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NAS CECIL FIELD, FL
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NORTH FUEL FARM AREA DEEP PLUME FINAL TECHNICAL MEMORANDUM NAS CECIL FIELD FL

1/12/1995

ABB ENVIRONMENTAL SERVICES INC

ABB

MEMORANDUM

TO: Bryan Kizer

FROM: John Kaiser, Task Order Manager
Jim Williams, P.G.
Jeff Tarr

DATE: January 12, 1995

SUBJECT: North Fuel Farm, Cecil Field
Deep Plume Technical Memorandum

INTRODUCTION ABB Environmental Services Inc. (ABB-ES) was contracted by the Naval Facilities Engineering Command, Southern Division (SOUTHNAVFACENGCOM) to conduct a preliminary contamination assessment (PCA) at the North Fuel Farm (NFF), United States Naval Air Station, Cecil Field, Jacksonville, Florida. The investigation was conducted between October 4 and November 10, 1994. This, report in the form of a Technical Memorandum, describes the findings of the PCA and presents the conclusions and recommendations for the site. It incorporates comments from FDEP and Southern Division which were received during a conference call discussing the draft report on December 19, 1994.

OBJECTIVE AND SCOPE The objective of the PCA was to collect soil and groundwater samples to evaluate the vertical and horizontal extent of petroleum related groundwater contamination associated with fuel leaks from tanks 76A and 76C at the NFF site. Samples of soil were collected using split-spoons every 5 or 10 feet to approximately 100 feet below land surface (bls). A Hydropunch™ sampler was used to collect groundwater samples at nine locations every 20 feet from land surface to approximately 100 feet bls. Groundwater and soil samples were screened on-site using an HNU™ Model 311 portable gas chromatograph (GC). Groundwater samples that were collected from the Hydropunch™ sampler were sent to a Florida Department of Environmental Protection (FDEP) approved laboratory for analysis using USEPA Method 602 for benzene, ethylbenzene, toluene, and total xylenes (BTEX).

SITE DESCRIPTION AND HISTORY The NFF is located at the northeast corner of "A" Avenue and Loop Road at Naval Air Station (NAS) Cecil Field (Figure 1, Attachment A). The fuel farm consists of six 595,000-gallon, interior-lined, asphalt-coated, steel, earth-mounded tanks which contain JP-5 jet fuel. The tanks are numbered Tank 76 and 76A through Tank 76E. Tanks 76 and 76A were installed in 1952; the remaining tanks were installed in 1954. The associated piping is corrosion-resistant-coated steel and is cathodically protected. In 1987 each tank was relined, and overfill protection (high level alarms) was installed. Each tank has impressed-current-type corrosion protection. Additionally, Tank 76 is equipped with an automatic shut-off system. All tanks are gauged daily. During the time the NFF site has been in operation, numerous releases of jet fuel (JP-5) have been reported. The most recent major release occurred on February 9 and 10, 1991, when an estimated 900,000 gallons of JP-5 was released from Tank 76E and entered Sal Taylor Creek (STC), located adjacent to tank 76E. JP-5 was subsequently observed at seven locations along STC where the released fuel pooled at dams and containment areas (ponds).

ABB Environmental Services Inc.

2590 Executive Center Circle East
Berkeley Building
Tallahassee, Florida 32301

Telephone (904) 656-1293
Fax (904) 877-0742

ABB-ES was contracted by SOUTHNAVFACENGCOM in 1991 to conduct a contamination assessment (CA) to characterize and assess the vertical and horizontal extent of contamination at the NFF and submit a contamination assessment report (CAR) to the FDEP. Thirty-seven soil borings, 26 shallow monitoring wells, and 4 deep monitoring wells were installed at the site. Soil and groundwater samples were collected and analyzed for petroleum constituents of the kerosene analytical group as defined in Chapter 17-770, Florida Administrative Code (FAC). ABB-ES submitted a CAR for the NFF to the FDEP in June, 1992.

The Truck Stand, Facility 372, is located southeast of the NFF. ABB-ES performed a CA at the site during June through September 1991 to identify petroleum contaminants at the site and assess the degree and extent of petroleum contamination in soils and in the surficial aquifer beneath the site. Soil and groundwater contamination at the Truck Stand site is associated with fuel releases which typically occur during tanker truck refueling operations. A CAR was submitted for the Truck Stand in May, 1992.

ABB-ES field personnel returned to the NFF again in January 1994 and installed three additional shallow monitoring wells (CEF-076-31, CEF-076-32, and CEF-076-34) and one two-stage deep monitoring well (CEF-076-33D). The additional monitoring wells were installed at the request of the FDEP.

The FDEP requested additional soil and groundwater data be obtained at both the NFF and Truck Stand sites and reported as addenda to the NFF and Truck Stand CARs. The FDEP also requested that the 900,000 gallon JP-5 spill area be assessed and the CARs for the JP-5 spill area and the affected sites along STC be submitted together with the CAR addenda (CARA) for the NFF and Truck Stand sites (hereafter referred to as the North Fuel Farm Area [NFFA] sites). The CAR and CARA for the NFFA sites were submitted to the FDEP in July, 1994.

Supplemental field investigations performed at the NFF site in February and March 1994 indicated that petroleum contamination in groundwater in the existing vertical extent monitoring well (CEF-076-28D) exceeded the FDEP target cleanup level for benzene. (As a convenience, monitoring well prefix "CEF-076" will be replaced with "MW" in the text, tables, and figures in this Technical Memorandum.) The concentration of benzene in monitoring well MW-28D was 750 parts per billion (ppb) in February, 1994. The well was resampled on May 5, 1994, because it was determined that contamination from above the screened interval (80 feet to 90 feet bls) was drawn into the well during purging. Well MW-28D was purged at a lower flow rate to reduce the possibility of contamination being drawn into the screen from above. The concentration of benzene following the May, 1994 sampling event was 43 ppb. Intermediate and deep groundwater monitoring wells (MW-39D, MW-40D, and MW-41D) were installed in May 1994, near and downgradient to well MW-28D to obtain additional data on the extent of groundwater contamination. Petroleum contamination was detected in all four monitoring wells. The extensive contamination appeared to be migrating at depths ranging from approximately 35 feet to 100 feet below land surface (bls). Analytical results from groundwater samples from shallow monitoring wells (15 feet bls) in this area (MW-6, MW-21, and MW-29) were below detection limits.

Monitoring wells MW-39D and MW-40D were advanced to 65 feet bls and 55 feet bls, respectively. Deep well MW-41D was advanced to 118.5 feet bls. Six-inch polyvinyl chloride (PVC) surface casing was set in intermediate monitoring wells MW-39D, MW-40D, and deep well MW-41D at depths of 30 feet and 105 feet respectively. The wells were installed with 10 feet of 0.010 slot PVC well screen.

Following installation of MW-39D, MW-40D, and MW-41D, groundwater samples were collected from all accessible monitoring wells associated with the NFF site. A total of 33 groundwater samples were collected in February and May 1994 and analyzed using U.S Environmental Protection Agency (USEPA) methods for kerosene analytical compounds as defined in Chapter 17-770, FAC. Monitoring well MW-39D contained 7,400 ppb benzene and 12,900 ppb total BTEX. Monitoring well MW-40D contained 6,800 ppb benzene and 12,600 total BTEX. MW-41D contained 2.3 ppb benzene and 3.4 ppb total BTEX.

Storage tank maintenance and repair records that were made available to ABB-ES during the supplemental investigation indicated that several holes were discovered in NFF tanks 76, 76A, and 76C. The tanks were repaired approximately 1 to 2 years after the tanks had been put into service. Based on storage tank records and laboratory analytical results from monitoring wells MW-28D, MW-39D, MW-40D, and MW-41D, ABB-ES believes considerable quantities of fuel had leaked from the NFF storage tanks approximately 35 to 40 years ago. Hydraulic conductivity measurements obtained from aquifer slug test data indicate the fuel apparently migrated 500 to 800 feet downgradient from the NFF. After discussing the circumstances at the NFF site with the FDEP, it was agreed that the addendum to the previously submitted CAR and Remedial Action Plan (RAP) for the NFF site should be submitted separately from the other NFFA sites.

SITE SPECIFIC HYDROGEOLOGY The Holocene to Pliocene undifferentiated deposits that contain the surficial aquifer are of variable thickness at NAS Cecil Field. At the NFF, these deposits are approximately 90 feet thick. The sediments generally constitute a coarsening-downward sequence. From land surface to approximately 50 feet bls, the sediments are typically fine- to very fined-grained, brown to tan, quartz sand and silt. From 50 to approximately 90 feet bls the sediments become silty to clayey, gray to green, quartz sands with intermittent, olive green clay stringers, beginning at approximately 55 feet bls. At approximately 90 feet bls the deposits are characteristically gray to green dolomitic clayey sands with phosphates and shell fragments. It is likely these latter deposits constitute the base of the Pliocene Age deposits or the uppermost parts of the Miocene Age Coosawhatchie Formation (Hawthorn Group).

Measured depth to water varied across the site from 1 to 4 feet bls in the shallow wells and from 4 to 8 feet bls in the deep wells. It is likely that the coarsening-downward sequence and the deeper clay stringers act as a semi-confining unit, separating the surficial aquifer into upper and lower parts, thus the difference of water level depths between the shallow and the deep wells. The water table surface approximately parallels topography; thus, groundwater flow direction in the shallow wells is radial around the tank farm. The groundwater flow direction in the lower part of the surficial aquifer was not estimated because deep wells, screened at various intervals, were installed. Additional deep monitoring wells, screened at the same depth intervals are needed to accurately determine groundwater flow direction in the deeper aquifer.

SUMMARY OF FIELD INVESTIGATION

Soil and Groundwater Screening Both soil and groundwater samples were collected at the NFF in October and November 1994 to address the presence of high benzene and volatile organic aromatic (VOA) contamination in groundwater samples obtained from intermediate and deep monitoring wells at the NFF. Samples were collected using a Hydropunch™ in conjunction with conventional hollow-

stem auger (HSA) and/or mud rotary drilling techniques (see the NFF CAP Field Investigation section for a description of the Hydropunch™ methodology). Hydropunch™ locations were initiated at a location near the west bank of STC. The strategy for delineating the vertical and horizontal extent of contaminated groundwater was to start at Hydropunch™ location HP-1 (Attachment A) near the west bank of STC, approximately 350 feet east of tanks 76A and 76C. Subsequent locations were spaced at 150- to 200-foot intervals in a radial pattern from areas where contamination was detected. Groundwater analytical data was submitted to Quanterra Laboratories in Tampa, Florida for rapid analysis. A 24-hour turnaround time allowed ABB-ES field personnel to make decisions on where to advance the next Hydropunch™ location. Hydropunch™ sample locations HP-1, HP-2, HP-3, HP-4, and HP-5 were advanced on the west side of STC.

During the CA at the JP-5 spill site, benzene was detected in monitoring well MW-17D. The concentration of benzene in the groundwater sample from MW-17D was 47 ppb in May, 1994. It is possible that the contaminant plume from Tanks 76A and 76C may have migrated as far as the JP-5 spill site. Therefore, Hydropunch™ location HP-4 was placed adjacent to MW-17D at the JP-5 spill site (Attachment A). If significant groundwater contamination was found at initial Hydropunch™ locations HP-1, HP-2, HP-3, HP-4, and HP-5, then additional Hydropunch™ locations were advanced further away radially from the source area on the east side of STC and south of the NFF. A total of 9 Hydropunch™ sampling locations were advanced and groundwater samples were collected at 20-, 40-, 60-, 80-, and 100-foot intervals.

The preliminary soil investigation included advancing 9 soil borings, using HSA and/or mud rotary drilling techniques in conjunction with split-spoon samplers every 5 feet. During drilling operations at Hydropunch™ location HP-1, flowing sands were encountered, causing ABB-ES field personnel to switch to mud rotary drilling. The change from conventional HSA to mud rotary drilling increased field production, groundwater sampling, collection of data, and saved considerable time. Soil samples were screened by headspace analysis using an Organic Vapor Analyzer (OVA) equipped with a flame ionization detector (FID). Although soil samples from the deeper sample intervals were saturated, these samples were screened with an OVA as an indication of potential groundwater contamination. The OVA soil headspace screening results are provided in Attachment B.

In addition, soil samples were screened in the field using a HNU™ Model 311 portable gas chromatograph (GC) equipped with a photoionization detector (PID). Soil samples were initially collected from each Hydropunch™ location using split-spoon samplers every 5 feet. Due to project time constraints, soil sampling intervals were extended to every 10 feet. The GC was calibrated to analytical standards containing BTEX (benzene, toluene, ethylbenzene, p-xylene, m-xylene, and o-xylene (reported as total xylenes)). The GC results indicate soil contamination exists at the following Hydropunch™ locations: HP-1, HP-2, HP-3, HP-4, HP-5, and HP-15. The GC screening results are provided in Attachment C.

Groundwater Sampling and Analysis. Groundwater samples were collected at 20-foot intervals from nine Hydropunch™ locations (HP-1 through HP-6, HP-9, HP-14, and HP-15) and sent to Quanterra, Inc. in Tampa, Florida. Samples were analyzed using a 24-hour rapid turnaround time for selected volatile organics (i.e. BTEX) in accordance with USEPA Method 602. Laboratory analytical results revealed total BTEX concentrations in excess of 50 ppb in HP-1 (47 feet bls, 60 feet bls, and 80 feet bls), HP-2 (60 feet bls), HP-3 (63.5 feet bls), HP-4, (60 feet bls), HP-5 (60 feet bls), and HP-9 (80 feet bls).

