielding formation. The unit volume of water contained within a monitoring well is dependent on the well diameter as follows:

Casing Inside Diameter (Inch)	Standing Water Length to Obtain 1 Gallon Water (Feet)
2	6.13
4	1.53
6	0.68

If a well recharges quickly after purging, then well diameter may not be an important factor regarding sample volume requirements.

Pumping tests for determining aquifer characteristics may require larger diameter wells (for installation of high capacity pumps); however, in small-diameter wells in-situ permeability tests can be performed during drilling or after well installation is completed.

5.2.2 Riser Pipe and Screen Materials

Well materials are specified by diameter, type of material, and thickness of pipe. Well screens require an additional specification of slot size. Thickness of pipe is referred to as "Schedule" for polyvinyl chloride (PVC) casing and is usually Schedule 40 (thinner wall) or 80 (thicker wall). Steel pipe thickness is often referred to as "Strength". Standard Strength is usually adequate for monitoring well purposes. With larger diameter pipe, the wall thickness must be greater to maintain adequate strength. The required thickness is also dependent on the method of installation; risers for drive points require greater strength than wells installed inside drilled borings.

The selection of well screen and riser materials depends on the method of drilling, the type of subsurface materials the well penetrates, the type of contamination expected, and natural water quality and depth. Cost and the level of accuracy required are also important. The materials generally available are Teflon, stainless steel, PVC galvanized steel, and carbon steel. Each has advantages and limitations (see Attachment A of this guideline for an extensive presentation on this topic). The two most commonly used materials are PVC and stainless steel. Properties of these two materials are compared in Attachment B. Stainless steel is a good choice where trace metals or organic sampling is required; however, costs are high. Teflon materials are extremely expensive, but are relatively inert and provide the least opportunity for water contamination due to well materials. PVC has many advantages, including low cost, excellent availability, light weight, ease of manipulation, and widespread acceptance. The crushing strength of PVC may limit the depth of installation, but the use of Schedule 80 materials may overcome some of the problems associated with depth. However, the smaller inside diameter of Schedule 80 pipe may be an important factor when considering the size of bailers or pumps required for sampling or testing. Due to this problem, the minimum well pipe size recommended for Schedule 80 wells is 4-inch I.D.

Screens and risers may have to be decontaminated before use because oil-based preservatives and oil used during thread cutting and screen manufacturing may contaminate samples. Metal pipe may corrode and release metal ions or chemically react with organic constituents, but this is considered a minor issue. Galvanized steel is not recommended where samples may be collected for metals analyses, as zinc and cadmium levels in groundwater samples may become elevated from leaching of the zinc coating.

Threaded, flush-joint casing is most often preferred for monitoring well applications. PVC, Teflon, and steel can all be obtained with threaded joints. Welded-joint steel casing is also acceptable. Glued PVC may release organic contaminants into the well, and therefore, should not be used if the well is to be sampled for organic constituents.

When the water-bearing zone is in consolidated bedrock, such as limestone or fractured granite, a well screen is often not necessary (the well is simply an open hole in bedrock). Unconsolidated materials, such as sands, clay, and silts require a screen. A screen slot size of 0.010 or 0.020 inch is generally used when a screen is necessary, and the annular borehole space around the screened interval is artificially packed with an appropriately sized sand, selected based on formation grain size. The slot size controls the quantity of water entering the well and prevents entry of natural materials or sand pack. The screen shall pass no more than 10 percent of the pack material, or in-situ aquifer material. The site geologist shall specify the combination of screen slot size and sand pack which will be compatible with the water-bearing zone, to maximize groundwater inflow and minimize head losses and movement of fines into the wells. For example, as a standard procedure, a Morie No. 1 or No. 10 to No. 20 U.S. Standard Sieve size filter pack is typically appropriate for a 0.020-inch slot screen; however, a No. 20 to No. 40 U.S. Standard Sieve size filter pack is typically appropriate for a 0.010-inch slot screen.

5.2.3 Annular Materials

Materials placed in the annular space between the borehole and riser pipe and screen include a sand pack when necessary, a bentonite seal, and cement-bentonite grout. The sand pack is usually a medium- to coarse-grained poorly graded, silica sand and should relate to the grain size of the aquifer sediments. The quantity of sand placed in the annular space is dependent upon the length of the screened interval, but should always extend at least 1 foot above the top of the screen. At least 1 to 3 feet of bentonite pellets or equivalent shall be placed above the sand pack. Cement-bentonite grout (or equivalent) is then placed to extent from the top of the bentonite pellets to the ground surface.

On occasion, and with the concurrence of the involved regulatory agencies, monitoring wells may be packed naturally (i.e., no artificial sand pack installed). In this case, the natural formation material is allowed to collapse around the well screen after the well is installed. This method has been used where the formation material itself is a relatively uniform grain size, or when artificial sand packing is not possible due to borehole collapse.

