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NTC ORLANDO
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WORK PLAN ADDENDUM 1 FOR GROUNDWATER INVESTIGATION AT OPERABLE UNIT 4
(OU 4) WITH TRANSMITTAL LETTER NTC ORLANDO FL
2/12/2009
TETRA TECH



TETRA TECH NUS, INC.

661 Andersen Drive • Pittsburgh, PA 15220
Tel 412.921.7090 • Fax 412.921.4040 • www.tetrattech.com

February 12, 2009

Commander Southeast
Naval Facilities Engineering Command
ATTN: Mr. Art Sanford
4130 Faber Place Drive, Suite 202
North Charleston, SC 29405

Reference: CLEAN Contract No. N62467-04-D-0055
Contract Task Order No. 0125

Subject: Addendum No. 1 to the Work Plan for Operable Unit 4
Naval Training Center, Orlando, Florida

Dear Mr. Sanford:

Please find enclosed Work Plan Addendum No. 1 for continuing the groundwater investigation in the Hawthorn zone at Operable Unit 4 for your review and use.

If you have any questions or comments, please contact me at (865) 220-4701.

Sincerely,

Teresa K. Grayson
Task Order Manager

Enclosure

c:
Mike Singletary, NAVFAC SE
David Grabka, FDEP
Greg Fraley, USEPA Region 4
Sam Naik, CH2M Hill, Atlanta
Chris Pike, Tetra Tech NUS, Pittsburgh
Mark Perry, Tetra Tech NUS, Pittsburgh
Allan Jenkins, Tetra Tech, Oak Ridge
Gary Braganza, Tetra Tech NUS, Boynton Beach
Debbie Humbert (cover letter only)
File 471108001

WORK PLAN ADDENDUM

Tetra Tech NUS, Inc.

Addendum No. 1 to the Work Plan for Operable Unit 4 Naval Training Center Orlando, Florida

Prepared for: Orlando Partnering Team

Art Sanford – BRAC PMO SE

Sam Naik – CH2M HILL

David Grabka – FDEP

Greg Fraley – USEPA

Prepared by: Teresa Grayson – Tetra Tech

Copies: Chris Pike, Mark Perry, Gary Braganza, Allan Jenkins

Contract: Navy Contract No. N62467-04-D-0055

Date: **February 12, 2009**

1.0 INTRODUCTION

This Addendum to the Work Plan for Operable Unit 4 (TtNUS, 2006) presents the technical approach and methods to be used in continuing the groundwater investigation in the Hawthorn Group at Operable Unit (OU) 4 at the former Naval Training Center (NTC) in Orlando, Florida (Figure 1).

1.1 PURPOSE

Previous investigations and analytical results have shown that the upper portion of the Hawthorn Group at OU 4 is contaminated with chlorinated compounds at concentrations greater than Florida Department of Environmental Protection (FDEP) Groundwater Cleanup Target Levels (GCTLs). Groundwater analytical results from January and April 2008 for a well (OLD-13-69D) at the northern boundary of OU 4 indicated that the extent of groundwater contamination (Table 1) is not yet defined and may extend beyond the northern boundary of OU 4.

The purpose of the proposed additional effort is to investigate the lateral and vertical extent of contaminated groundwater in the Hawthorn Water-Bearing Zone (WBZ) north of the northern property boundary at OU 4.

2.0 PROPOSED ADDITIONAL INVESTIGATION

All proposed investigation activities will be performed as outlined in the June 2006 Work Plan for Operable Unit 4, Naval Training Center Orlando with the exception of the construction of nested wells. The revised construction details for nested wells are presented in this addendum. Surface and shallow subsurface soil sampling, groundwater profiling, subsurface soil sampling, and aquifer hydraulic conductivity testing will not be conducted.

2.1 PROJECT OBJECTIVE AND SUMMARY OF ACTIVITIES

The objective of the proposed investigation is to continue delineation of the lateral and vertical extent of groundwater contamination north of the property boundary of OU 4 in the Hawthorn WBZ.

The objectives of the proposed investigation at OU 4 will be accomplished as follows:

- Collect groundwater samples for analyses of volatile organic compounds (VOCs) from the three Hawthorn continuous multi-channel tubing (CMT) wells (a total of 18 channels) located along the northern boundary of OU 4 (Table 2).
- Advance one boring north of the site boundary in the direction of groundwater flow (north) using Rotasonic drilling methods. The proposed location is shown on Figure 2. This boring will be continuously cored through the Hawthorn WBZ from approximately 65 feet below ground surface (bgs) to a total depth of approximately 130 feet bgs. Soil cores will be collected in 5-foot core barrels between these depths. Utility clearance at the proposed location will be through Florida One-Call and vacuum extraction utility services (day lighting).
- Install a pair of nested monitoring wells in the boring. One well will be screened in the lithologic unit known to contain contamination at the property boundary, and the other well will be screened in the permeable zone below that target interval at the bottom of the Hawthorn WBZ.
- Survey the horizontal location, ground surface elevation, and top of casing elevation of each new permanent monitoring well to provide groundwater hydraulic data.
- Measure water levels in newly installed and existing Hawthorn Group monitoring wells to evaluate groundwater flow direction and gradients.