Table 1
Summary of Hydropunch Groundwater Analytical Results
October-November, 1994
Technical Memorandum
North Fuel Farm Deep Plume
NAS Cecil Field, Jacksonville, Florida

Hydropunch Boring Location and Sampling Depth	Contaminant					
	Benzene	Toluene	Ethylbenzene	Total Xylenes	Total BTEX	Detection Limit
HP-1, 20′	NA	NA	NA	NA	NA	NA
HP-1, 47′	1400	ND	200	830	2,430	20
HP-1, 60′	2200	ND	ND	140	2,340	100
HP-1, 80′	72	ND	3.8	46	121.8	2.0
HP-1, 100′	6.8	ND	ND	5.7	12.5	1.0
HP-2, 20′	ND	ND	ND	ND	ND	1.0
HP-2, 40′	ND	ND	ND	ND	ND	1.0
HP-2, 60′	110	ND	1	ND	111	1.0
HP-2, 80′	25	ND	ND	ND	25	1.0
HP-2, 100′	4.6	ND	ND	ND	4.6	1.0
HP-3, 23.5′	ND	ND	ND	ND	ND	1.0
HP-3, 40′	NA	NA	NA	NA	NA	NA
HP-3, 63.5′	11	ND	ND	230	241	5.0
HP-3, 84.5′	3.0	ND	ND	7.5	10.5	2.0
HP-3, 99.5′	ND	ND	ND	ND	ND	1.0
HP-4, 20′	ND	6.9	3.1	17	27	1.0

Hydropunch Boring Location and Sampling Depth	Contaminant					
	Benzene	Toluene	Ethylbenzene	Total Xylenes	Total BTEX	Detection Limit
HP-4, 40'	ND	1.4	ND	3.6	5	1.0
HP-4, 60'	ND	16	7.6	41	64.6	1.0
HP-4, 80'	ND	ND	2.0	7.7	9.7	1.0
HP-4, 100'	ND	2.0	ND	3.7	5.7	1.0
HP-5, 20'	ND	ND	ND	ND	ND	1.0
HP-5, 40'	ND	ND	ND	ND	ND	1.0
HP-5, 60'	28	ND	93	740	861	10
HP-5, 80'	ND	ND	1.2	10	11.2	1.0
HP-5, 100'	24	ND	ND	1.1	25.1	1.0
HP-6, 20'	ND	ND	ND	ND	ND	1.0
HP-6, 40'	ND	ND	ND	ND	ND	1.0
HP-6, 60'	ND	ND	ND	ND	ND	1.0
HP-6, 80'	ND	ND	ND	ND	ND	1.0
HP-6, 100'	1.9	ND	ND	8.1	10	1.0
HP-9, 20'	ND	ND	ND	ND	ND	1.0
HP-9, 40'	ND	ND	ND	ND	ND	1.0
HP-9, 60'	ND	ND	ND	ND	ND	1.0
HP-9, 80'	1700	ND	44	330	2,074	20
HP-9, 100'	ND	ND	ND	ND	ND	1.0

Hydropunch Boring Location and Sampling Depth	Contaminant					
	Benzene	Toluene	Ethylbenzene	Total Xylenes	Total BTEX	Detection Limit
HP-14, 20′	ND	ND	ND	ND	ND	1.0
HP-14, 40′	ND	ND	ND	ND	ND	1.0
HP-14, 59′	ND	ND	ND	ND	ND	1.0
HP-14, 80′	ND	ND	ND	ND	ND	1.0
HP-14, 99′	ND	ND	ND	ND	ND	1.0
HP-15, 20′	ND	ND	ND	ND	ND	1.0
HP-15, 40′	ND	ND	ND	ND	ND	1.0
HP-15, 60′	ND	ND	ND	ND	ND	1.0
HP-15, 80′	ND	ND	ND	ND	ND	1.0
HP-15, 100′	20	ND	1.1	8.0	29.1	1.0

Notes: Concentrations in micrograms per liter (μg/L)
NA - sample not analyzed in laboratory
ND - none detected

Table 2
Summary of Monitoring Well Groundwater Analytical Results, 1994
February, March, and May, 1994
Technical Memorandum
North Fuel Farm Deep Plume
NAS Cecil Field, Jacksonville, Florida

Monitoring Well Location	Total Depth (feet)	Screened Interval (ft. bls)	Contaminant				
			Benzene	Toluene	Ethylbenzene	Total Xylenes	Total BTEX
TRUCK STAND							
CEF-372-06	12.04	2.0-12.04	ND	ND	ND	ND	ND
CEF-372-07	11.58	2.0-11.58	ND	ND	ND	ND	ND
CEF-372-08	11.48	2.0-11.48	ND	ND	ND	ND	ND
CEF-372-13	10.95	1.5-10.95	11	ND	11	46	68
CEF-372-16D	35.88	30.0-35.88	4.3	1.0	9.8	17	32
NORTH FUEL FARM							
CEF-076-04[1]	25.0	5.0-25.0	FP/1.2	FP/ND	FP/ND	FP/9.8	FP/11
CEF-076-05	15.0	5.0-15.0	4.1	17	19	110	150
CEF-076-06	15.0	5.0-15.0	ND	ND	ND	ND	ND
CEF-076-07	15.0	5.0-15.0	ND	ND	ND	ND	ND
CEF-076-19	12.0	2.0-12.0	ND	2.1	1.4	ND	3.5
CEF-076-20	12.0	2.0-12.0	ND	ND	ND	ND	ND
CEF-076-21	12.0	2.0-12.0	ND	1.1	ND	ND	1.1
CEF-076-22	12.0	2.0-12.0	2.0	ND	1.7	ND	3.7
CEF-076-27D	76.0	66.0-76.0	ND	ND	ND	ND	ND
CEF-076-28D*	90.0	80.0-90.0	750	ND	ND	130	880

Table 2
Summary of Monitoring Well Groundwater Analytical Results, 1994
February, March, and May, 1994
Technical Memorandum
North Fuel Farm Deep Plume
NAS Cecil Field, Jacksonville, Florida

Monitoring Well Location	Total Depth (feet)	Screened Interval (ft. bls)	Contaminant				
			Benzene	Toluene	Ethylbenzene	Total Xylenes	Total BTEX
CEF-076-28D*	90.0	80.0-90.0	43	ND	ND	ND	43
CEF-076-29	12.76	2.76-12.76	ND	ND	ND	6.6	6.6
CEF-076-30	12.20	2.20-12.20	ND	ND	ND	ND	ND
CEF-076-33D	35.0	30.0-35.0	ND	ND	ND	ND	ND
CEF-076-34	5.5	0.5-5.5	ND	ND	ND	6.0	6.0
CEF-076-39D	65.0	55.0-65.0	7,400	ND	1,000	4,500	12,900
CEF-076-40D	55.0	45.0-55.0	6,800	100	1,100	4,600	12,600
CEF-076-41D	119.0	109.0-119.0	2.3	ND	ND	1.1	3.4
JP-5 SPILL AREA							
CEF-JP5-01	10.0	5.0-10.0	ND	ND	ND	1.3	1.3
CEF-JP5-02	7.0	2.0-7.0	ND	ND	ND	ND	ND
CEF-JP5-03	6.5	1.5-6.5	ND	ND	ND	ND	ND
CEF-JP5-04	6.0	1.0-6.0	ND	ND	ND	ND	ND
CEF-JP5-05	5.5	0.5-5.5	ND	6.0	ND	ND	6.0
CEF-JP5-06	6.5	1.5-6.5	ND	6.9	ND	ND	6.9
CEF-JP5-07	7.5	2.5-7.5	ND	ND	ND	ND	ND
CEF-JP5-08	7.5	2.5-7.5	ND	ND	ND	ND	ND
CEF-JP5-09	6.5	1.5-6.5	ND	ND	ND	ND	ND

Table 2
Summary of Monitoring Well Groundwater Analytical Results, 1994
February, March, and May, 1994
Technical Memorandum
North Fuel Farm Deep Plume
NAS Cecil Field, Jacksonville, Florida

Monitoring Well Location	Total Depth (feet)	Screened Interval (ft. bls)	Contaminant				
			Benzene	Toluene	Ethylbenzene	Total Xylenes	Total BTEX
CEF-JP5-10	5.5	0.5-5.5	ND	ND	ND	ND	ND
CEF-JP5-11	5.5	0.5-5.5	FP	FP	FP	FP	FP
CEF-JP5-12	11.0	1.0-11.0	1.8	3.2	11	40	56
CEF-JP5-13	11.0	1.0-11.0	ND	ND	ND	ND	ND
CEF-JP5-14	11.0	1.0-11.0	200	3.0	19	58	280
CEF-JP5-15	5.5	0.5-5.5	1.2	54	1.7	55	119
CEF-JP5-16	11.0	1.0-11.0	ND	ND	ND	ND	ND
CEF-JP5-17D	35.0	30.0-35.0	47	ND	2.4	3.3	53

[1] - Monitoring well sampled below the free product-groundwater interface; sampled on February 24, 1994 and March 7, 1994.
* - Monitoring well CEF-076-28D sampled twice.

Notes: Concentrations in micrograms per liter (µg/L), equal to parts per billion (ppb)
ND - none detected
FP - Free petroleum product in well, no sample collected.

Groundwater analytical results from selected monitoring wells, including screened intervals, are provided in Table 2. Groundwater samples were also collected at various Hydropunch™ sampling depths and analyzed using the GC. Selected groundwater samples were filtered through a peristaltic pump, analyzed by Quanterra, and compared with unfiltered hydropunch groundwater samples.

CONCLUSIONS The GC screening data, Hydropunch™ groundwater analytical results from Quanterra Inc. and groundwater analytical data from monitoring wells MW-28D, MW-39D, MW-40D, and MW-41D indicate that the groundwater is contaminated with benzene and total VOAs at various depths to at least 100 feet below land surface (bls). Due to budgetary and time constraints, only nine of the proposed twenty Hydropunch™ sampling locations were advanced at the NFF. Additional groundwater screening data would reduce the number of groundwater monitoring wells needed to delineate the horizontal and vertical extent of the contaminant plume.

The greatest concentrations of VOAs are near the source area (tanks 76A and 76C) in monitoring wells MW-28D, MW-39D, and MW-40D, and approximately 350 feet East of the source area at hydropunch location HP-1. Total VOA concentrations at Hydropunch HP-1 were 2,430 ppb at 47' bls, 2,340 ppb at 60 feet bls, 121 ppb at 80 feet bls, and 12.5 ppb at 100 feet bls. Total VOA concentration maps at 20 feet bls, 40 feet bls, 60 feet bls, 80 feet bls, and 100 feet bls are provided in Attachment A.

A clayey-sand layer is present across the study area. Lithologic soil boring logs indicate that the clayey-sand is at approximately 55 feet bls and extends to approximately 80 feet bls. However, stringers of clay and/or clayey-sand do occur above 55 feet in some hydropunch locations (HP-6). Due to high VOA concentrations at hydropunch location HP-1 and absence of VOAs at hydropunch location HP-6 (located on the east side of STC), it appears that the clayey-sand retards the vertical movement of the contaminant plume at approximately 55 feet bls on the west side of STC. Therefore, the clayey-sand may be acting as a semi-confining layer at approximately 55 feet bls (hence the high VOA concentrations at 60 feet bls) with the contaminant plume migrating beneath the clayey-sand at various depths that contain porous sand zones. Lithologic cross-sections A-A' (northwest-southeast), B-B' (east-west), and a fence diagram with total VOA concentrations at 20 foot intervals are provided in Attachment A. Lithologic soil boring logs from Hydropunch™ locations and monitoring wells MW-28D, MW-39D, MW-40D, and MW41D are provided in Attachment D.

RECOMMENDATIONS The screening data indicates that additional groundwater monitoring wells, screened at various depths are warranted. The soil appears to be excessively contaminated in lithologic zones that have high groundwater contamination. Groundwater monitoring wells MW-39D, MW-40D, and MW-41D are set in clayey-sand, sand, and dolomitic-clayey-sand, respectfully, near the source area. It appears the clayey-sand is retaining most of the contamination west of STC and migrating beneath the clayey-sand through porous sand zones across the site (HP-9 contains sand at 80 feet bls with a total VOA concentration of 2,074 ppb).

Due to a minimal number of Hydropunch™ groundwater analytical data obtained during the PCA, ABB-ES is proposing to advance a minimum of 39 groundwater monitoring wells in the areas shown in Figure 10, Attachment A. Additional groundwater monitoring wells may have to be installed if significant groundwater contamination is detected at perimeter monitoring wells. Groundwater monitoring wells will be installed using mud-rotary drilling techniques with 5 feet of slotted PVC well screen. A portable HNU™ Model 311 portable GC will be used to screen groundwater samples or

groundwater samples will be sent to a laboratory for quick turnaround time. The GC screening and laboratory analysis will allow the onsite Field Operations Leader and Technical Lead judicial decisions on well placement and monitoring well screened intervals. Screened intervals will be selected based on the GC and/or lab analyses. A CAR will be submitted to the FDEP after the horizontal and vertical extent of the contaminant plume is completely delineated.

ATTACHMENT A FIGURES

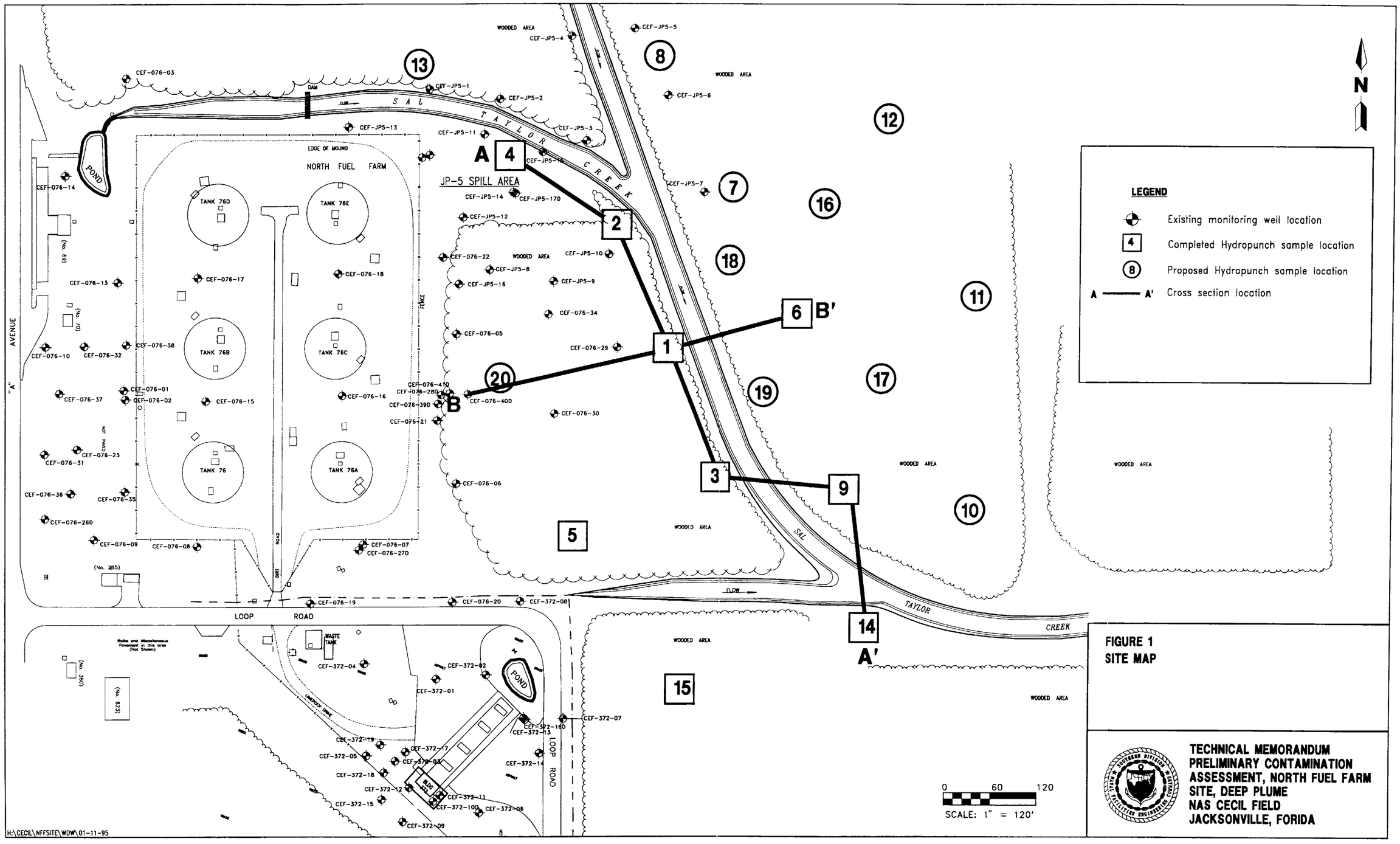

FIGURE 1
SITE MAP

TECHNICAL MEMORANDUM
PRELIMINARY CONTAMINATION ASSESSMENT, NORTH FUEL FARM SITE, DEEP PLUME
NAS CECIL FIELD
JACKSONVILLE, FORIDA