Bentonite expands by absorbing water and provides a seal between the screened interval and the overlying portion of the annular space and formation. Cement-bentonite grout is placed on top of the bentonite pellets, extending to the surface. The grout effectively seals the remaining borehole annulus and eliminates the possibility for surface infiltration reaching the screened interval. Grouting also replaces material removed during drilling and prevents hole collapse and subsidence around the well. A tremie pipe should be used to introduce grout from the bottom upward, to prevent bridging, and to provide a better seal. In shallow boreholes that don't collapse, it may be more practical to pour the grout from the surface without a tremie pipe.

Grout is a general term which has several different connotations. For all practical purposes within the monitoring well installation industry, grout refers to the solidified material which is installed and occupies the annular space above the bentonite pellet seal. Grout, most of the time, is made up of one or two assemblages of material, (e.g., cement and/or bentonite). A cement-bentonite grout, which is the most common type of grout used in monitoring well completions, normally is a mixture of cement, bentonite, and water at a ratio of one 90-pound bag of Portland Type I cement, plus 3 to 5 pounds of granular or flake-type bentonite, and 6-7 gallons of water. A neat cement consists of one ninety-pound bag of Portland Type I cement and 6-7 gallons of water. A bentonite slurry (bentonite and water mixed to a thick but pumpable mixture) is sometimes used instead of grout for deep well installations where placement of bentonite pellets is difficult. Bentonite chips are also occasionally used for annular backfill in place of grout.

In certain cases, the borehole may be drilled to a depth greater than the anticipated well installation depth. For these cases, the well shall be backfilled to the desired depth with bentonite pellets/chips or sand. A short (1- to 2-foot) section of capped riser pipe sump is sometimes installed immediately below the screen, as a silt reservoir, when significant post-development silting is anticipated. This will ensure that the entire screen surface remains unobstructed.

5.2.4 Protective Casing

When the well is completed and grouted to the surface, a protective steel casing is typically placed over the top of the well. This casing generally has a hinged cap and can be locked to prevent vandalism. The protective casing has a larger diameter than the well and is set into the wet cement grout over the well upon completion. In addition, one hole is drilled just above the cement collar through the protective casing which acts as a weep hole for the flow of water which may enter the annulus during well development, purging, or sampling.

A protective casing which is level with the ground surface (flush-mounted) is used in roadway or parking lot applications where the top of a monitoring well must be below the pavement. The top of the riser pipe is placed 4 to 5 inches below the pavement, and a locking protective casing is cemented in place to 3 inches below the pavement. A large diameter, manhole-type protective collar is set into the wet cement around the well with the top set level with or slightly above the pavement. An appropriately-sized id is placed over the protective sleeve. The cement should be slightly mounded to direct pooled water away from the well head.

5.3 Monitoring Well Installation

Pertinent data regarding monitoring well installation shall be recorded on log sheets as depicted and discussed in SOP SA-6.3. Attachments to this referenced SOP illustrate terms and physical construction of various types of monitoring wells.

5.3.1 Monitoring Wells in Unconsolidated Sediments

After the borehole is drilled to the desired depth, well installation can begin. The procedure for well installation will partially be dictated by the stability of the formation in which the well is being placed. If the borehole collapses immediately after the drilling tools are withdrawn, then a temporary casing must be installed and well installation will proceed through the center of the temporary casing, and continue as the temporary casing is withdrawn from the borehole. In the case of hollow-stem auger drilling, the augers will act to stabilize the borehole during well installation.

Before the screen and riser pipe are lowered into the borehole, all pipe and screen sections should be measured with an engineer's rule to ensure proper placement. When measuring sections, the threads on one end of the pipe or screen must be excluded while measuring, since the pipe and screen sections are screwed flush together.

After the screen and riser pipe are lowered through the temporary casing, the sand pack can be installed. A weighted tape measure must be used during the installation procedure to carefully monitor installation progress. The sand is slowly poured into the annulus between the riser pipe and temporary casing, as the casing is withdrawn. Sand should always be kept within the temporary casing during withdrawal in order to ensure an adequate sand pack. However, if too much sand is within the temporary casing (greater than 1 foot above the bottom of the casing) bridging between the temporary casing and riser pipe may occur. Centralizers may be used at the geologist's discretion, one above and one below the screen, to assure enough annular space for sand pack placement.

After the sand pack is installed to the desired depth (at least 1 foot above the top of the screen), then the bentonite pellet seal (or equivalent), can be installed in the same manner as the sand pack. At least 1 to 3 feet of bentonite pellets should be installed above the sand pack. Pellets should be added slowly and their fall monitored closely to ensure that bridging does not occur.

The cement-bentonite grout is then mixed and tremied into the annulus as the temporary casing or augers are withdrawn. Finally, the protective casing can be installed as detailed in Section 5.2.4.