- Collect and analyze groundwater samples from newly installed monitoring wells (Table 2) to characterize the lateral and vertical limits of the plume and to support future assessment action decisions.

The monitoring wells installed during the proposed investigation may also be included in future monitoring of the site as part of the proposed remedy. The Orlando Partnering Team will evaluate the data and determine if additional monitoring well sampling rounds are needed.

2.2 TECHNICAL APPROACH

This investigation includes obtaining authorization to drill from the property owner of the housing community located directly north of OU 4. After permission is obtained, drilling activities including sampling will be coordinated with the landowner. If permission cannot be obtained in a timely manner, borings will be installed in the public street north of the private property along Plaza Terrace Drive.

The Hawthorn Group wells along the northern boundary (OLD-13-68D, 69D, and -70D) will be sampled and the data used in conjunction with previous sampling results to determine the current extent of the plume at the site. The location of the proposed boring and nested wells will be based on the observations of groundwater flow direction in the existing Hawthorn Group wells and the analytical results of groundwater samples collected from monitoring wells along the northern property line, primarily well OLD-13-69D. Lithologic observations from the proposed boring will be used to select the screen depths for the new permanent nested monitoring wells. The new wells will be installed and sampled to evaluate the lateral and vertical extent of groundwater contamination beyond the northern property boundary of OU 4. Water level measurements from existing and new Hawthorn Group monitoring wells will be used to determine the direction and rate of groundwater flow. The following section describes the monitoring well installation method and construction details for the new wells.

2.3 MONITORING WELL INSTALLATION

The location and screen intervals of permanent monitoring wells will be selected based on evaluation of the lithology from the boring. Concentrations of chlorinated VOCs have been highest at the OLD-13-69D location in a gravelly interval at an elevation of 5 feet above mean sea level (amsl). The bottom of the Hawthorn WBZ was encountered at an elevation of approximately 19 feet amsl. A pair of nested wells (OLD-13-81D and OLD-13-82D) will be installed in the boring. One well will be screened within the lithologic unit of known contamination (approximately 3 to 8 feet amsl), and the other well will be screened directly below at the bottom of the Hawthorn WBZ (approximately 15 to 20 feet amsl). The final screen

intervals will be determined following review of the lithologic log. Pertinent cross-sections from previous investigation activities identifying the zones of interest are included as Attachment 1.

2.3.1 Well Construction

The nested pair of monitoring wells will be installed in the same borehole using Rotosonic methods. The wells will be constructed of 1.0-inch inside diameter (ID) polyvinyl chloride (PVC) riser and 30/65 sieve size (or equivalent) pre-packed PVC screens. A 5-foot section of screen with a slot size of 0.006 inch will be used for each target interval as determined by the lithologic log. A clean silica fine-grained sand filter pack of U.S. Standard Sieve Size No. 30/65 (or equivalent) will be placed around the pre-packed screens along the entire length of the screens and extending from 0.5 feet below to a maximum of 2 feet above the top of the screens. The top of the sand pack will be sounded to verify its depth during placement. The well seal will be completed by placing a minimum 2 foot-thick bentonite seal above the sand pack, using a tremie pipe, to within 2 feet of the bottom of the screen of the monitoring well completed in the interval above. The remaining annulus above the seal for the upper screened interval will be backfilled to the surface, using a tremie pipe, with a 20:1 cement/bentonite grout. The wells will be located within a single flush-mounted manhole and completed to grade. The depths and thicknesses of the well construction materials will be recorded by the TtNUS on-site geologist.

2.3.2 Well Development

The newly constructed monitoring wells will be developed as described in Section 3.3.2.4 of the Work Plan for Operable Unit 4, Naval Training Center, Orlando, Florida.

2.4 MONITORING WELL SAMPLING

All monitoring well sampling will be conducted according to the methods described in the Work Plan for Operable Unit 4, Naval Training Center, Orlando, Florida. Table 2 indicates the proposed sampling plan including well names, screen intervals, and selected parameters.