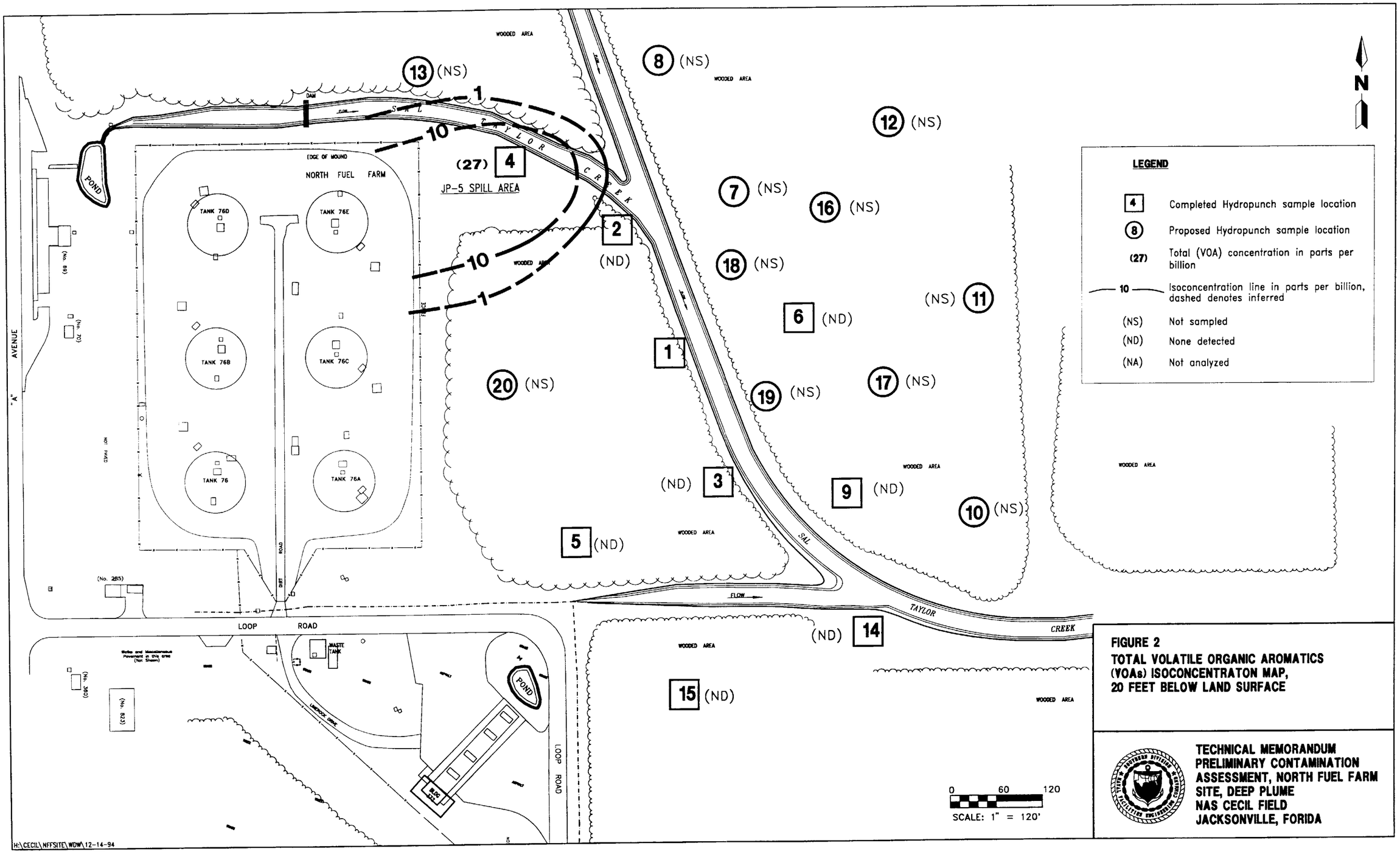

FIGURE 2
TOTAL VOLATILE ORGANIC AROMATICS (VOAs) ISOCONCENTRATON MAP, 20 FEET BELOW LAND SURFACE

TECHNICAL MEMORANDUM
PRELIMINARY CONTAMINATION ASSESSMENT, NORTH FUEL FARM SITE, DEEP PLUME
NAS CECIL FIELD
JACKSONVILLE, FORIDA

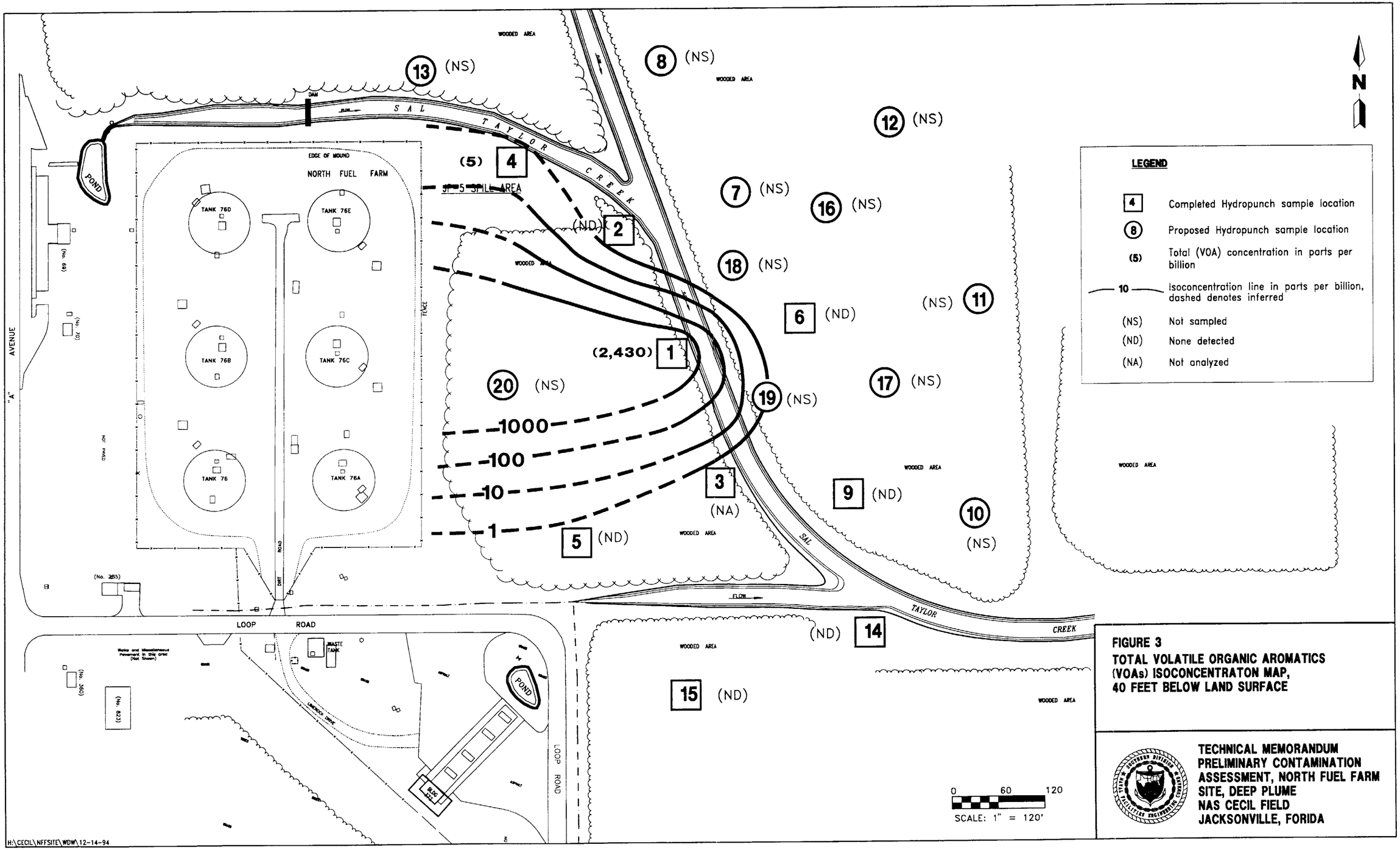

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FIGURE 3
TOTAL VOLATILE ORGANIC AROMATICS (VOAs) ISOCONCENTRATON MAP, 40 FEET BELOW LAND SURFACE

TECHNICAL MEMORANDUM
PRELIMINARY CONTAMINATION ASSESSMENT, NORTH FUEL FARM SITE, DEEP PLUME
NAS CECIL FIELD
JACKSONVILLE, FORIDA

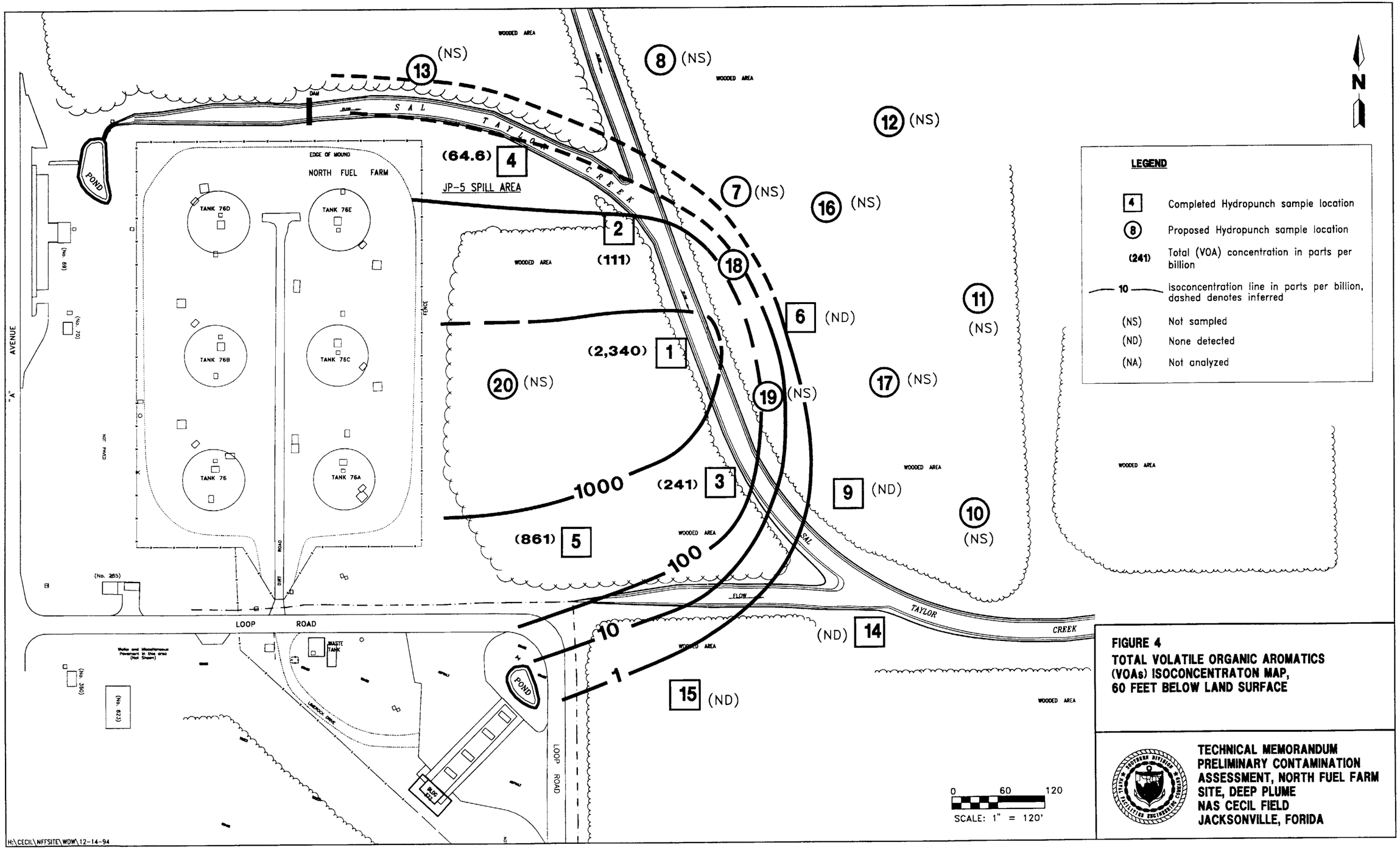

FIGURE 4
TOTAL VOLATILE ORGANIC AROMATICS (VOAs) ISOCONCENTRATON MAP, 60 FEET BELOW LAND SURFACE

TECHNICAL MEMORANDUM
PRELIMINARY CONTAMINATION ASSESSMENT, NORTH FUEL FARM SITE, DEEP PLUME
NAS CECIL FIELD
JACKSONVILLE, FORIDA

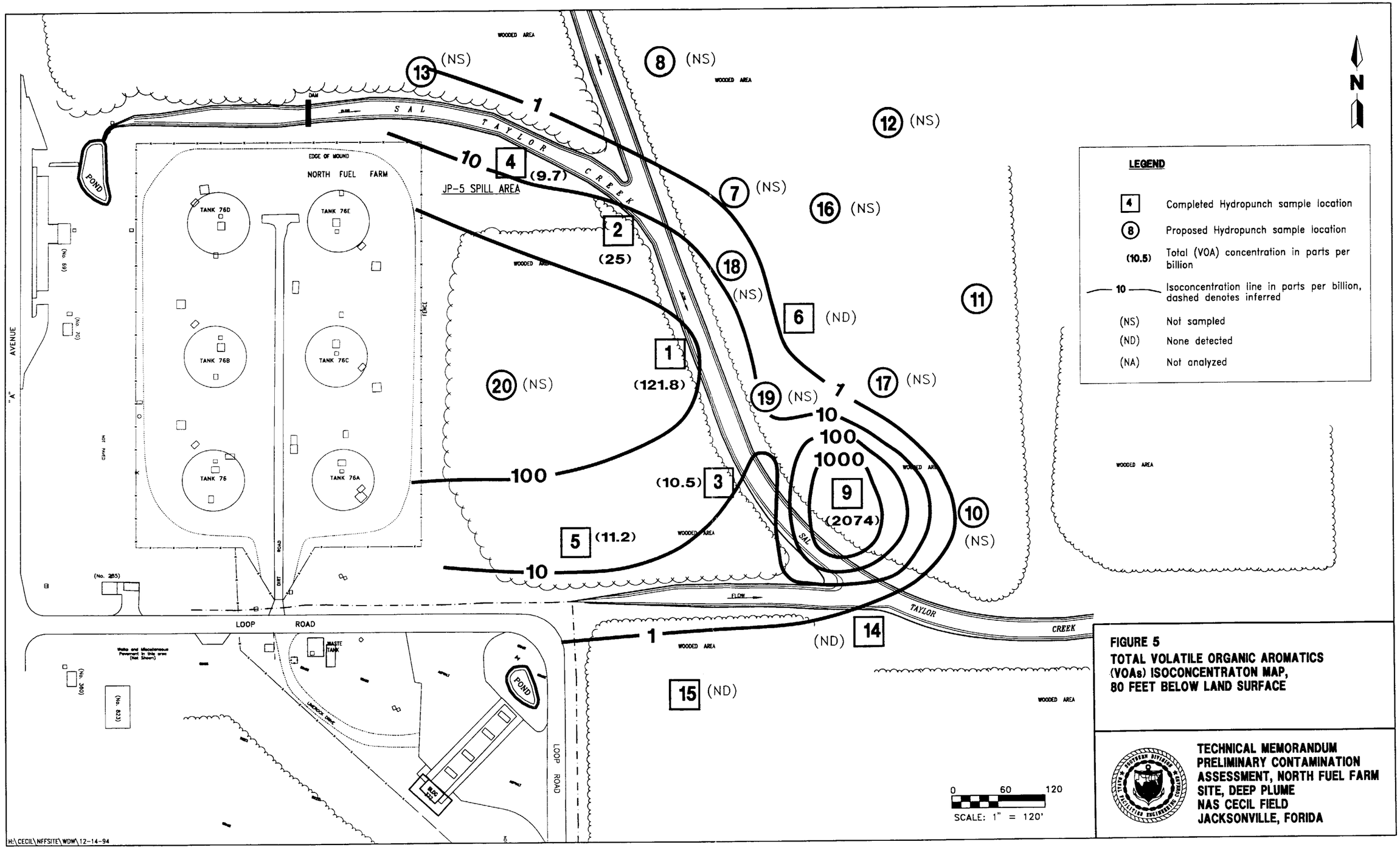

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FIGURE 5
TOTAL VOLATILE ORGANIC AROMATICS (VOAs) ISOCONCENTRATON MAP, 80 FEET BELOW LAND SURFACE