5.3.2 Confining Layer Monitoring Wells

When drilling and installing a well in a confined aquifer, proper well installation techniques must be applied to avoid cross contamination between aquifers. Under most conditions, this can be accomplished by installing double-cased wells. This is accomplished by drilling a large-diameter boring through the upper aquifer, 1 to 5 feet into the underlying confining layer, and setting and pressure grouting or tremie grouting a large-diameter casing into the confining layer. The grout material must fill the space between the native material and the outer casing. A smaller diameter boring is then continued through the confining layer for

installation of the monitoring well as detailed for overburden monitoring wells. Sufficient time (determined by the field geologist), must be allowed for setting of the grout prior to drilling through the confined layer.

5.3.3 Bedrock Monitoring Wells

When installing bedrock monitoring wells, a large diameter boring is drilled through the overburden and approximately 5 –10 feet into bedrock. A casing (typically steel) is installed and either pressure grouted or tremie grouted in place. After the grout has cured, a smaller diameter boring is continued into bedrock to the desired depth. If the boring does not collapse, the well can be left open, and a screen is not necessary. If the boring collapses, then a screen is required and can be installed as detailed for overburden monitoring wells. If a screen is to be used, then the casing which is installed through the overburden and into the bedrock does not require grouting and can be removed when the final well installation is completed.

5.3.4 Drive Points

Drive points can be installed with either a sledge hammer, drop hammer, or a mechanical vibrator. The screen section is threaded and tightened onto the riser pipe with pipe wrenches. The drive point is simply pounded into the subsurface to the desired depth. If a heavy drop hammer is used, then a tripod and pulley setup is required to lift the hammer. Drive points typically cannot be manually driven to depths exceeding 10 feet.

Direct push sampling/monitoring point installation methods, using a direct push rig or drilling rig, are described in SOP SA-2.5.

5.3.5 Innovative Monitoring Well Installation Techniques

Certain innovative sampling devices have proven advantageous. These devices are essentially screened samplers installed in a borehole with only small-diameter tubes extending to the surface. This reduces drilling costs, decreases the volume of stagnant water, and provides a sampling system that minimizes cross-contamination from sampling equipment. Four manufacturers of these samplers include Timco Manufacturing Company, Inc., of Prairie du Sac, Wisconsin, BARCAD Systems, Inc., of Concord, Massachusetts, Westbay Instruments Ltd. of Vancouver, British Columbia, Canada and the University of Waterloo at Waterloo, Ontario, Canada.. Each manufacturer offers various construction materials.

5.4 Well Development Methods

The purpose of well development is to stabilize and increase the permeability of the gravel pack around the well screen, and to restore the permeability of the formation which may have been reduced by drilling operations. Wells are typically developed until all fine material and drilling water is removed from the well. Sequential measurements of pH, conductivity, turbidity, and temperature taken during development may yield information (stabilized values) regarding whether sufficient development has been performed. The selection of the well development method shall be made by the field geologist and is based on the drilling methods, well construction and installation details, and the characteristics of the formation that the well is screened in. The primary methods of well development are summarized below. A more detailed discussion may be found in Driscoll (1986).

5.4.1 Overpumping and Backwashing

Wells may be developed by alternatively drawing the water level down at a high rate (by pumping or bailing) and then reversing the flow direction (backwashing) so that water is passing from the well into the formation. This back and forth movement of water through the well screen and gravel pack serves to

remove fines from the formation immediately adjacent to the well, while preventing bridging (wedging) of sand grains. Backwashing can be accomplished by several methods, including pouring water into the well and then bailing, starting and stopping a pump intermittently to change water levels, or forcing water into the well under pressure through a water-tight fitting ("rawhiding"). Care should be taken when backwashing not to apply too much pressure, which could damage or destroy the well screen.

5.4.2 Surging with a Surge Plunger

A surge plunger (also called a surge block) is approximately the same diameter as the well casing and is aggressively moved up and down within the well to agitate the water, causing it to move in and out of the screens. This movement of water pulls fine materials into the well, where they may be removed by any of several methods, and prevents bridging of sand particles in the gravel pack. There are two basic types of surge plungers; solid and valved surge plungers. In formations with low yields, a valved surge plunger may be preferred, as solid plungers tend to force water out of the well at a greater rate than it will flow back in. Valved plungers are designed to produce a greater inflow than outflow of water during surging.

5.4.3 Compressed Air

Compressed air can be used to develop a well by either of two methods: backwashing or surging. Backwashing is done by forcing water out through the screens, using increasing air pressure inside a sealed well, then releasing the pressurized air to allow the water to flow back into the well. Care should be taken when using this method so that the water level does not drop below the top of the screen, thus introducing air into the formation and reducing well yield. Surging, or the "open well" method, consists of alternately releasing large volumes of air suddenly into an open well below the water level to produce a strong surge by virtue of the resistance of water head, friction, and inertia. Pumping of the well is subsequently done using the air lift method.