TABLES

TABLE 1

SELECT GROUNDWATER ANALYTICAL RESULTS
OPERABLE UNIT 4

NAVAL TRAINING CENTER
ORLANDO, FLORIDA

PAGE 1 of 2

Well Sampling Parameters	FDEP GCTL ¹	OLD1368D	OLD1369D			OLD1370D
		105-110 ft bgs	100-105 ft bgs	100-105 ft bgs	110-115 ft bgs	101-106 ft bgs
		1/24/2008	1/24/2008	04/16/2008	04/16/2008	1/24/2008
Volatiles Organics (µg/L)						
1,1,1-Trichloroethane	200	1 U	5 U	2.9 U	0.58 U	1 U
1,1,2,2-Tetrachloroethane	0.2	0.5 U	2.5 U	3.7 U	0.74 U	0.5 U
1,1,2-Trichloro-1,2,2-trifluoroethane	210000	1 U	2 J			1 U
1,1,2-Trichloroethane	5	1 U	5 U	3 U	0.6 U	1 U
1,1-Dichloroethane	70	1 U	5 U	2.5 U	0.5 U	1 U
1,1-Dichloroethene	7	1 U	1.6 J	2.3 U	1.7 J	1 U
1,2,3-Trichlorobenzene	70	1 U	5 U			1 U
1,2,4-Trichlorobenzene	70	1 U	5 U			1 U
1,2-Dibromo-3-chloropropane	0.2	0.5 U	2.5 U			0.5 U
1,2-Dibromoethane (Ethylene dibromide)	0.02	0.5 U	2.5 U			0.5 U
1,2-Dichlorobenzene	600	1 U	5 U			1 U
1,2-Dichloroethane	3	1 U	5 U	2 U	0.4 U	1 U
1,2-Dichloropropane	5	1 U	5 U	2.5 U	0.5 U	1 U
1,3-Dichlorobenzene	210	1 U	5 U			1 U
1,4-Dichlorobenzene	75	1 U	5 U			1 U
2-Hexanone	280	5 U	25 U	29 U	5.7 U	5 U
Acetone	6300	10 UJ	50 UJ	100 U	20 U	10 UJ
Benzene	1	1 U	5 U	2 U	0.4 U	1 U
Bromochloromethane	91	1 U	5 U			1 U
Bromodichloromethane	0.6	0.6 U	3 U	2.9 U	0.58 U	0.6 U
Bromoform	4.4	1 U	5 U	2.8 U	0.56 U	1 U
Bromomethane	9.8	1 UJ	5 UJ	5.4 U	1.1 U	1 UJ
Carbon disulfide	700	1 U	5 U	2 U	0.4 U	1 U
Carbon tetrachloride	3	1 U	5 U	2.9 U	0.58 U	1 U
Chlorobenzene	100	1 U	5 U	2 U	0.4 U	1 U
Chloroethane	12	1 U	5 U	4.6 U	0.92 U	1 U
Chloroform	70	1 U	5 U	2.1 U	0.42 U	1 U
Chloromethane	2.7	1 U	5 U	3.8 U	0.76 U	1 U
cis-1,2-Dichloroethene	70	1 U	170	139	167	1 U
cis-1,3-Dichloropropene	NA	1 U	5 U	2.4 U	0.48 U	1 U
Dibromochloromethane	0.4	0.5 U	2.5 U			0.5 U
Dichlorodifluoromethane	1400	1 U	5 U			1 U
Ethylbenzene	30	1 U	5 U	2 U	0.4 U	1 U
Isopropylbenzene (Cumene)	0.8	0.8 U	4 U			0.8 U
Methyl acetate	3000	1 U	5 U			1 U
Methyl ethyl ketone (2-butanone)	4200	10 UJ	50 UJ	20 U	4 U	10 UJ