TECHNICAL MEMORANDUM
PRELIMINARY CONTAMINATION ASSESSMENT, NORTH FUEL FARM SITE, DEEP PLUME
NAS CECIL FIELD
JACKSONVILLE, FORIDA

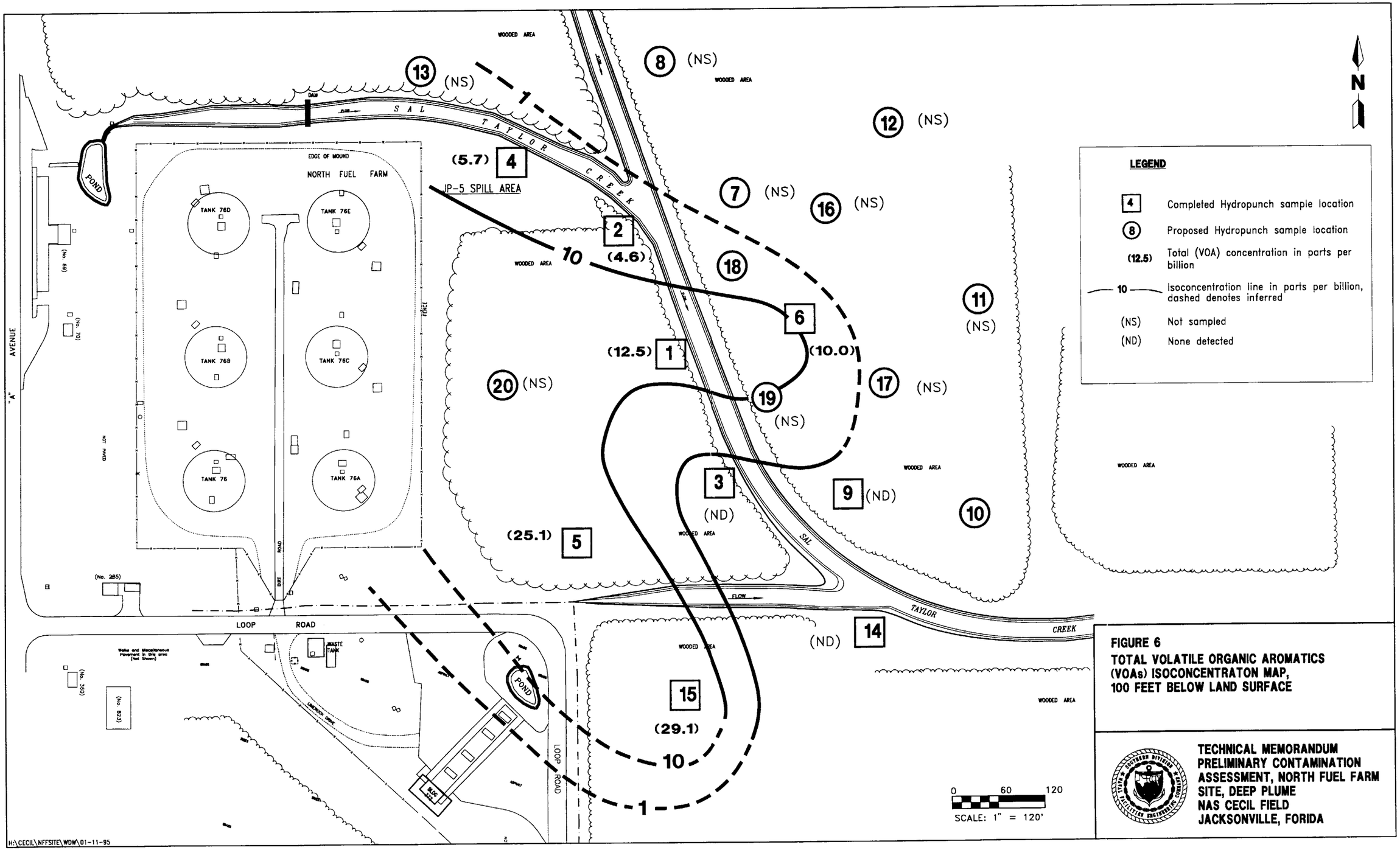
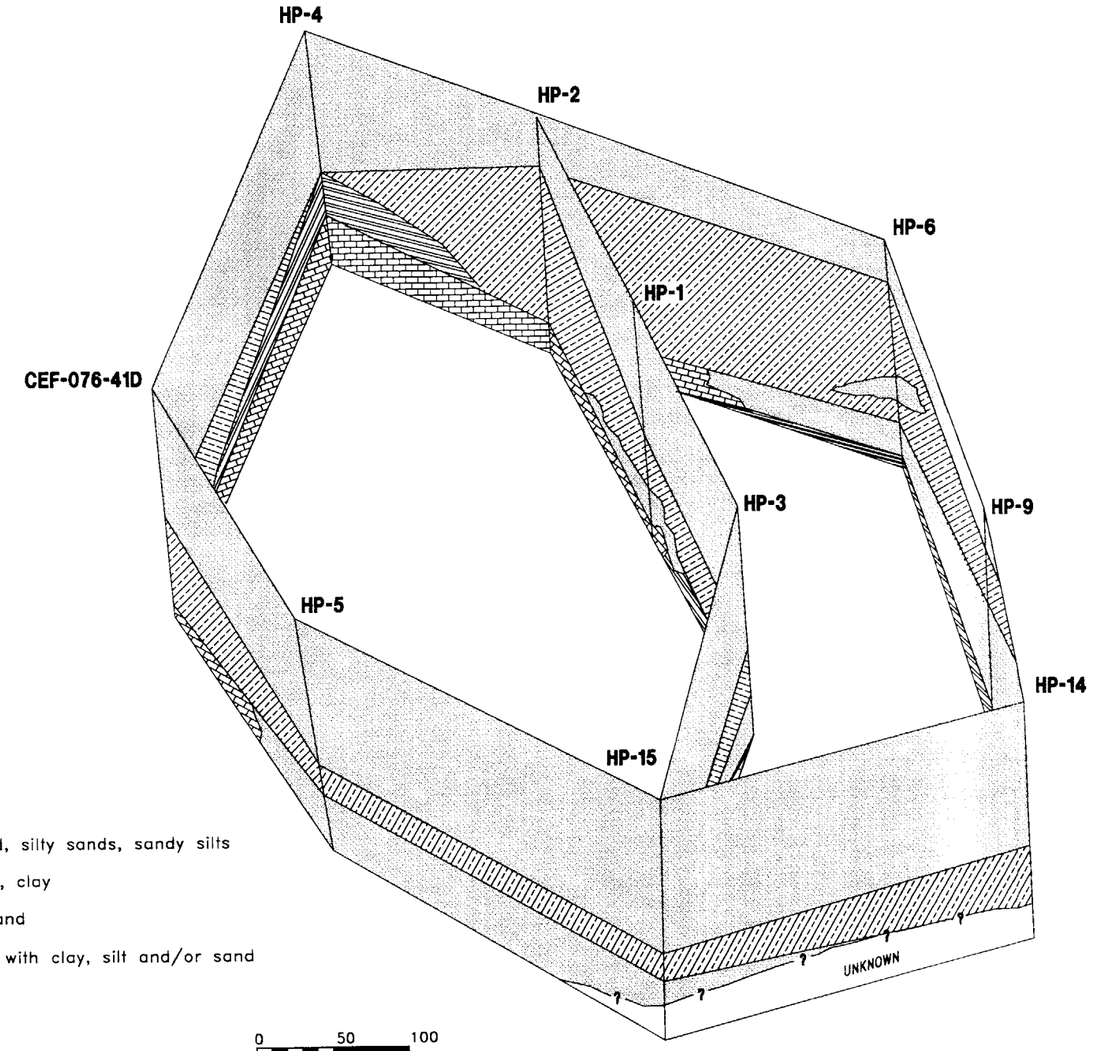


FIGURE 6
TOTAL VOLATILE ORGANIC AROMATICS (VOAs) ISOCONCENTRATON MAP, 100 FEET BELOW LAND SURFACE

TECHNICAL MEMORANDUM
PRELIMINARY CONTAMINATION ASSESSMENT, NORTH FUEL FARM SITE, DEEP PLUME
NAS CECIL FIELD
JACKSONVILLE, FORIDA



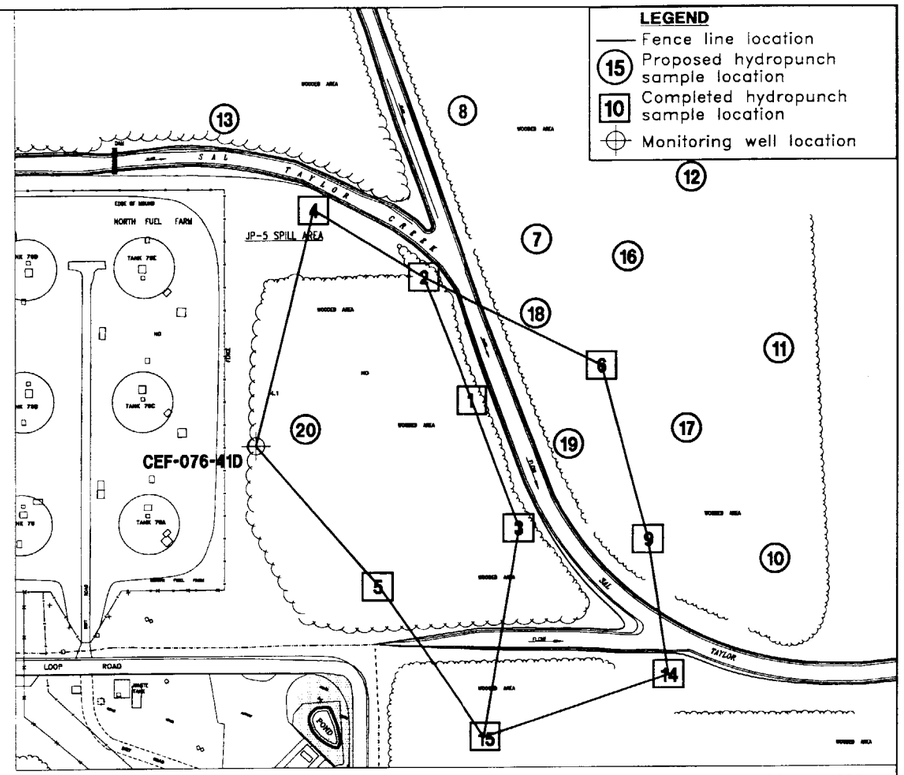
LEGEND

- Silt, sand, silty sands, sandy silts
- Silty clay, clay
- Clayey sand
- Dolomite with clay, silt and/or sand

0 50 100

SCALE: 1" = 100'

VERTICAL SCALE: 1"=125'



SITE LOCATION MAP

0 100 200

SCALE: 1" = 200'

FIGURE 7
FENCE DIAGRAM OF HYDROPUNCH SAMPLE LOCATIONS

TECHNICAL MEMORANDUM
PRELIMINARY CONTAMINATION ASSESSMENT, NORTH FUEL FARM
SITE, DEEP PLUME
NAS CECIL FIELD
JACKSONVILLE, FLORIDA

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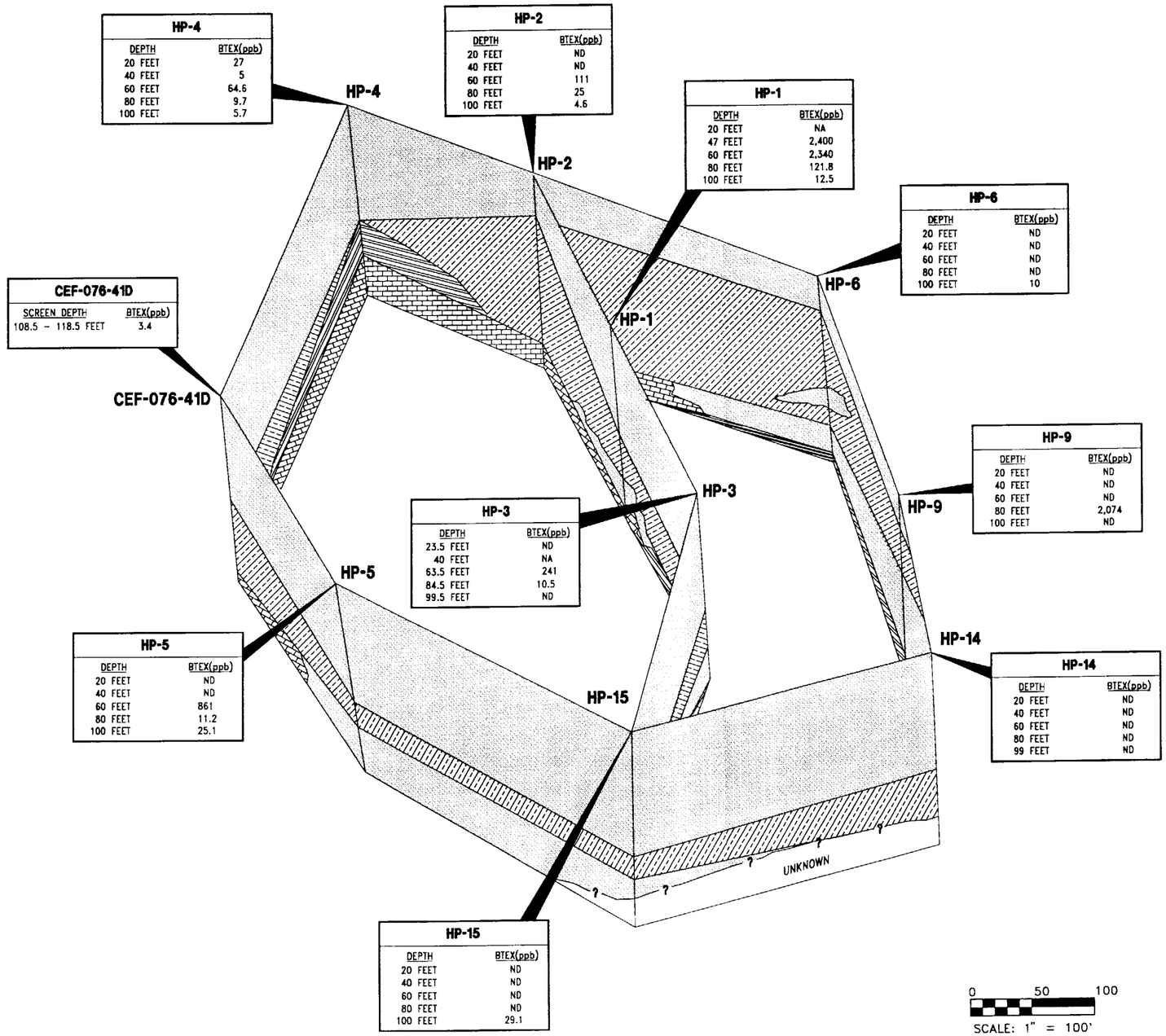