5.4.4 High Velocity Jetting

In the high velocity jetting method, water is forced at high velocities from a plunger-type device and through the well screen to loosen fine particles from the sand pack and surrounding formation. The jetting tool is slowly rotated and raised and lowered along the length of the well screen to develop the entire screened area. Jetting using a hose lowered into the well may also be effective. The fines washed into the screen during this process can then be bailed or pumped from the well.

6.0 RECORDS

A critical part of monitoring well installation is recording of all significant details and events in the site logbook or field notebook. The geologist must record the exact depths of significant hydrogeological features, screen placement, gravel pack placement, and bentonite placement.

A Monitoring Well Sheet (see Attachments to SOP SA-6.3) shall be completed, ensuring the uniform recording of data for each installation and rapid identification of missing information. Well depth, length, materials of construction, length and openings of screen, length and type of riser, and depth and type of all backfill materials shall be recorded. Additional information shall include location, installation date, problems encountered, water levels before and after well installation, cross-reference to the geologic boring log, and methods used during the installation and development process. Documentation is very important to prevent problems involving questionable sample validity. Somewhat different information will need to be recorded, depending on whether the well is completed in overburden (single- or double-cased), as a cased well in bedrock, or as an open hole in bedrock.

The quantities of sand, bentonite, and grout placed in the well are also important. The geologist shall calculate the annular space volume and have an idea of the quantity of material needed to fill the annular

space. Volumes of backfill significantly higher than the calculated volume may indicate a problem such as a large cavity, while a smaller backfill volume may indicate a cave-in or bridging of the backfill materials. Any problems with rig operation or down-time shall be recorded and may affect the driller's final fee.

7.0 REFERENCES

Scalf, M. R., J. F. McNabb, W. J. Dunlap, R. L. Cosby, and J. Fryberger, 1981. Manual of Groundwater Sampling Procedures. R. S. Kerr Environmental Research Laboratory, Office of Research and Development, U.S. EPA, Ada, Oklahoma.

Barcelona, M. J., P. P. Gibb and R. A. Miller, 1983. A Guide to the selection of Materials for Monitoring Well Construction and Groundwater Sampling. ISWS Contract Report 327, Illinois State Water Survey, Champaign, Illinois.

U.S. EPA, 1980. Procedures Manual for Groundwater Monitoring of Solid Waste Disposal Facilities. Publication SW-611, Office of Solid Waste, U.S. EPA, Washington, D.C.

Driscoll, Fletcher G., 1986. Groundwater and Wells. Johnson Division, St. Paul, Minnesota, 1989.

ATTACHMENT A

RELATIVE COMPATIBILITY OF RIGID WELL CASING MATERIAL (PERCENT)

Potentially-Deteriorating Substance	Type of Casing Material						
	PVC 1	Galvanized Steel	Carbon Steel	Lo-carbon Steel	Stainless Steel 304	Stainless Steel 316	Teflon*
Buffered Weak Acid	100	56	51	59	97	100	100
Weak Acid	98	59	43	47	96	100	100
Mineral Acid/ High Solids Content	100	48	57	60	80	82	100
Aqueous/Organic Mixtures	64	69	73	73	98	100	100
Percent Overall Rating	91	58	56	59	93	96	100

Preliminary Ranking of Rigid Materials:

1 Teflon®
2 Stainless Steel 316
3. Stainless Steel 304
4 PVC 1
5 Lo-Carbon Steel
6 Galvanized Steel
7 Carbon Steel

* Trademark of DuPont

RELATIVE COMPATIBILITY OF SEMI-RIGID OR ELASTOMERIC MATERIALS (PERCENT)

Potentially-Deteriorating Substance	Type of Casing Material								
	PVC Flexible	PP	PE Conv.	PE Linear	PMM	Viton®*	Silicone	Neoprene	Teflon®*
Buffered Weak Acid	97	97	100	97	90	92	87	85	100
Weak Acid	92	90	94	96	78	78	75	75	100
Mineral Acid/ High Solids Content	100	100	100	100	95	100	78	82	100
Aqueous/Organic Mixtures	62	71	40	60	49	78	49	44	100
Percent Overall Rating	88	90	84	88	78	87	72	72	100

Preliminary Ranking of Semi-Rigid or Elastomeric Materials:

1 Teflon®
2 Polypropylene (PP)
3. PVC Flexible/PE Linear
4 Viton®
5 PE Conventional
6 Plexiglas/Lucite (PMM)
7 Silicone/Neoprene

* Trademark of DuPont

Source: Barcelona et al., 1983

ATTACHMENT B

COMPARISON OF STAINLESS STEEL AND PVC FOR MONITORING WELL CONSTRUCTION

Characteristic	Stainless Steel	PVC
Strength	Use in deep wells to prevent compression and closing of screen/riser.	Use when shear and compressive strength are not critical.
Weight	Relatively heavier.	Light-weight; floats in water.
Cost	Relatively expensive.	Relatively inexpensive.
Corrosivity	Deteriorates more rapidly in corrosive water.	Non-corrosive -- may deteriorate in presence of ketones, aromatics, alkyl sulfides, or some chlorinated hydrocarbons.
Ease of Use	Difficult to adjust size or length in the field.	Easy to handle and work with in the field.
Preparation for Use	Should be steam cleaned if organics will be subsequently sampled.	Never use glue fittings -- pipes should be threaded or pressure fitted. Should be steam cleaned when used for monitoring wells.
Interaction with Contaminants*	May sorb organic or inorganic substances when oxidized.	May sorb or release organic substances.