TABLE 1

**SELECT GROUNDWATER ANALYTICAL RESULTS
OPERABLE UNIT 4**

**NAVAL TRAINING CENTER
ORLANDO, FLORIDA**

PAGE 2 of 2

Well Sampling Parameters	FDEP GCTL ¹	OLD1368D	OLD1369D			OLD1370D
		105-110 ft bgs	100-105 ft bgs	100-105 ft bgs	110-115 ft bgs	101-106 ft bgs
		1/24/2008	1/24/2008	04/16/2008	04/16/2008	1/24/2008
Volatile Organics (µg/L)						
1,1,1-Trichloroethane	200	1 U	5 U	2.9 U	0.58 U	1 U
1,1,2,2-Tetrachloroethane	0.2	0.5 U	2.5 U	3.7 U	0.74 U	0.5 U
Methyl isobutyl ketone (4-methyl-2-pentanone)	560	5 U	25 U	22 U	4.4 U	5 U
Methyl-tert-Butyl Ether	20	1 U	5 U	2.5 U	0.5 U	1 U
Methylene chloride	5	1 U	5 U	10 UJ	2 UJ	1 U
Styrene	100	1 U	5 U	2 U	0.4 U	1 U
Tetrachloroethene (PCE)	3	1 U	1500	1980	0.5 U	4.8
Toluene	40	1 U	5 U	2.7 U	0.54 U	1 U
trans-1,2-Dichloroethene	100	1 U	5 U	2 U	0.4 U	1 U
trans-1,3-Dichloropropene	NA	1 U	5 U	2.1 U	0.42 U	1 U
Trichloroethene (TCE)	3	1 U	320	260	0.76 U	0.23 J
Trichlorofluoromethane	2100	1 U	5 U			1 U
Vinyl chloride	1	1 U	5 U	3.4 U	0.68 U	1 U
Xylenes, total	20	1 U	5 U	5.6 U	1.1 U	1 U

¹ Florida Department of Environmental Protection (FDEP) Groundwater Cleanup Target Levels (GCTLs) reported in µg/L Chapter 62-777, Florida Administrative Code

Bold indicates concentration equal to or greater than GCTL

Empty cell indicates analyte not analyzed.

ft bgs - feet below ground surface

J - estimated value

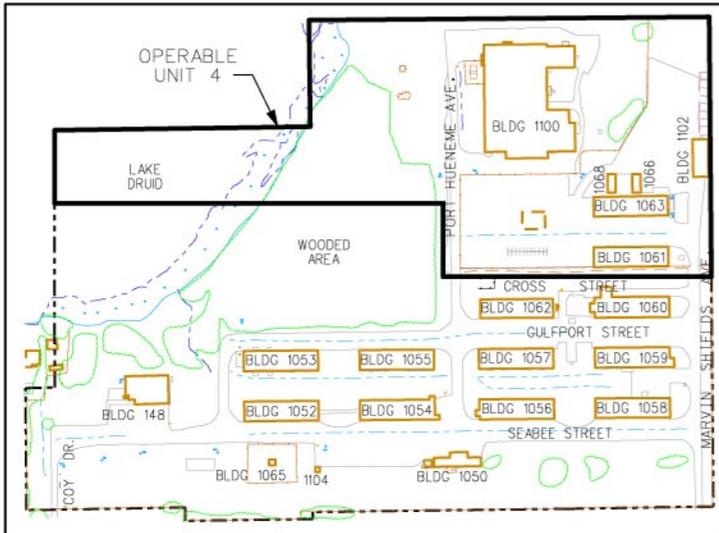
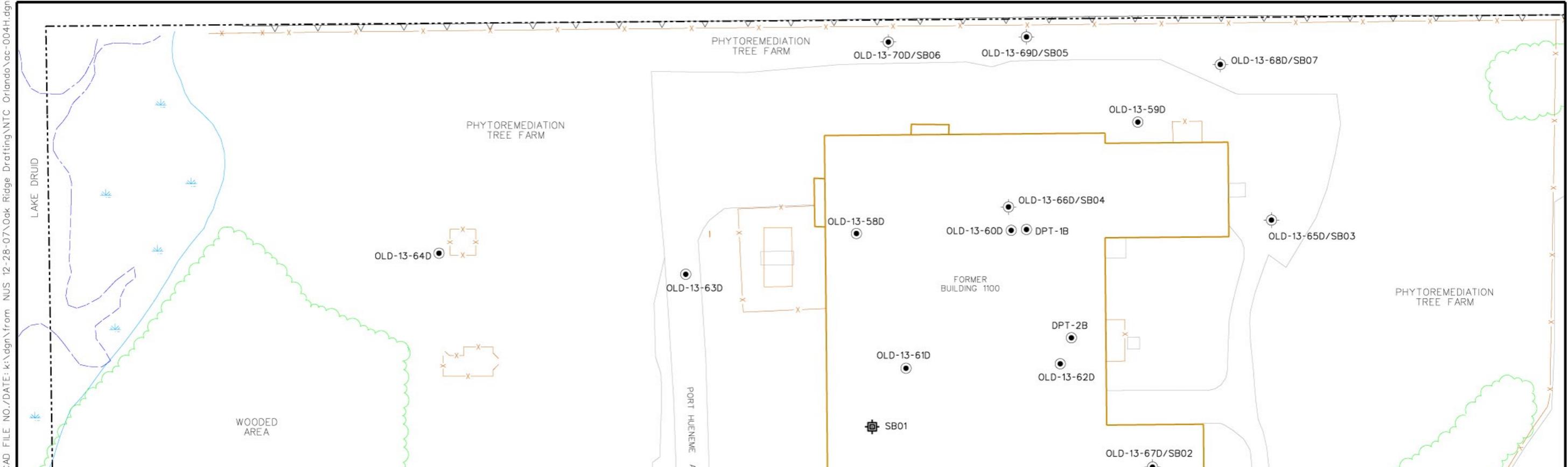
U - not detected at the detection limit shown