LEGEND

- Silt, sand, silty sand, sandy silt
- Silty clay, clay
- Clayey sand
- Dolomite with clay, silt, and /or sand
- NA Not analyzed
- ND None detected
- HP-1 Hydropunch sample location
- ppb Parts per billion

FIGURE 7A
TOTAL VOLATILE ORGANIC AROMATICS DETECTED IN HYDROPUNCH SAMPLE LOCATIONS

TECHNICAL MEMORANDUM
PRELIMINARY CONTAMINATION ASSESSMENT, NORTH FUEL FARM SITE, DEEP PLUME
NAS CECIL FIELD
JACKSONVILLE, FLORIDA

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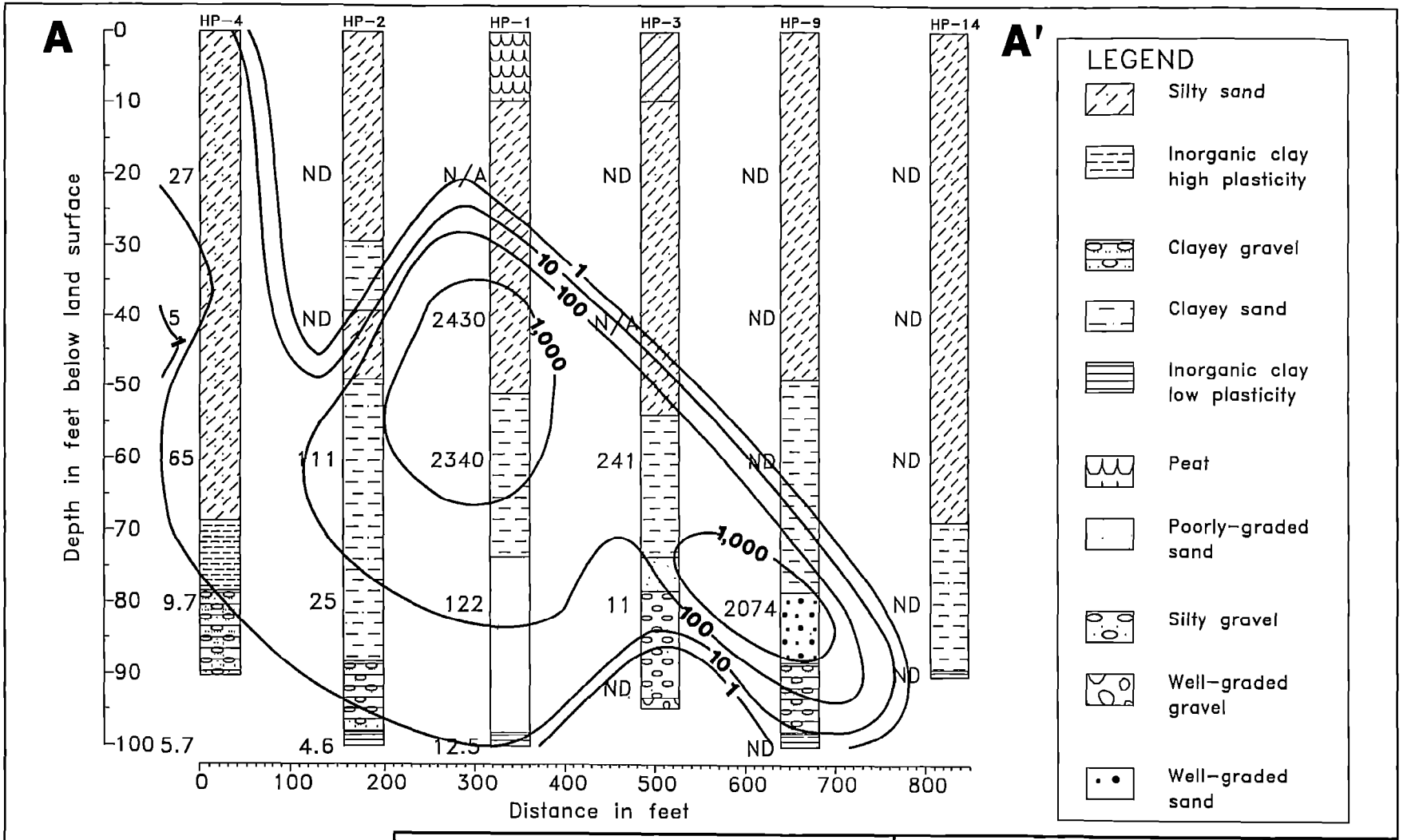

FIGURE 8
LITHOLOGIC CROSS SECTION A TO A' SHOWING TOTAL VOLATILE ORGANIC AROMATIC CONCENTRATIONS

TECHNICAL MEMORANDUM
PRELIMINARY CONTMAINATION ASSESSMENT, NORTH FUEL FARM
SITE, DEEP PLUME
NAS CECIL FIELD
JACKSONVILLE, FLORIDA

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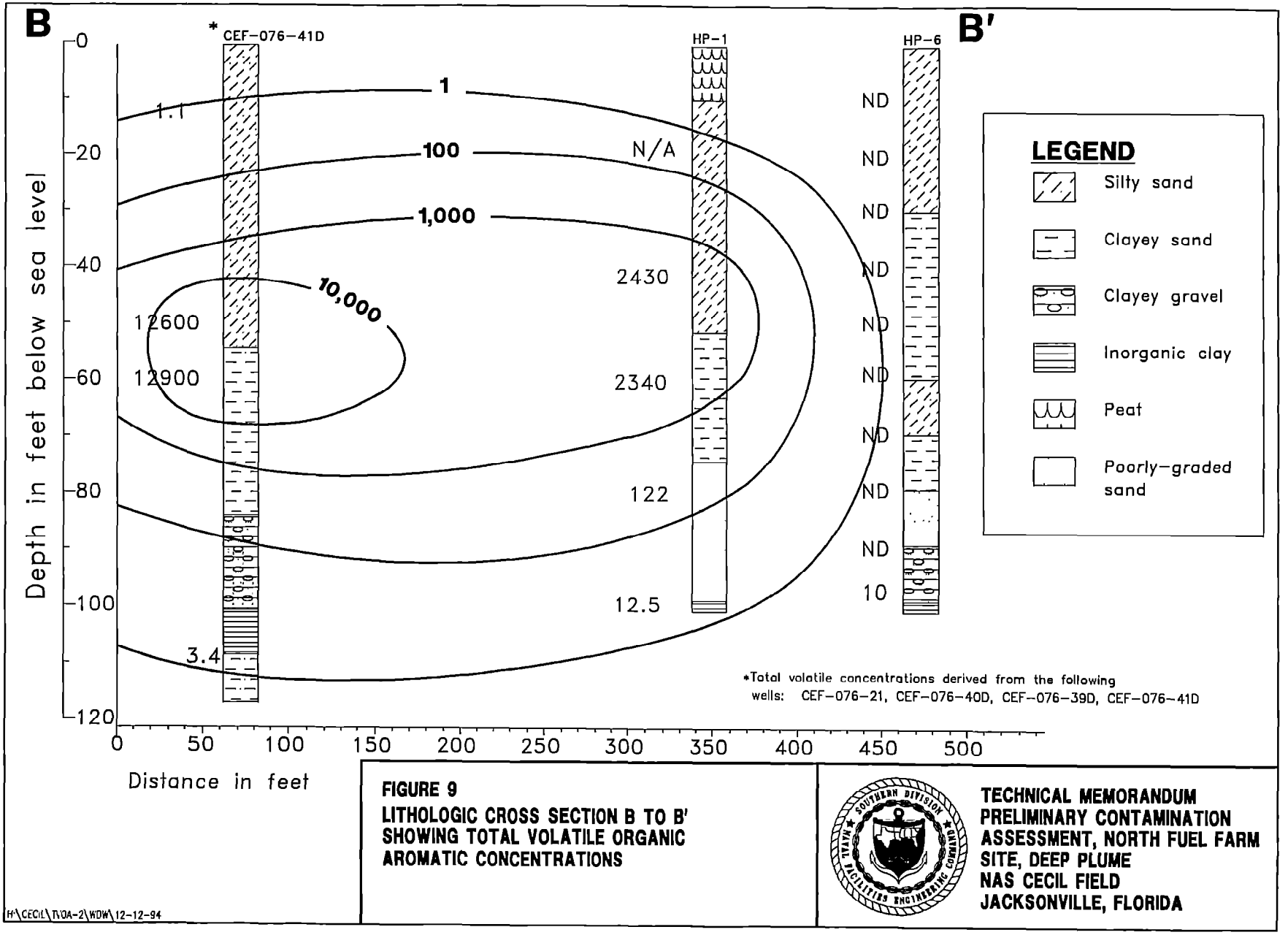

FIGURE 9
LITHOLOGIC CROSS SECTION B TO B' SHOWING TOTAL VOLATILE ORGANIC AROMATIC CONCENTRATIONS

TECHNICAL MEMORANDUM
PRELIMINARY CONTAMINATION ASSESSMENT, NORTH FUEL FARM SITE, DEEP PLUME
NAS CECIL FIELD
JACKSONVILLE, FLORIDA

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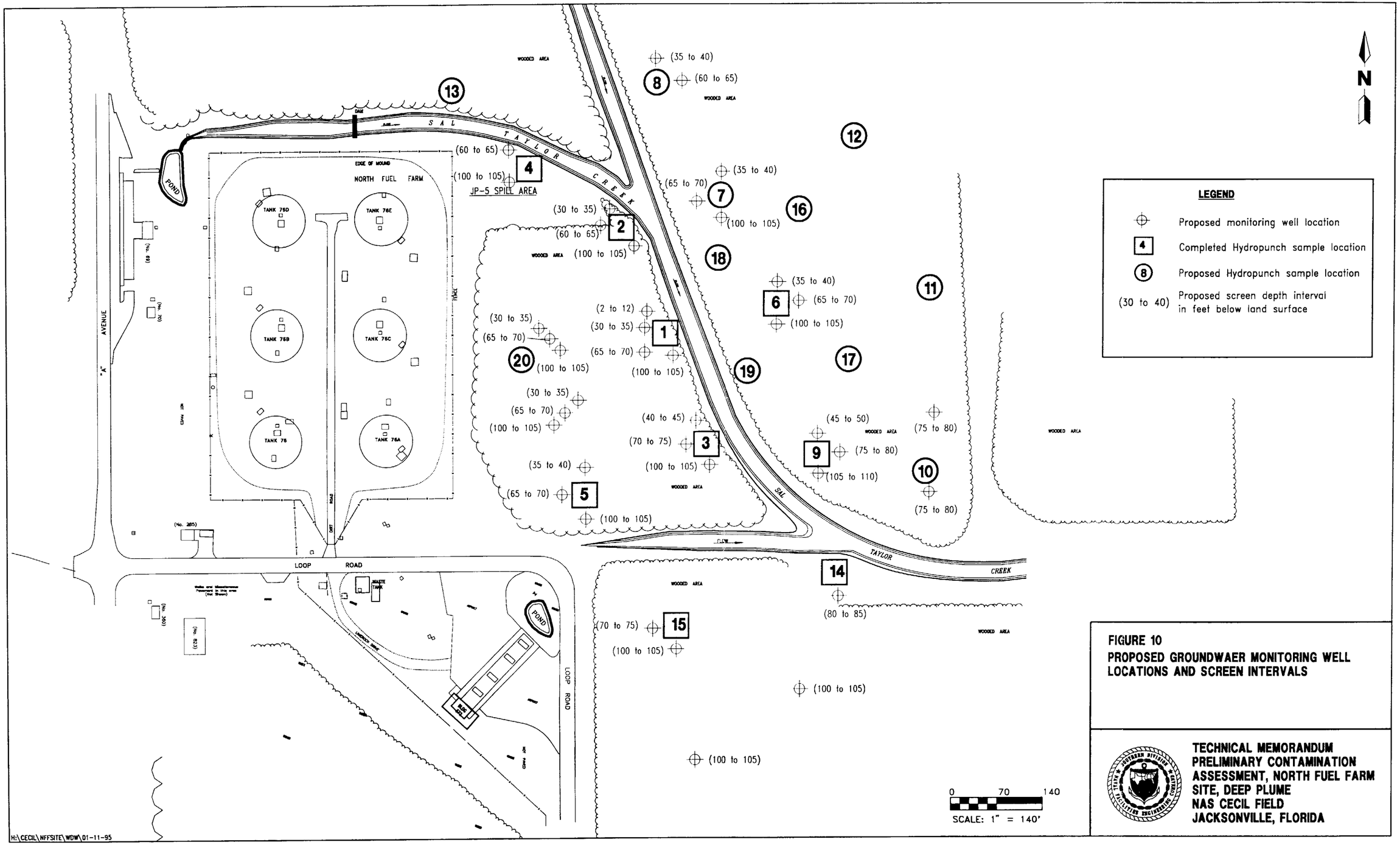

FIGURE 10
PROPOSED GROUNDWAER MONITORING WELL LOCATIONS AND SCREEN INTERVALS

TECHNICAL MEMORANDUM
PRELIMINARY CONTAMINATION ASSESSMENT, NORTH FUEL FARM SITE, DEEP PLUME
NAS CECIL FIELD
JACKSONVILLE, FLORIDA