* See also Attachment A.

ATTACHMENT 5

NFF SYSTEM OPERATION AND MAINTENANCE FORMS

NORTH FUEL FARM AIR SPARGE SYSTEM OPERATION AND MAINTENANCE FORM
CECIL FIELD
JACKSONVILLE, FL
8030.08A2.NAVF

Technician: MILLARD H. SHARP Time In: RETURN OFFICE 12:25pm
Date: APRIL 14 2010 Time Out: DEPART OFFICE 7:50 am

Air Compressor

Air Compressor Status	(On)	Off	Air Compressor Pressure	105	PSI
Air Compressor Temperature	167	°F	Air Compressor Run Hours	027919	Hours
Air Compressor Load Hours	027132	Hours	Condensate Container Level	1/3	Percent Full
Air Tank Pre-filter Gauge	(Green)	Red	Air Tank Post-filter Gauge	(Green)	Red

Sparge Well Manifolds

Cycle 1 Wells	Red Indicator Light		Flow Rate (SCFM)	Pressure (PSI)	Regulator Leaking ?	Cycle 2 Wells	Red Indicator Light		Flow Rate (SCFM)	Pressure (PSI)	Regulator Leaking ?
AS-18	(On)	Off	5	130		BD-13	On	(Off)	5	120	
BD-06	(On)	Off	5	100		AS-25	On	(Off)	4	110	
AS-17	(On)	Off	20	110		AS-24	On	(Off)	4	110	
BD-05	(On)	**Off**	5	120		BD-12	On	(Off)	4	110	
AS-29	(On)	**Off**	4	110		BD-11	On	(Off)	5	120	
AS-36	(On)	Off	5	110		AS-23	On	(Off)	5	100	
BD-19	(On)	**Off**	20	105		AS-35	On	(Off)	2	100	
AS-31	(On)	Off	5	95		AS-30	(On)	Off	5	110	
* AS-44	(On)	Off	5	80		AS-40	(On)	**Off**	5	140 ✓	
AS-41	(On)	Off	4	120		AS-37	(On)	Off	5	70	
BD-20	(On)	Off	5	90		**BD-26**	**On**	(Off)	0	110	
AS-32	(On)	Off	5	145		AS-42	(On)	Off	5	110	
AS-45	(On)	Off	5	105		**BD-32**	**On**	(Off)	1	90	
AS-38	(On)	Off	5	60		BD-27	On	(Off)	2	70	
BD-21	(On)	**Off**	5	105		AS-43	On	(Off)	2	105	
AD-15	(On)	Off	5	65		AS-39	On	(Off)	5	90	
AD-08	(On)	**Off**	2	110		BD-52	On	(Off)	2	110	
AD-12	(On)	Off	5	70		AD-11	On	(Off)	5	100	
AD-09	(On)	Off	5	60		AD-13	On	(Off)	0	100	
AD-16	(On)	Off	5	60		AD-19	On	(Off)	1	100	
AD-10	(On)	Off	5	60		AD-17	On	(Off)	4	110	
AD-18	(On)	Off	5	60		AD-14	On	(Off)	2	100	
AD-31	(On)	Off	5	110		AD-20	On	(Off)	0	100	
AD-33	(On)	Off	5	100		AD-30	On	(Off)	2	110	
BD-82	(On)	**Off**	2	115		AD-32	On	(Off)	4	110	
BD-89	(On)	Off	5	75		AD-34	On	(Off)	1	85	
BD-94	(On)	Off	5	100		**BD-81**	**On**	(Off)	5	110	
BD-95	(On)	**Off**	5	95		BD-88	On	(Off)	5	90	
BD-100	(On)	Off	5	100		BD-105	On	(Off)	3	105	
BD-106	(On)	Off	7	75		BD-101	On	(Off)	0	100	
BD-102	(On)	Off	5	100		BD-96	On	(Off)	0	105	
BD-97	(On)	Off	5	80		BD-90	On	(Off)	0	80	
BD-91	(On)	Off	5	120		BD-83	On	(Off)	4	120	

Comments: SOLUTIONS LOCK AND 2 OTHER CONTRACTOR LOCKS FOUND REMOVED FROM MAIN GATE "DAISY CHAIN" LOCK ARRAY. SPOKE WITH OPERATIONS OFFICE ABOUT SITUATION. OPERATIONS OFFICE REP UNLOCKED MAIN GATE. CECIL OPERATIONS RESOLVED GATE LOCK ISSUE. EMPTIED CONDENSATE INTO DRUM. RELOCKED MAIN GATE EXACTLY AS LEFT BY CECIL OPERATIONS REP.