TABLE 2
SAMPLING PLAN
OPERABLE UNIT 4
NAVAL TRAINING CENTER
ORLANDO, FLORIDA

Well ID	Channel	Well Diameter (in.)	Total Depth (ft bgs)	Stickup (ft ags)	TOC Elevation (ft amsl)	Top of Screen (ft bgs)	Bottom of Screen (ft bgs)	Analysis	Turnaround Time
OLD-13-58D	--	2	111	2.5	112.67	101	111	Water level only	
OLD-13-59D	--	2	110	-0.2	110.33	100	110		
OLD-13-60D	--	2	110	2.6	113.67	100	110		
OLD-13-61D	--	2	109	2.6	113.47	99	109		
OLD-13-62D	--	2	120	2.6	113.63	110	120		
OLD-13-63D	--	2	106	-0.4	107.49	96	106		
OLD-13-64D	--	2	110	-0.3	103.75	100	110		
OLD-13-65D	1	1.9	130	-0.1	111.11	64	69	Water level only	
	2					75	80		
	3					87	92		
	4					102	107		
	5					113	118		
	6					125	130		
OLD-13-66D	1	1.9	132	3.1	114.18	60	65	Water level only	
	2					74	79		
	3					89	94		
	4					104	109		
	5					115	120		
	6					127	132		
OLD-13-67D	1	1.9	142	3.4	114.45	55	60	Water level only	
	2					68	73		
	3					84	89		
	4					110	115		
	5					120	125		
	6					137	142		
OLD-13-68D	1	1.9	128	3.4	113.49	51	55	VOCs	Standard (30-day)
	2					63	68	VOCs	Standard (30-day)
	3					73	78	VOCs	Standard (30-day)
	4					90	95	VOCs	Standard (30-day)
	5					105	110	VOCs	Standard (30-day)
	6					118	128	VOCs	Standard (30-day)
OLD-13-69D	1	1.9	127	3.5	111.62	60	65	VOCs	Standard (30-day)
	2					70	75	VOCs	Standard (30-day)
	3					85	90	VOCs	Standard (30-day)
	4					100	105	VOCs	Standard (30-day)
	5					110	115	VOCs	Standard (30-day)
	6					122	127	VOCs	Standard (30-day)
OLD-13-70D	1	1.9	128	3.3	111.85	64	69	VOCs	Standard (30-day)
	2					80	85	VOCs	Standard (30-day)
	3					90	95	VOCs	Standard (30-day)
	4					101	106	VOCs	Standard (30-day)
	5					112	117	VOCs	Standard (30-day)
	6					123	128	VOCs	Standard (30-day)
OLD-13-81D		1	To be determined					VOCs	Standard (30-day)
OLD-13-82D		1	To be determined					VOCs	Standard (30-day)

ags - above ground surface
amsl - above mean sea level
bgs - below ground surface
BTOC - below top of casing
ft - feet
in - inches
TOC - top of casing

FIGURES



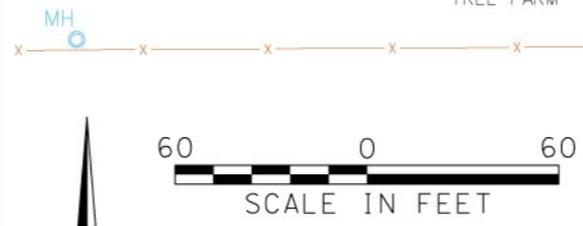
AREA C

SOURCE:
ROADS, BUILDINGS, ETC. ARE FROM A PHOTOGRAMMETRIC SURVEY BY DEMAPS, INC. AND REPS, INC. IN 1997.

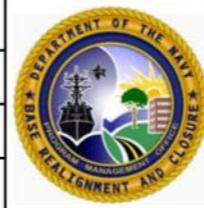
LEGEND

- MONITORING WELL
- CMT MONITORING WELL/SOIL BORING
- SOIL BORING
- FENCE
- WOODS BOUNDARY
- PROPERTY BOUNDARY
- DRAINAGE/EDGE OF WATER
- MARSH AREA

NOTE
MONITORING WELL LOCATIONS FOR WELLS OLD-13-66D AND OLD-13-68D THROUGH OLD-13-70D SURVEYED ON AUGUST 15, 2006. MONITORING WELL LOCATION FOR OLD-13-65D SURVEYED ON SEPTEMBER 18, 2006. LOCATIONS OF SB01 AND OLD-13-67D BASED ON GPS DATA.