ATTACHMENT B OVA HEADSPACE RESULTS, October and November, 1994

Table 3
Summary of OVA Headspace Soil Screening Results
Technical Memorandum
North Fuel Farm Deep Plume
Naval Air Station Cecil Field
Jacksonville, Florida
October-November, 1994

Sample I.D	Depth (feet)	Concentration (ppm)
HP-1	5-7	N/A
HP-1	10-12	110
HP-1	15-17	40
HP-1	20-22	250
HP-1	25-27	35
HP-1	32-34	2
HP-1	38-40	10
HP-1	43-45	130
HP-1	47-49	12
HP-1	52-54	1,300
HP-1	60-62	800
HP-1	65-67	140
HP-1	70-72	110
HP-1	75-77	9
HP-1	80-82	NO SAMPLE COLLECTED
HP-1	85-87	ND
HP-1	90-92	7
HP-1	95-97	10
HP-1	100-102	20
HP-2	10-12	280
HP-2	20-22	ND
HP-2	30-32	1,000
HP-2	40-42	300
HP-2	50-52	1,500
HP-2	60-62	200
HP-2	70-72	38

Sample I.D	Depth (feet)	Concentration (ppm)
HP-2	80-82	50
HP-2	90-92	90
HP-2	100-102	N/A
HP-3	5-7	ND
HP-3	10-12	ND
HP-3	15-17	ND
HP-3	20-22	ND
HP-3	25-27	ND
HP-3	30-32	ND
HP-3	35-37	ND
HP-3	40-42	ND
HP-3	45-47	ND
HP-3	50-52	ND
HP-3	55-57	ND
HP-3	60-62	ND
HP-3	65-67	ND
HP-3	70-72	15
HP-3	75-77	ND
HP-3	80-82	120
HP-3	85-87	50
HP-3	90-92	ND
HP-3	95-97	ND
HP-4	10-12	160
HP-4	20-22	1,800
HP-4	30-32	70
HP-4	40-42	800
HP-4	50-52	700
HP-4	60-62	850
HP-4	70-72	70
HP-4	80-82	48

Sample I.D	Depth (feet)	Concentration (ppm)
HP-4	90-92	44
HP-5	10-12	9
HP-5	20-22	ND
HP-5	30-32	1
HP-5	40-42	3
HP-5	50-52	10
HP-5	60-62	24
HP-5	70-72	16
HP-5	80-82	1
HP-5	90-92	2
HP-5	100-102	2
HP-6	10-12	10
HP-6	20-22	30
HP-6	30-32	15
HP-6	40-42	ND
HP-6	50-52	6
HP-6	60-62	ND
HP-6	70-72	ND
HP-6	80-82	ND
HP-6	90-92	ND
HP-6	100-102	ND
HP-9	10-12	16
HP-9	20-22	ND
HP-9	30-32	ND
HP-9	40-42	20
HP-9	50-52	7
HP-9	60-62	38
HP-9	70-72	18
HP-9	80-82	ND
HP-9	90-92	N/A

Sample I.D	Depth (feet)	Concentration (ppm)
HP-9	100-102	ND
HP-14	10-12	ND
HP-14	20-22	ND
HP-14	30-32	ND
HP-14	40-42	ND
HP-14	50-52	ND
HP-14	60-62	4
HP-14	70-72	5
HP-14	80-82	ND
HP-14	90-92	2
HP-15	10-12	ND
HP-15	20-22	3
HP-15	30-32	2
HP-15	40-42	ND
HP-15	50-52	ND
HP-15	60-62	ND
HP-15	70-72	ND
HP-15	80-82	ND
HP-15	90-92	ND

ppm = parts per million
N/A = Not analyzed
ND = None detected

ATTACHMENT C Soil and Groundwater GAS CHROMATOGRAPH (GC) SCREENING RESULTS, October and November, 1994

Table 4

Summary of Gas Chromatograph Analytical Data
Technical Memorandum
North Fuel Farm Deep Plume
NAS Cecil Field, Jacksonville, Florida
October-November, 1994

Saturated Soils										
Hydropunch Boring Location and Sampling Depths	Benzene		Toluene		Ethylbenze		Total Xylenes		Total BTEX	
	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry
HP-1, 5-7	ND		ND		ND		ND		ND	
HP-1, 10-12	ND		ND		ND		ND		ND	
HP-1, 15-17	ND		ND		ND		ND		ND	
HP-1, 20-22	ND		ND		ND		ND		ND	
HP-1, 25-27	ND		ND		ND		ND		ND	
HP-1, 32-34	ND		ND		ND		ND		ND	
HP-1, 38-40	ND		ND		ND		ND		ND	
HP-1, 43-45	ND		ND		ND		ND		ND	
HP-1, 47-49	ND		ND		ND		ND		ND	
HP-1, 52-54	ND		ND		ND		ND		ND	
HP-1, 55-57	5.4	4.3	ND		2.6	2.1	41	33	49	39
HP-1, 60-62	1.2	<1	ND		ND		18	14	19	<15
HP-1, 65-67	<1		ND		ND		1.4	1.2	1.4	1.2
HP-1, 70-72	ND		ND		ND		ND		ND	
HP-1, 75-77	ND		ND		ND		ND		ND	
HP-1, 80-82	ND		ND		ND		ND		ND	
HP-1, 85-87	ND		ND		ND		ND		ND	

Saturated Soils										
Hydropunch Boring Location and Sampling Depths	Benzene		Toluene		Ethylbenze		Total Xylenes		Total BTEX	
	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry
HP-1, 95-97	ND		ND		ND		ND		ND	
HP-1, 100-102	ND		ND		ND		ND		ND	
HP-2, 10-12	ND		ND		ND		ND		ND	
HP-2, 20-22	ND		ND		ND		ND		ND	
HP-2, 30-32	ND		ND		ND		ND		ND	
HP-2, 40-42	ND		ND		ND		ND		ND	
HP-2, 50-52	29	23	ND		ND		5.2	4.1	34	27
HP-2, 60-62	7.4	5.9	ND		ND		ND		7.4	5.9
HP-2, 70-72	ND		ND		ND		ND		ND	
HP-2, 80-82	ND		ND		ND		ND		ND	
HP-2, 90-92	ND		ND		ND		ND		ND	
HP-2, 100-102	ND		ND		ND		ND		ND	
HP-3, 5-7	ND		ND		ND		ND		ND	
HP-3, 10-12	ND		14	9.7	ND		ND		14	9.7
HP-3, 15-17	ND		63	45	ND		ND		63	45
HP-3, 20-22	ND		ND		ND		ND		ND	
HP-3, 25-27	ND		21	17	ND		ND		21	17
HP-3, 30-32	ND		ND		ND		ND		ND	
HP-3, 35-37	ND		ND		ND		ND		ND	
HP-3, 40-42	ND		ND		ND		ND		ND	
HP-3, 45-47	ND		ND		ND		ND		ND	

Saturated Soils										
Hydropunch Boring Location and Sampling Depths	Benzene		Toluene		Ethylbenze		Total Xylenes		Total BTEX	
	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry
HP-3, 50-52	ND		ND		ND		ND		ND	
HP-3, 55-57	ND		ND		ND		ND		ND	
HP-3, 60-62	ND		ND		ND		12	9.8	12	9.8
HP-3, 65-67	ND		ND		ND		<1		<1	
HP-3, 70-72	ND		ND		ND		ND		ND	
HP-3, 75-77	ND		ND		ND		ND		ND	
HP-3, 80-82	ND		ND		ND		ND		ND	
HP-3, 85-87	ND		ND		ND		ND		ND	
HP-3, 90-92	ND		ND		ND		ND		ND	
HP-3, 95-97	ND		ND		ND		ND		ND	
HP-4, 10-12	ND		ND		ND		14	11	14	11
HP-4, 20-22	ND		ND		ND		ND		ND	
HP-4, 30-32	ND		ND		ND		ND		ND	
HP-4, 40-42	ND		ND		ND		13	10	13	10
HP-4, 50-52	ND		ND		ND		ND		ND	
HP-4, 60-62	ND		ND		ND		19	15	19	15
HP-4, 70-72	ND		ND		ND		ND		ND	
HP-4, 80-82	ND		ND		ND		ND		ND	
HP-4, 90-92	ND		ND		ND		ND		ND	
HP-5, 10-12	ND		ND		ND		ND		ND	
HP-5, 20-22	ND		ND		ND		ND		ND	

Saturated Soils										
Hydropunch Boring Location and Sampling Depths	Benzene		Toluene		Ethylbenze		Total Xylenes		Total BTEX	
	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry
HP-5, 40-42	ND		ND		ND		ND		ND	
HP-5, 50-52	7.6	6.2	ND		<1		4.1 9.6	3.4 7.8	12 17	9.6 14
HP-5, 60-62	2.3	2.0	ND		ND		ND		2.3	2.0
HP-5, 70-72	ND		ND		ND		ND		ND	
HP-5, 80-82	ND		ND		ND		ND		ND	
HP-5, 90-92	ND		ND		ND		ND		ND	
HP-5, 100-102	ND		ND		ND		ND		ND	
HP-6, 10-12	ND		ND		ND		ND		ND	
HP-6, 20-22	ND		ND		ND		ND		ND	
HP-6, 30-32	ND		ND		ND		ND		ND	
HP-6, 40-42	ND		ND		ND		ND		ND	
HP-6, 50-52	ND		ND		ND		ND		ND	
HP-6, 60-62	ND		ND		ND		ND		ND	
HP-6, 70-72	ND		ND		ND		ND		ND	
HP-6, 80-82	ND		ND		ND		ND		ND	
HP-6, 90-92	ND		ND		ND		ND		ND	
HP-6, 100-102	ND		ND		ND		ND		ND	
HP-9, 10-12	ND		ND		ND		ND		ND	
HP-9, 20-22	ND		ND		ND		ND		ND	
HP-9, 30-32	ND		ND		ND		ND		ND	
HP-9, 40-42	ND		ND		ND		ND		ND	

Saturated Soils										
Hydropunch Boring Location and Sampling Depths	Benzene		Toluene		Ethylbenze		Total Xylenes		Total BTEX	
	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry
HP-9, 60-62	ND		ND		ND		ND		ND	
HP-9, 70-72	ND		ND		ND		ND		ND	
HP-9, 80-82	<1		ND		ND		<1		<2	
	1.1	<1					2.1	1.8	3.2	<2.8
HP-9, 90-92	1.6	1.3	ND		ND		ND		1.6	1.3
HP-9, 100-102	<1		ND		ND		ND		<1	
HP-14, 10-12	ND		ND		ND		ND		ND	
HP-14, 20-22	ND		ND		ND		ND		ND	
HP-14, 30-32	ND		ND		ND		ND		ND	
HP-14, 40-42	ND		ND		ND		ND		ND	
HP-14, 50-52	ND		ND		ND		ND		ND	
HP-14, 60-62	ND		ND		ND		ND		ND	
HP-15, 40-42	ND		ND		ND		ND		ND	
HP-15, 10-12	ND		ND		ND		ND		ND	
HP-15, 20-22	ND		ND		ND		ND		ND	
HP-15, 30-32	ND		ND		ND		ND		ND	

Saturated Soils										
Hydropunch Boring Location and Sampling Depths	Benzene		Toluene		Ethylbenze		Total Xylenes		Total BTEX	
	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry
HP-15, 40-42	ND		ND		ND		ND		ND	
HP-15, 50-52	ND		ND		ND		ND		ND	
HP-15, 60-62	ND		ND		ND		ND		ND	
HP-15, 70-72	ND		ND		ND		ND		ND	
HP-15, 80-82	ND		ND		ND		ND		ND	
HP-15, 90-92	ND		ND		ND		6.9	6.3	6.9	6.3

Notes: ND = Not detected.
E = Estimated value ±3 standard deviations above highest calibration standard.

Groundwater										
Hydropunch Boring Location and Sampling Depths	Benzene		Toluene		Ethylbenzene		Total Xylenes		Total BTEX	
	Run 1	Run 2	Run 1	Run 2	Run 1	Run 2	Run 1	Run 2	Run 1	Run 2
HP-4, 80 UNF.	5.8		ND		ND		59		65	
HP-1, 25 UNF.	6.8		11		ND		ND		18	
HP-3, 80 UNF.	ND		ND		ND		ND		ND	
HP-1, 60 UNF.	>1000 E		ND		ND		ND		>1000E	
HP-14, 20 UNF.	ND		ND		ND		ND		ND	
HP-4, 100 UNF.	ND		ND		ND		43	48	43	48
HP-1, 80 UNF.	15	15	ND		ND		ND		15	15
HP-5, 20 FIL.	ND		ND		ND		ND		ND	
HP-5, 60 FIL.	9.6		<1		8.1		65		<84	
HP-5, 40 UNF.	ND		ND		ND		ND		ND	
HP-5, 80 UNF.	ND		ND		ND		ND		ND	
HP-15, 40 UNF.	ND		ND		ND		ND		ND	
HP-6, 20 UNF.	ND		ND		ND		ND		ND	
HP-6, 60 UNF.	ND		ND		ND		ND		ND	

Groundwater										
Hydropunch Boring Location and Sampling Depths	Benzene		Toluene		Ethylbenzene		Total Xylenes		Total BTEX	
	Run 1	Run 2	Run 1	Run 2	Run 1	Run 2	Run 1	Run 2	Run 1	Run 2
HP-4, 20 FIL.	ND		ND		ND		ND		ND	
HP-6, 80 UNF.	ND		ND		ND		ND		ND	
HP-6, 100, UNF.	ND		ND		ND		ND		ND	
HP-5, 80, UNF.	ND		ND		ND		ND		ND	
HP-5, 100, UNF.	ND		ND		ND		ND		ND	
HP-9, 20, UNF.	ND		ND		ND		42		42	
HP-9, 60, UNF.	ND		ND		ND		ND		ND	
HP-9, 80, UNF.	383 E	425 E	1.7	2.5	11	15	94	127	490 E	570 E

Notes: ND = Not detected.
E = Estimated value ±3 standard deviations above highest calibration standard.