* = Adjusted ** = Will not adjust

Bolded Do not adjust flow for wells that are bolded, record flow only. Well will not take air or meter needs repair.

Check "Regulator Leaking" box if regulator is leaking

R-24
L-24

Solutions-IES
(919) 873-1060

SENIOR PROJECT MANAGER
SOLUTIONS-IES
919 873-1060
FAX 919 873-1074

NORTH FUEL FARM AIR SPARGE SYSTEM OPERATION AND MAINTENANCE FORM
CECIL FIELD
JACKSONVILLE, FL
8030.08A2.NAVF

Technician: MILLARD H. SHARP Time In: 1:30 pm RETURN OFFICE
Date: APRIL 21 2010 Time Out: 9:30 am DEPART OFFICE

Air Compressor

Air Compressor Status	(On)	Off	Air Compressor Pressure	112	PSI
Air Compressor Temperature	173	°F	Air Compressor Run Hours	027996	Hours
Air Compressor Load Hours	027209	Hours	Condensate Container Level	0	Percent Full
Air Tank Pre-filter Gauge MAX	(Green)	Red	Air Tank Post-filter Gauge MAX	(Green)	Red

Sparge Well Manifolds

Cycle 1 Wells	Red Indicator Light		Flow Rate (SCFM)	Pressure (PSI)	Regulator Leaking ?	Cycle 2 Wells	Red Indicator Light		Flow Rate (SCFM)	Pressure (PSI)	Regulator Leaking ?
AS-18	(On)	Off	5	140		BD-13	On	(Off)	5	130	
BD-06	(On)	Off	5	105		AS-25	On	(Off)	4	130	
AS-17 HANDGAUGE DOESN'T WORK	(On)	Off	20	135		AS-24	On	(Off)	5	110	
BD-05	(On)	**Off**	5	120		BD-12	On	(Off)	0	130	
AS-29	(On)	**Off**	4	110		BD-11	On	(Off)	4	120	
AS-36	(On)	Off	5	120		AS-23	On	(Off)	6	105	
BD-19	(On)	**Off**	5	110 ✓		AS-35	On	(Off)	4	105	
AS-31	(On)	Off	5	100		AS-30	(On)	Off	5	120	
AS-44	(On)	Off	5	80		**AS-40**	(On)	**Off**	5	140 ✓	
AS-41	(On)	Off	5	110 ✓		AS-37	(On)	Off	5	110 ✓	
BD-20	(On)	Off	5	105		**BD-26**	**On**	(Off)	0	120	
AS-32	(On)	Off	5	150		AS-42	(On)	Off	5	110	
AS-45	(On)	Off	5	110		**BD-32**	**On**	(Off)	0	90	
AS-38	(On)	Off	5	70		BD-27	On	(Off)	0	90	
BD-21	(On)	**Off**	5	110		AS-43	On	(Off)	2	110	
AD-15	(On)	Off	5	60		AS-39	On	(Off)	0	95	
AD-08	(On)	**Off**	0	115		BD-52	On	(Off)	1	120	
AD-12	(On)	Off	5	75		AD-11	On	(Off)	2	110	
AD-09	(On)	Off	5	65		AD-13	On	(Off)	2	110	
AD-16	(On)	Off	5	60		AD-19	On	(Off)	0	110	
AD-10	(On)	Off	5	60		AD-17	On	(Off)	5	115	
AD-18	(On)	Off	5	70		AD-14	On	(Off)	2	110	
AD-31	(On)	Off	5	110		AD-20	On	(Off)	2	105	
AD-33	(On)	Off	5	110		AD-30	On	(Off)	0	115	
BD-82	(On)	**Off**	5	110		AD-32	On	(Off)	2	120	
BD-89	(On)	Off	5	85		AD-34	On	(Off)	2	105 ✓	
BD-94	(On)	Off	5	105		**BD-81**	**On**	(Off)	4	110	
BD-95	(On)	**Off**	5	90		BD-88	On	(Off)	2	90	
BD-100	(On)	Off	5	95		BD-105	On	(Off)	2	110	
BD-106	(On)	Off	5	80		BD-101	On	(Off)	0	110	
BD-102	(On)	Off	5	100		BD-96	On	(Off)	2	110	
BD-97	(On)	Off	5	80		BD-90	On	(Off)	0	80	
BD-91	(On)	Off	5	120		BD-83	On	(Off)	5	120	

AIR LEAKS
BD-46
BD-98

Comments: MAIN GATE LOCKS A BIG JUMBLE AGAIN. MANAGED TO UNLOCK AND SEPARATE SOLUTIONS LOCK. SYSTEM NOT OPERATING ON ARRIVAL. RESET CIRCUIT BREAKER, ENERGIZED AND PLACED SYSTEM ON LOAD. WAITED 15 MINUTES FOR PRESSURE TO BUILD AND STABILIZE BEFORE GAGE READINGS RELOCKED FRONT GATE BETTER THAN FOUND

off for ≈ 4

* = Adjusted ** = Will not adjust

Bolded Do not adjust flow for wells that are bolded, record flow only. Well will not take air or meter needs repair.