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JFF	04-05-06
CHECKED BY	DATE
MJC	04-06-06
REVISED BY	DATE
ILG	07-30-08
SCALE	
AS NOTED	



**SITE MAP
OPERABLE UNIT 4 - AREA C
NAVAL TRAINING CENTER
ORLANDO, FLORIDA**

CONTRACT NO. N62467-04-D-0055	
OWNER NO. -----	
APPROVED BY ---	DATE -----
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FIGURE 2
Proposed Monitoring Well Location
Operable Unit 4

Naval Training Center
Orlando, Florida



ATTACHMENT 1

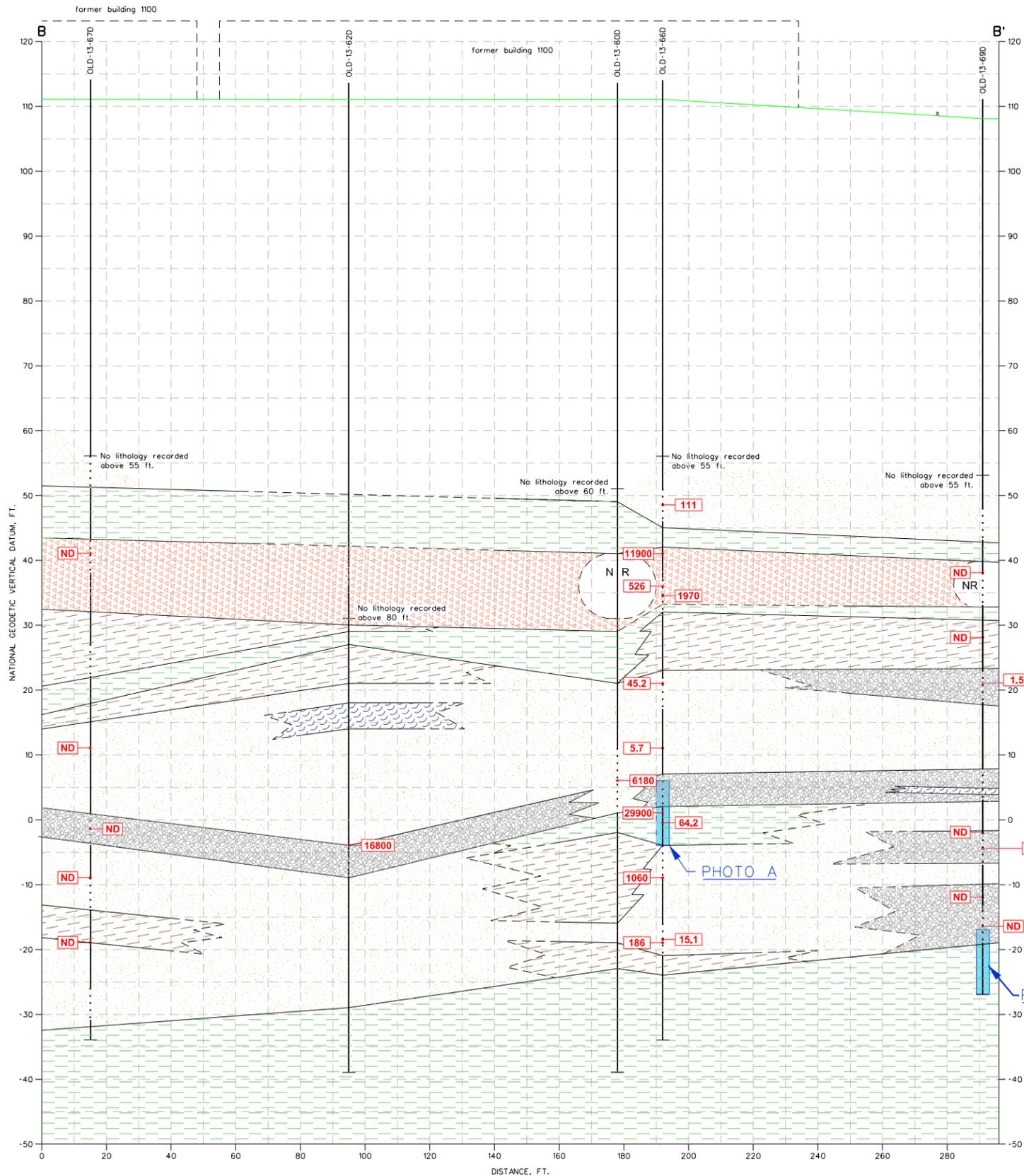
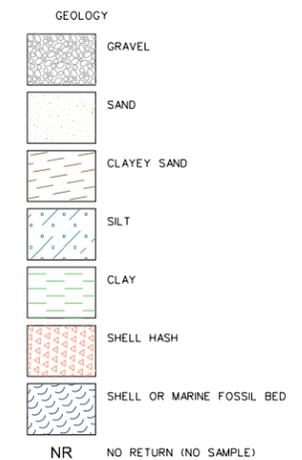
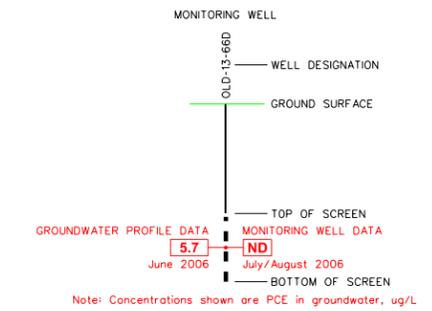
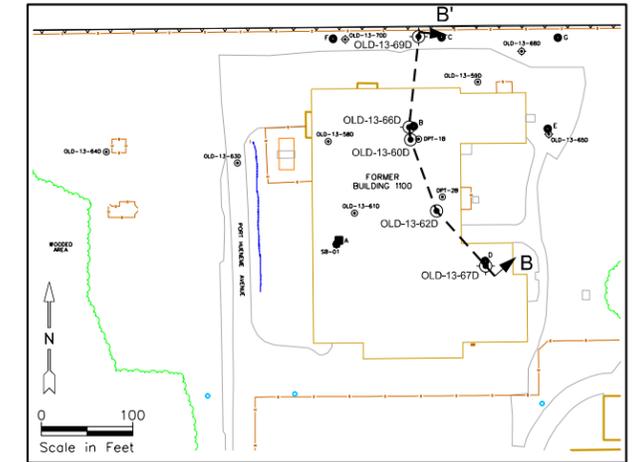