ATTACHMENT D LITHOLOGIC SOIL BORING AND MONITORING WELL LOGS

Project: NAS Cecil Field **Technical Memorandum**		**Hydropunch I.D.:** HP-1	
Site: North Fuel Farm Deep Plume		**Client:** SOUTHNAVFACENGCOM	**Project no.:** 08518.41
Drilling contractor: Alliance Environmental Services, Inc.		**Drill rig:** ATV, B-57	**Drilling method:** HSA/Mud Rotary
Installation date: 10/08/84	**Completion date:** 10/22/84	**Well development date:** N/A	
Casing ID: N/A	**Screened int.:** N/A	**Total depth:** 102ft.	**Initial depth to ▽** ft.
TOC elev.: ft.	**Monitor instrument/OVD type:** Porta-FID		**Geologist:** Jeff Tarr

Depth (ft.)	Headspace Field GC BTEX (ppb)	Sample	Recovery	Headspace (ppm)	Geologic Description and Remarks	Lithologic symbol	Soil class.	Blows/6-in.
							PT	
5	ND		80%	N/A	(5-7') CLAYEY-SAND: Brown, fine grained with silt, tree roots and organics, (swamp soil).			12,8,10,8
10	ND		80%	110	(10-12') SAND: Brown, fine grained, poorly graded subangular to subrounded with organics.		SM	5,7,8,12
15	ND		80%	40	(15-17') SAND: Brown, fine grained, poorly graded.			N/A
20	ND		100%	250	(20-22') SAND: Brown, fine grained, poorly graded.			21,11,13,11
25	ND		N/A	35	(25-27') SAND: Brown, fine grained, poorly graded.			9,15,8,13
30	ND		20%	2	(32-34') SAND: Light gray, fine to medium grained, poorly graded.			28,33,50 (4")STP
35	ND		50%	10	(38-40') SAND: Light gray, fine grained with silt, poorly graded.			15,18,50 (4")STP
40	ND		40%	130	(43-45') SAND: Light gray, fine grained with silt, poorly graded, very dense. Slight hydrocarbon odor.			42,43,50 (4")STP
45	ND		50%	12	(47-49') SAND: Light gray, fine grained with silt, very dense. Hydropunch groundwater sample analyzed at 47'.			48,53,79 (5")STP
50	ND		100%	1300	(52-54') CLAYEY-SAND: Greenish-gray, fine grained with strong hydrocarbon odor.		SC	13,32,38,34

Project: NAS Cecil Field **Technical Memorandum**		**Hydropunch I.D.:** HP-1	
Site: North Fuel Farm Deep Plume		**Client:** SOUTHNAVFACENGCOM	**Project no.:** 08518.41
Drilling contractor: Alliance Environmental Services, Inc.		**Drill rig:** ATV, B-57	**Drilling method:** HSA/Mud Rotary
Installation date: 10/08/84	**Completion date:** 10/22/84	**Well development date:** N/A	
Casing ID: N/A	**Screened int.:** N/A	**Total depth:** 102ft.	**Initial depth to ▽** ft.
TOC elev.: ft.	**Monitor instrument/OVD type:** Porta-FID		**Geologist:** Jeff Tarr

Depth (ft.)	Headspace Field GC BTEX (ppb)	Sample Recovery	Headspace (ppm)	Geologic Description and Remarks	Lithologic symbol	Soil class.	Blows/6-in.
	48	50%	1000	(55-57') CLAYEY-SAND: Greenish-gray to olive gray, fine grained, dense sand with soft clay. Very strong hydrocarbon odor.		SC	15,33,34,50 (4")
59	18.8	40%	800	(80-82') CLAYEY-SAND: Greenish-gray to olive gray, fine grained, dense sand with soft clay. Very strong hydrocarbon odor. Hydropunch groundwater sample analyzed at 80'.			25,50,50 (3")STP
64	1.4	50%	140	(85-87') CLAYEY-SAND: Greenish-gray to olive gray, fine grained, dense sand with soft clay. Hydrocarbon odor.			50,50,50 (5")STP
69	ND	20%	110	(70-72') CLAYEY-SAND: Light brown to greenish-gray, fine grained, very hard sand and stiff clay.			10,110,STOP
74	ND	50%	8	(75-77') SAND: Light brown, fine to medium grained with quartz		SP	8,50,50 (2")STOP
78	ND	N/A	N/A	(80-82') NO SAMPLE COLLECTED. Hydropunch groundwater sample analyzed at 80'.			N/A
84	ND	40%	ND	(85-87') SAND: Greenish-gray to light brown, fine to medium grained, very dense, subrounded, poorly graded, trace of quartz.			40,80,80,STP
89	ND	70%	7	(90-92') SAND: Light brown, fine to medium grained with coarse grained quartz, loose-medium dense.			7,33,10,19
94	ND	100%	10	(95-97') SAND: Light brown, fine to medium grained with coarse grained quartz, dense, poorly graded, subrounded-rounded, very porous.			20,30,43,82
99	ND	100%	20	(100-102') SILTY-CLAY: Calcareous greenish-gray clay with pale yellow dolomite and gray limestone. 80% clay, 20% limestone/dolomite. Clay is pliable with low plasticity. Hydropunch groundwater sample analyzed at 100'.		CL	10,10,12,23
104							

Project: NAS Cecil Field **Technical Memorandum**		**Hydropunch I.D.:** HP-2	
Site: North Fuel Farm Deep Plume		**Client:** SOUTHNAVFACENGCOM	**Project no.:** 08518.41
Drilling contractor: Alliance Environmental Services, Inc.		**Drill rig:** ATV, B-57	**Drilling method:** Mud Rotary
Installation date: 11/05/94	**Completion date:** 11/08/94	**Well development date:** N/A	
Casing ID: N/A	**Screened int.:** N/A	**Total depth:** 102ft.	**Initial depth to ▽** ft.
TOC elev.: ft.	**Monitor instrument/OVD type:** Porta-FID		**Geologist:** Jeff Tarr

Depth (ft.)	Headspace Field GC BTEX (ppb)	Sample	Recovery	Headspace (ppm)	Geologic Description and Remarks	Lithologic symbol	Soil class.	Blows/6-in.
10	ND		50%	280	(10-12') SILTY-SAND: Light brown, very fine to fine grained, loose, poorly graded.		SM	5,7,7,8
20	ND		80%	ND	(20-22') SILTY-SAND: Light brown, very fine to fine grained, loose to very loose, poorly graded. Hydropunch groundwater sample analyzed at 20'.			2,1,1,1
30	ND		80%	1,000	(30-32') CLAYEY-SAND: Greenish-gray, loose sand with soft green clay.		SC	3,5,4,8
40	ND		50%	300	(40-42') SILTY-SAND: Light gray to blue, very fine to fine grained with trace clay. Hydropunch groundwater sample analyzed at 40'.		SM	10,10,11,22
50	34.2		40%	1,500	(50-52') CLAYEY-SAND: Greenish-gray to olive gray, fine grained, medium dense sand with soft green clay. Hydrocarbon odor detected.		SC	8,10,15,18

Project: NAS Cecil Field **Technical Memorandum**		**Hydropunch I.D.:** HP-2	
Site: North Fuel Farm Deep Plume		**Client:** SOUTHNAVFACENGCOM	**Project no.:** 08518.41
Drilling contractor: Alliance Environmental Services, Inc.		**Drill rig:** ATV, B-57	**Drilling method:** Mud Rotary
Installation date: 11/05/94	**Completion date:** 11/08/94	**Well development date:** N/A	
Casing ID: N/A	**Screened int.:** N/A	**Total depth:** 102ft.	**Initial depth to ▽** ft.
TOC elev.: ft.	**Monitor instrument/OVD type:** Porta-FID		**Geologist:** Jeff Tarr

Depth (ft.)	Headspace Field GC BTEX (ppb)	Sample	Recovery	Headspace (ppm)	Geologic Description and Remarks	Lithologic symbol	Soil class.	Blows/6-in.
59	7.4		100%	200	(80-82') CLAYEY-SAND: Greenish-gray to olive gray, fine to medium grained, medium dense. Hydrocarbon odor. Hydropunch groundwater sample analyzed at 80'.		SC	7,14,17,22
64								
69	ND		70%	38	(70-72') CLAYEY-SAND: Light brown to greenish-gray, fine to medium grained, very dense sand and stiff clay.			48,90,100,STOP
74								
79	ND		80%	50	(80-82') CLAYEY-SAND: Dark gray to olive gray. Sand is medium dense to loose. Clay is soft with thick stringers. Hydropunch groundwater sample analyzed at 80'.			7,14,24,32
84								
89	ND		80%	90	(90-92') CLAYEY-SAND AND DOLOMITE: Green clayey-sand with pale yellow dolomite and traces of gray limestone. 40% clayey-sand, 60% dolomite, <1% limestone.		GC	14,15,18,22
94								
99	ND		<5%	N/A	(100-102') CLAY: Calcareous greenish-gray clay with traces of fossiliferous pale yellow dolomite. Hydropunch groundwater sample analyzed at 100'.		CL	24,32,34,38
104								

Project: NAS Cecil Field **Technical Memorandum**		**Hydropunch I.D.:** HP-3	
Site: North Fuel Farm Deep Plume		**Client:** SOUTHNAVFACENGCOM	**Project no.:** 08518.41
Drilling contractor: Alliance Environmental Services, Inc.		**Drill rig:** ATV, B-57	**Drilling method:** Mud Rotary
Installation date: 10/17/94	**Completion date:** 10/19/94	**Well development date:** N/A	
Casing ID: N/A	**Screened int.:** N/A	**Total depth:** 971t.	**Initial depth to ▽** ft.
TOC elev.: ft.	**Monitor instrument/OVD type:** Porta-FID		**Geologist:** Jeff Tarr

Depth (ft.)	Headspace Field GC BTEX (ppb)	Sample	Recovery	Headspace (ppm)	Geologic Description and Remarks	Lithologic symbol	Soil class.	Blows/6-in.
5	ND		40%	ND	(5-7') SILT: Dark brown, with organics.		OL	8,17,18,20
10	14		70%	ND	(10-12') SILTY-SAND: Dark brown, fine grained, very dense.		SM	10,35,28,28
15	83		80%	ND	(15-17') SILTY-SAND: Dark brown, fine grained, poorly graded.			8,15,30,12
20	ND		40%	ND	(20-22') SAND: Light gray, fine grained, dense, well-washed. Hydropunch groundwater sample analyzed at 23.5'.			21,23,30,37
25	21		50%	ND	(25-27') SAND: Light brown to greenish-gray, very dense, silty, well-washed.			17,20,45,50 (3")
30	ND		70%	ND	(30-32') SAND: Light brown to greenish-gray, very dense, silty, well-washed.			18,20,30,50 (4")
35	ND		40%	ND	(35-37') SAND: Brown, fine grained with silt, very dense, well washed.			30,25,50 (3")
40	ND		40%	ND	(40-42') SAND: Brown, fine grained with silt, very dense, well washed.			12,60 (5")
45	ND		100%	ND	(45-47') SAND: Brown, fine grained with silt, well-washed, poorly graded.			4,10,24,50 (2")
50	ND		50%	ND	(50-52') SAND: Light gray to greenish-gray, fine grained with silt, poorly graded. Slight hydrocarbon odor.			17,28,32,50 (2")

Project: NAS Cecil Field **Technical Memorandum**	**Hydropunch I.D.:** HP-3	
Site: North Fuel Farm Deep Plume	**Client:** SOUTHNAVFACENGCOM	**Project no.:** 08518.41
Drilling contractor: Alliance Environmental Services, Inc.	**Drill rig:** ATV, B-57	**Drilling method:** Mud Rotary
Installation date: 10/17/94	**Completion date:** 10/18/94	**Well development date:** N/A
Casing ID: N/A	**Screened int.:** N/A	**Total depth:** 87ft.
TOC elev.: ft.	**Monitor instrument/OVD type:** Porta-FID	**Initial depth to ▽** ft.
		Geologist: Jeff Tarr

Depth (ft.)	Headspace Field GC BTEX (ppb)	Sample	Recovery	Headspace (ppm)	Geologic Description and Remarks	Lithologic symbol	Soil class.	Blows/6-in.
	ND		50%	ND	(55-57') CLAYEY-SAND: Greenish-gray, dense sand with soft clay. Slight hydrocarbon odor.		SM SC	12,18,32,28
59	12		60%	ND	(60-62') CLAYEY-SAND: Olive gray, dense sand with soft clay. Slight hydrocarbon odor. Hydropunch groundwater sample analyzed at 63.5'.			18,22,22,24
64	<1		30%	ND	(65-67') CLAYEY-SAND: Greenish-gray to olive gray, fine grained with silt, very dense sand with soft clay.			21,37,50 (4")
69	ND		10%	0.5	(70-72') CLAYEY-SAND: Light gray to greenish-gray, fine grained with silt, dense sand, soft clay, and traces of medium to coarse grained quartz. Hydrocarbon odor.			45,>50
74	ND		10%	ND	(75-77') SAND: Light gray, fine to medium grained with quartz.		SP	48,>50
79	ND		80%	120	(80-82') GRAVEL AND SAND: Greenish-gray to light brown, fine gravel sand with some silt and quartz grains. Traces of pale yellow dolomite and gray limestone. Very hard.		GM	85,85,120
84	ND		100%	50	(85-87') GRAVEL AND SAND: Light brown to greenish-gray, fine gravel sand with gravel size quartz grains, trace silt.			29,28,83,50
89	ND		100%	ND	(90-91') SAND: Light brown, coarse grained sand to fine grained gravel, trace silt. (91-92') CLAYEY-SAND: Greenish-gray with quartz grains throughout.			20,35,30,20
94	ND		100%	ND	(95-96.5') SANDY-GRAVEL: Greenish-gray, well graded, very loose- loose, fine grained gravel to coarse grained sand with trace silt, quartz, and phosphates.		GW	8,2,1,8
99								
104								

Project: NAS Cecil Field **Technical Memorandum**	**Hydropunch I.D.:** HP-4	
Site: North Fuel Farm Deep Plume	**Client:** SOUTHNAVFACENGCOM	**Project no.:** 08518.41
Drilling contractor: Alliance Environmental Services, Inc.	**Drill rig:** ATV, B-57	**Drilling method:** Mud Rotary
Installation date: 10/23/94	**Completion date:** 10/24/94	**Well development date:** N/A
Casing ID: N/A	**Screened int.:** N/A	**Total depth:** 102ft.
TOC elev.: ft.	**Monitor instrument/OVD type:** Porta-FID	**Initial depth to ▽** ft.
		Geologist: Jeff Tarr

Depth (ft.)	Headspace Field GC BTEX (ppb)	Sample	Recovery	Headspace (ppm)	Geologic Description and Remarks	Lithologic symbol	Soil class.	Blows/6-in.
5							SM	
10	14		100%	180	(10-12') SILTY-SAND: Light brown, very fine to fine grained, loose, strong hydrocarbon odor.			6,6,8,8
15								
20	ND		100%	1800	(20-22') SILTY-SAND: Light brown, very fine to fine grained, very loose. Strong hydrocarbon odor. Hydropunch groundwater sample analyzed at 20'.			3,3,4,5
25								
30	ND		50%	70	(30-32') SILTY-SAND: Greenish-gray, very fine to fine grained, medium dense to dense. Poorly graded, strong hydrocarbon odor.			10,20,38,55
35								
40	13		70%	800	(40-42') SILTY-SAND: Light brown to 41.5, then green-gray from 41.5 to 42'. Very fine to fine grained, loose, poorly graded. Hydropunch groundwater sample analyzed at 40'.			5,10,10,11
45								
50	ND		40%	700	(50-52') SILTY-SAND: Greenish-gray, fine grained, very dense, traces of clay. Strong hydrocarbon odor.			25,85,82,50

Project: NAS Cecil Field **Technical Memorandum**		**Hydropunch I.D.:** HP-4	
Site: North Fuel Farm Deep Plume		**Client:** SOUTHNAVFACENGCOM	**Project no.:** 08518.41
Drilling contractor: Alliance Environmental Services, Inc.		**Drill rig:** ATV, B-57	**Drilling method:** Mud Rotary
Installation date: 10/23/94	**Completion date:** 10/24/94	**Well development date:** N/A	
Casing ID: N/A	**Screened int.:** N/A	**Total depth:** 102ft.	**Initial depth to ▽** ft.
TOC elev.: ft.	**Monitor instrument/OVD type:** Porta-FID		**Geologist:** Jeff Tarr