Check "Regulator Leaking" box if regulator is leaking

Rm-77
C-77

ERIK DRINN ROBBIN
SENIOR PROJECT MANAGER
SOLUTIONS-IES
919 873-1060
FAX 919 873-1074

NORTH FUEL FARM AIR SPARGE SYSTEM OPERATION AND MAINTENANCE FORM
CECIL FIELD
JACKSONVILLE, FL
8030.08A2.NAVF

Technician: MILLARD H. SHARP Time In: 1:00 pm RETURN OFFICE
Date: APRIL 26 2010 Time Out: 9:00 am DEPART OFFICE

Air Compressor

Air Compressor Status	(On) Off	Air Compressor Pressure	112 PSI
Air Compressor Temperature	174 °F	Air Compressor Run Hours	027997 Hours
Air Compressor Load Hours	027210 Hours	Condensate Container Level	0 Percent Full
Air Tank Pre-filter Gauge	MAX (Green) Red	Air Tank Post-filter Gauge	MAX (Green) Red

Sparge Well Manifolds

Cycle 1 Wells	Red Indicator Light	Flow Rate (SCFM)	Pressure (PSI)	Regulator Leaking ?	Cycle 2 Wells	Red Indicator Light	Flow Rate (SCFM)	Pressure (PSI)	Regulator Leaking ?
AS-18	On (Off)	3	140		BD-13	(On) Off	5	130	
BD-06	On (Off)	2	105		AS-25	(On) Off	5	110	
AS-17	On (Off)	2	120		AS-24	(On) Off	5	110	
BD-05	On (Off)	2	120		BD-12	(On) Off	5	115	
AS-29	On (Off)	2	115		BD-11	(On) Off	5	120	
AS-36	(On) Off	5	115		AS-23	(On) Off	5	110	BD-98 VALVE LEAKING AIR
BD-19	On (Off)	0	100		AS-35	(On) Off	5	105	
AS-31	On (Off)	2	100		AS-30	(On) Off	5	115	
* AS-44	On (Off)	0	80		AS-40	(On) Off	5	140 ✓	
AS-41	(On) Off	5	120		AS-37	(On) Off	5	110 ✓	
BD-20	On (Off)	2	105		**BD-26**	(On) Off	4	115	
AS-32	On (Off)	3	150		AS-42	(On) Off	5	110	
AS-45	On (Off)	5	110		**BD-32**	(On) Off	5 ~~3~~	90	
AS-38	On (Off)	0	80		BD-27	(On) Off	5	80	
BD-21	On (Off)	2	110		AS-43	(On) Off	5	110	
AD-15	On (Off)	5	60		AS-39	(On) Off	5	95	
AD-08	On (Off)	1	110		BD-52	(On) Off	5	120	
AD-12	On (Off)	2	80		AD-11	(On) Off	5	110	
AD-09	On (Off)	0	70		AD-13	(On) Off	5	110	
AD-16	On (Off)	0	60		AD-19	(On) Off	5	110	
AD-10	On (Off)	0	70		AD-17	(On) Off	5	115	
AD-18	On (Off)	2	80		AD-14	(On) Off	5	105	
AD-31	On (Off)	2	115		AD-20	(On) Off	5	100	
AD-33	On (Off)	3	100		AD-30	(On) Off	5	115	
BD-82	On (Off)	2	110		AD-32	(On) Off	5	120	
BD-89	On (Off)	4	80		AD-34	(On) Off	5	105 ✓	
BD-94	On (Off)	2	105		**BD-81**	(On) Off	20	105	* TAPPING HARD ON GAGE HOWING DOES NOT MOVE GAGE
BD-95	On (Off)	0	90		BD-88	(On) Off	5	90	
BD-100	On (Off)	5	90		BD-105	(On) Off	5	110	
BD-106	On (Off)	2	90		BD-101	(On) Off	5	110	
BD-102	On (Off)	3	100		BD-96	(On) Off	5	110	
BD-97	On (Off)	4	80		BD-90	(On) Off	5	80	
BD-91	On (Off)	4	125		BD-83	(On) Off	5	125	

Comments SYSTEM NOT OPERATING ON ARRIVAL. 2ND CONSECUTIVE WEEK. RESET MAIN CIRCUIT BREAKER, ENERGIZED SYSTEM, WAITED 15 MINUTES FOR PRESSURE TO BUILD AND STABILIZE BEFORE GAGE RECORDING. RELOCKED MAIN GATE EXACTLY AS FOUND

* = Adjusted ** = Will not adjust

Bolded Do not adjust flow for wells that are bolded, record flow only. Well will not take air or meter needs repair