PHOTO A
 OLD-13-66D 105'bgs TO 115'bgs
 (6.05' TO -3.95' MEAN SEA LEVEL)



PHOTO B
 OLD-13-69D 125'bgs TO 135'bgs
 (-16.9' TO -26.9' MEAN SEA LEVEL)



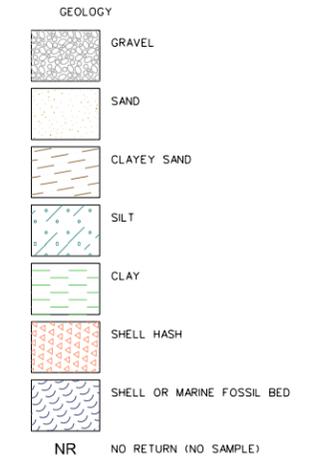
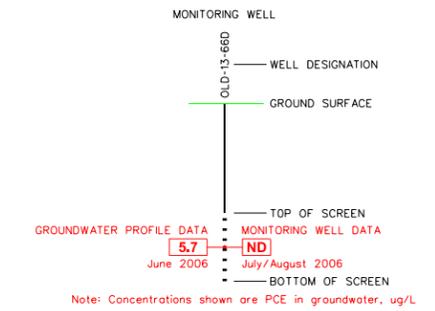
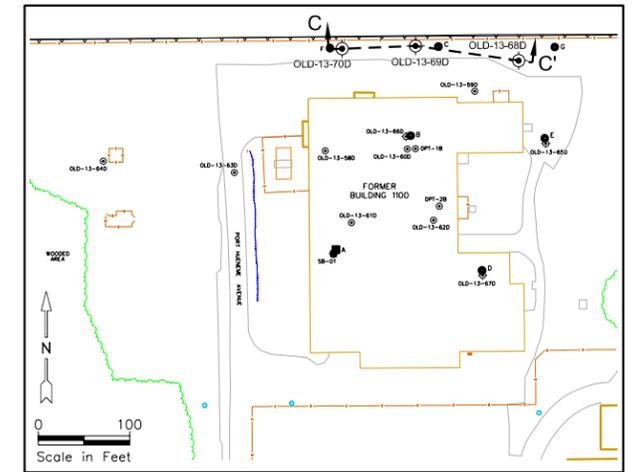
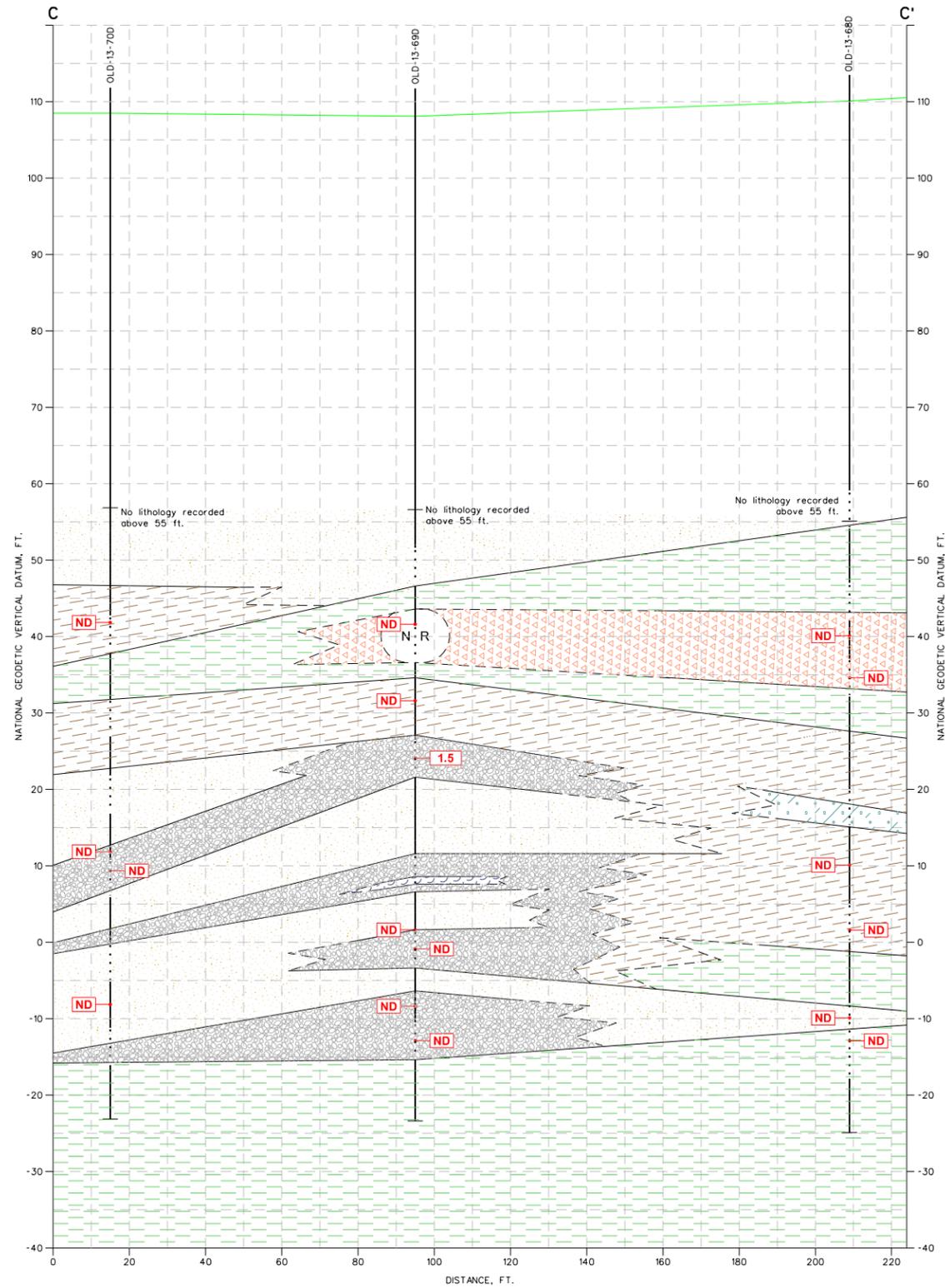
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REVISED BY ILG	DATE 4-23-08
SCALE AS NOTED	



**INTERPRETIVE HYDROGEOLOGIC
 CROSS SECTION B-B'
 OPERABLE UNIT 4 - AREA C**

**NAVAL TRAINING CENTER
 ORLANDO, FLORIDA**

CONTRACT NO. N62467-04-D-0055	
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REVISED BY ILG	DATE 7-23-08
SCALE AS NOTED	



**INTERPRETIVE HYDROGEOLOGIC
CROSS SECTION C-C'
OPERABLE UNIT 4 - AREA C**

**NAVAL TRAINING CENTER
ORLANDO, FLORIDA**

CONTRACT NO. N62467-04-D-0055	
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