Check "Regulator Leaking" box if regulator is leaking

SENIOR PROJECT MANAGER
SOLUTIONS-IES
919 873-1060
FAX 919 873-1074

NORTH FUEL FARM AIR SPARGE SYSTEM OPERATION AND MAINTENANCE FORM
CECIL FIELD
JACKSONVILLE, FL
8030.08A2.NAVF

Technician: MILLARD H. SHARP Time In: RETURN OFFICE 2:30pm
Date: MAY 5 2010 Time Out: DEPART OFFICE 7:30am

Air Compressor

Air Compressor Status	(On) Off	Air Compressor Pressure	113 PSI
Air Compressor Temperature	172 °F	Air Compressor Run Hours	028007 Hours
Air Compressor Load Hours	027220 Hours	Condensate Container Level	0 Percent Full
Air Tank Pre-filter Gauge MAX	(Green) Red	Air Tank Post-filter Gauge MAX	(Green) Red

Sparge Well Manifolds

Cycle 1 Wells	Red Indicator Light	Flow Rate (SCFM)	Pressure (PSI)	Regulator Leaking ?	Cycle 2 Wells	Red Indicator Light	Flow Rate (SCFM)	Pressure (PSI)	Regulator Leaking ?
AS-18	On (Off)	2	140		BD-13	(On) Off	5	130	
BD-06	On (Off)	2	110		AS-25	(On) Off	5	115	
AS-17	On (Off)	2	120		AS-24	(On) Off	5	110	
BD-05	On (Off)	2	125		BD-12	(On) Off	5	120	
AS-29	On (Off)	1	115		BD-11	(On) Off	5	125	
AS-36	(On) Off	5	120		AS-23	(On) Off	5	110	
BD-19	On (Off)	20	100		AS-35	(On) Off	5	110	
AS-31	On (Off)	1	100		AS-30	(On) Off	5	120	
* AS-44	On (Off)	0	80		**AS-40**	(On) Off	5	140 ✓	
AS-41	(On) Off	5	120 ✓		AS-37	(On) Off	5	115	
BD-20	On (Off)	2	115		BD-26	(On) Off	5	120	
AS-32	On (Off)	2	150		AS-42	(On) Off	5	120	
AS-45	On (Off)	0	110		**BD-32**	(On) Off	5	90	
AS-38	On (Off)	2	85		BD-27	(On) Off	5	80	
BD-21	On (Off)	0	110		AS-43	(On) Off	5	110	
AD-15	On (Off)	6	60		AS-39	(On) Off	5	95	
AD-08	On (Off)	0	110		BD-52	(On) Off	5	120	
AD-12	On (Off)	0	80		AD-11	(On) Off	5	110	
AD-09	On (Off)	0	75		AD-13	(On) Off	5	110	
AD-16	On (Off)	0	60		AD-19	(On) Off	6	110	
AD-10	On (Off)	0	70		AD-17	(On) Off	5	115	
AD-18	On (Off)	4	80		AD-14	(On) Off	5	115	
AD-31	On (Off)	1	120		AD-20	(On) Off	5	100	
AD-33	On (Off)	0	100		AD-30	(On) Off	5	115	
BD-82	On (Off)	2	120		AD-32	(On) Off	5	120	
BD-89	On (Off)	5	85		AD-34	(On) Off	5	110 ✓	
BD-94	On (Off)	0	110		**BD-81**	(On) Off	20	115	
BD-95	On (Off)	2	105		BD-88	(On) Off	5	95	
BD-100	On (Off)	2	85		BD-105	(On) Off	5	110	
BD-106	On (Off)	2	85		BD-101	(On) Off	5	110	
BD-102	On (Off)	2	100		BD-96	(On) Off	5	110	
BD-97	On (Off)	0	50		BD-90	(On) Off	5	60	
BD-91	On (Off)	4	125		BD-83	(On) Off	5	125	

* ELECTRICAL SHOCK WHEN I TOUCHED LAMP HOLDER

AS-34
BD-46
BD-98

Comments: ** 3RD CONSECUTIVE WEEK! SYSTEM NOT OPERATING ON ARRIVAL. NO ELECTRICAL STORMS IN AREA PRECEDING WEEK. RESET MAIN CIRCUIT BREAKER, ENERGIZED SYSTEM & PLACED ON LOAD, WAITED 15 MINUTES FOR PRESSURE STABILIZATION BEFORE DATA RECORDING. RELOCKED MAIN GATE EXACTLY AS FOUND

* = Adjusted ** – Will not adjust

Bolded Do not adjust flow for wells that are bolded, record flow only. Well will not take air or meter needs repair.

Check "Regulator Leaking" box if regulator is leaking

R 10 hr
C 10

Solutions-IPS
(919) 873-1060

OandMform.xls

TIK DOWN ...
SENIOR PROJECT MANAGER
FAX 919 873-1074