Depth (ft.)	Headspace Field GC BTEX (ppb)	Sample	Recovery	Headspace (ppm)	Geologic Description and Remarks	Lithologic symbol	Soil class.	Blows/6-in.
59	18		100%	850	(80-82') SILTY-SAND: Light brown, fine grained with trace of green clay, loose to medium dense, strong hydrocarbon odor. Hydropunch groundwater sample analyzed at 80'.		SM	5,8,8,7
64								
69	ND		100%	70	(70-72') CLAY: Greenish-gray to dark gray, soft to medium stiff, highly plastic, fat clay.		CH	5,5,6,6
74								
79	ND		50%	48	(80-82') SHELL, SAND, CLAY, AND DOLOMITE/LIMESTONE: Light brown to greenish-gray clayey sand with shells, pale yellow dolomite and gray limestone. Large quartz grains and black phosphates, rounded to sub- rounded. 40% limestone/dolomite, 30% sand, 20% clay, 8% shell, 2% phosphate. Hydropunch groundwater sample analyzed at 80'.		GC	15,30,33,28
84								
89	ND		100%	44	(90-92') CLAYEY-SAND AND DOLOMITE: Greenish-gray, clayey-sand with yellow dolomite. 50% dolomite, 50% clayey-sand.			14,18,22,18
94								
99	N/A		N/A	N/A	(100-102') NO SAMPLE COLLECTED. Hydropunch groundwater sample analyzed at 100'.			N/A
104								

Project: NAS Cecil Field **Technical Memorandum**		**Hydropunch I.D.:** HP-5	
Site: North Fuel Farm Deep Plume		**Client:** SOUTHNAVFACENGCOM	**Project no.:** 08518.41
Drilling contractor: Alliance Environmental Services, Inc.		**Drill rig:** ATV, B-57	**Drilling method:** Mud Rotary
Installation date: 10/31/94	**Completion date:** 11/01/94	**Well development date:** N/A	
Casing ID: N/A	**Screened int.:** N/A	**Total depth:** 102ft.	**Initial depth to ▽** ft.
TOC elev.: ft.	**Monitor instrument/OVD type:** Porta-FID		**Geologist:** Jeff Tarr

Depth (ft.)	Headspace Field GC BTEX (ppb)	Sample	Recovery	Headspace (ppm)	Geologic Description and Remarks	Lithologic symbol	Soil class.	Blows/6-in.
5							SM	
10	ND		80%	9	(10-12') SILTY-SAND: Dark brown, very fine to fine grained, loose, poorly graded, dense.			22,28,28,33
15								
20	ND		80%	ND	(20-22') SILTY-SAND: Brown to dark brown, very fine to fine grained, poorly graded, medium dense to loose. Hydropunch groundwater sample analyzed at 20'.			3,4,10,14
25								
30	ND		30%	1	(30-32') SILTY-SAND: Greenish-gray, very fine to fine grained, dense with trace of clay.			4,24,33,40
35								
40	ND		80%	3	(40-42') SILTY-SAND: Light brown to blueish-gray, very fine to fine grained, poorly graded, medium dense to dense. Hydropunch groundwater sample analyzed at 40'.			8,17,33,30
45								
50	18.5		30%	10	(50-52') SILTY-SAND: Light brown to greenish-gray, very fine to fine grained with traces of green clay. very dense.			28,25,78

Project: NAS Cecil Field **Technical Memorandum**		**Hydropunch ID:** HP-5	
Site: North Fuel Farm Deep Plume		**Client:** SOUTHNAVFACENGCOM	**Project no.:** 08518.41
Drilling contractor: Alliance Environmental Services, Inc.		**Drill rig:** ATV, B-57	**Drilling method:** Mud Rotary
Installation date: 10/31/94	**Completion date:** 11/01/94	**Well development date:** N/A	
Casing ID: N/A	**Screened int.:** N/A	**Total depth:** 102ft.	**Initial depth to ▽** ft.
TOC elev.: ft.	**Monitor instrument/OVD type:** Porta-FID		**Geologist:** Jeff Tarr

Depth (ft.)	Headspace Field GC BTEX (ppb)	Sample	Recovery	Headspace (ppm)	Geologic Description and Remarks	Lithologic symbol	Soil class.	Blows/6-in.
59	2.3		80%	24	(80-82') SAND: Light gray to light brown, fine to medium grained with trace silt, well-graded, very dense sand. Hydropunch groundwater sample analyzed at 80'.		SM	35,48,80,58
64							SW	
69	ND		50%	18	(70-72') CLAYEY-SAND: Light gray with green clay stringers, very dense sand, slight hydrocarbon odor.		SC	85,113,STOP
74								
79	ND		80%	1	(80-82') SAND: Light brown to light gray fine to medium grained with trace silt, poorly graded, dense to very dense sand. Hydropunch groundwater sample analyzed at 80'.		SP	8,15,88,88
84								
89	ND		20%	2	(90-92') SAND: Light gray to blue, coarse grained sand to fine grained gravel, trace silt and clay, very dense.		GC	55,110,STOP
94								
99	ND		70%	2	(100-101') SAND: Light brown coarse grained sand to fine grained gravel. (101-102') SAND: Greenish-gray to blue, medium to coarse grained sand with trace silt and clay. Hydropunch groundwater sample analyzed at 100'.			10,10,15,17
104								

Project: NAS Cecil Field **Technical Memorandum**		**Hydropunch I.D.:** HP-8	
Site: North Fuel Farm Deep Plume		**Client:** SOUTHNAVFACENGCOM	**Project no.:** 08518.41
Drilling contractor: Alliance Environmental Services, Inc.		**Drill rig:** ATV, B-57	**Drilling method:** Mud Rotary
Installation date: 11/07/94	**Completion date:** 11/08/94	**Well development date:** N/A	
Casing ID: N/A	**Screened int.:** N/A	**Total depth:** 102ft.	**Initial depth to ▽** ft.
TOC elev.: ft.	**Monitor instrument/OVD type:** Porta-FID		**Geologist:** Jeff Tarr

Depth (ft.)	Headspace Field GC BTEX (ppb)	Sample	Recovery	Headspace (ppm)	Geologic Description and Remarks	Lithologic symbol	Soil class.	Blows/6-in.
10	ND		50%	10	(10-12') SILTY-SAND: Brown, very fine to fine grained, loose to medium dense.		SM	8,13,12,8
20	ND		50%	30	(20-22') SILTY-SAND: Light brown, very fine to fine grained, poorly graded, loose, clean, well-washed. Hydropunch groundwater sample analyzed at 20'.			2,3,4,4
30	ND		80%	15	(30-32') CLAYEY-SAND: Greenish-gray, loose to medium dense sand with soft clay.		SC	3,8,11,12
40	ND		70%	ND	(40-42') CLAYEY-SAND: Light gray to blueish-green, medium dense sand with blueish-green clay. Hydropunch groundwater sample analyzed at 40'.			7,14,24,17
50	ND		50%	8	(50-52') CLAYEY-SAND: Greenish-gray to light gray to olive gray, loose to medium dense sand and medium stiff clay.			8,13,13,42

Project: NAS Cecil Field **Technical Memorandum**	**Hydropunch ID.:** HP-8	
Site: North Fuel Farm Deep Plume	**Client:** SOUTHNAVFACENGCOM	**Project no.:** 08518.41
Drilling contractor: Alliance Environmental Services, Inc.	**Drill rig:** ATV, B-57	**Drilling method:** Mud Rotary
Installation date: 11/07/94	**Completion date:** 11/08/94	**Well development date:** N/A
Casing ID: N/A	**Screened int.:** N/A	**Total depth:** 102ft.
TOC elev.: ft.	**Monitor instrument/OVD type:** Porta-FID	**Initial depth to ∇** ft.
		Geologist: Jeff Tarr

Depth (ft.)	Headspace Field GC BTEX (ppb)	Sample	Recovery	Headspace (ppm)	Geologic Description and Remarks	Lithologic symbol	Soil class.	Blows/6-in.
59	ND		100%	ND	(80-82') SILTY-SAND: Brown to light brown, fine grained, poorly graded, loose to medium dense, trace of green clay. Hydropunch groundwater sample analyzed at 80'.		SC	3,3,10,22
64							SM	
69	ND		40%	ND	(70-72') CLAYEY-SAND: Light brown with green clay, fine to medium grained, very dense, well-washed, poorly graded.		SC	48,100,STOP
74								
79	ND		60%	ND	(80-82') SAND: Light brown, fine to medium grained, poorly graded, dense to very dense with traces of blue-green clay. Hydropunch groundwater sample analyzed at 80'.		SP	7,27,50,50 (2")
84								
89	ND		40%	ND	(90-92') SAND: Light brown to bluish-green to gray, medium to coarse grained sand, trace silt and clay, very dense.		GC	54,88,100,STOP
94								
99	ND		100%	ND	(100-101') SILTY-CLAY: Green, slightly plastic, soft to medium stiff with trace quartz and phosphates. Hydropunch groundwater sample analyzed at 100'.		CL	4,4,8,8
104								

Project: NAS Cecil Field **Technical Memorandum**		**Hydropunch I.D.:** HP-9	
Site: North Fuel Farm Deep Plume		**Client:** SOUTHNAVFACENGCOM	**Project no.:** 08518.41
Drilling contractor: Alliance Environmental Services, Inc.		**Drill rig:** ATV, B-57	**Drilling method:** Mud Rotary
Installation date: 11/08/84	**Completion date:** 11/08/84	**Well development date:** N/A	
Casing ID: N/A	**Screened int.:** N/A	**Total depth:** 102ft.	**Initial depth to ∇** ft.
TOC elev.: ft.	**Monitor instrument/OVD type:** Porta-FID		**Geologist:** Jeff Tarr

Depth (ft.)	Headspace Field GC BTEX (ppb)	Sample	Recovery	Headspace (ppm)	Geologic Description and Remarks	Lithologic symbol	Soil class.	Blows/6-in.
5							SM	
10	ND		60%	18	(10-12') SAND: Brown, fine grained with silt and organics, loose to medium dense.			15,15,15,21
15								
20	ND		50%	ND	(20-22') SAND: Light brown, fine grained with silt, loose. Hydropunch groundwater sample analyzed at 20'.			3,4,4,7
25								
30	ND		40%	ND	(30-32') SAND: Light gray, fine grained with silt, loose, very porous.			5,5,5,7
35								
40	ND		50%	20	(40-42') SAND: Light brown to light gray, fine grained with silt, very porous, very loose to loose. Hydropunch groundwater sample analyzed at 40'.			2,3,3,4
45								
50	ND		30%	7	(50-52') CLAYEY-SAND: Greenish-gray to light gray, fine grained sand with green clay. (80% sand, 10% clay).		SC	22,44,30,48

Project: NAS Cecil Field **Technical Memorandum**		**Hydropunch I.D.:** HP-8	
Site: North Fuel Farm Deep Plume		**Client:** SOUTHNAVFACENGCOM	**Project no.:** 08518.41
Drilling contractor: Alliance Environmental Services, Inc.		**Drill rig:** ATV, B-57	**Drilling method:** Mud Rotary
Installation date: 11/08/94	**Completion date:** 11/09/94	**Well development date:** N/A	
Casing ID: N/A	**Screened int.:** N/A	**Total depth:** 102ft.	**Initial depth to ∇** ft.
TOC elev.: ft.	**Monitor instrument/OVD type:** Porta-FID		**Geologist:** Jeff Tarr

Depth (ft.)	Headspace Field GC BTEX (ppb)	Sample	Recovery	Headspace (ppm)	Geologic Description and Remarks	Lithologic symbol	Soil class.	Blows/6-in.
59	ND		90%	38	(80-82') CLAYEY-SAND: Light brown, fine grained with trace clay to 81'. 81-82' is greenish-gray clayey sand, dense to very dense sand medium stiff clay. Hydropunch groundwater sample analyzed at 80'.		SC	8,19,58,50
64								
69	ND		70%	18	(70-72') CLAYEY-SAND: Greenish-gray, medium grained sand with coarse grained quartz, trace silt, very dense.			14,34,80,90 (2")
74								
79	3.2		100%	ND	(80-82') SAND: Light brown, medium to fine grained with some coarse grains, well graded, loose, subrounded to rounded. Hydropunch groundwater sample analyzed at 80'.		SW	8,10,15,28
84								
89	1.8		90%	N/A	(90-92') SAND: Brown to greenish-gray, coarse grained to medium grained with some fines, trace clay, very dense.		GC	24,30,70,120
94								
99	<1		90%	ND	(100-102') SILTY-CLAY: Greenish-gray, stiff, low to medium plasticity with poor porosity and permeability. Hydropunch groundwater sample analyzed at 100'.		CL	4,7,10,14
104								

Project: NAS Cecil Field **Technical Memorandum**	**Hydropunch ID:** HP-14	
Site: North Fuel Farm Deep Plume	**Client:** SOUTHNAVFACENGCOM	**Project no.:** 08518.41
Drilling contractor: Alliance Environmental Services, Inc.	**Drill rig:** ATV, B-57	**Drilling method:** Mud Rotary
Installation date: 10/25/94	**Completion date:** 10/28/94	**Well development date:** N/A
Casing ID: N/A	**Screened int.:** N/A	**Total depth:** 82ft.
TOC elev.: ft.	**Monitor instrument/OVD type:** Porta-FID	**Geologist:** Jeff Tarr

Depth (ft.)	Headspace Field GC BTEX (ppb)	Sample	Recovery	Headspace (ppm)	Geologic Description and Remarks	Lithologic symbol	Soil class.	Blows/6-in.
10	ND		50%	ND	(10-12') SILTY-SAND: Light brown to yellow-orange, very fine to fine grained, loose.		SM	5,6,7,8
20	ND		100%	ND	(20-22') SILTY-SAND: Light brown to yellow-orange, very fine to fine grained, loose. Hydropunch groundwater sample analyzed at 20'.			4,5,6,7
30	ND		40%	ND	(30-32') SILTY-SAND: Light brown to light gray, very fine to fine grained, dense, poorly graded.			18,32,43,45
40	ND		80%	ND	(40-42') SILTY-SAND: Light brown, very fine to fine grained, very loose, poorly graded. Hydropunch groundwater sample analyzed at 40'.			3,2,4,7
50	ND		30%	ND	(50-52') SILTY-SAND: Light gray to greenish-gray, very fine to fine grained, very dense. Traces of green clay.			22,80,100

Project: NAS Cecil Field **Technical Memorandum**		**Hydropunch I.D.:** HP-14	
Site: North Fuel Farm Deep Plume		**Client:** SOUTHNAVFACENGCOM	**Project no.:** 08518.41
Drilling contractor: Alliance Environmental Services, Inc.		**Drill rig:** ATV, B-57	**Drilling method:** Mud Rotary
Installation date: 10/25/94	**Completion date:** 10/26/94	**Well development date:** N/A	
Casing ID: N/A	**Screened int.:** N/A	**Total depth:** 921t.	**Initial depth to ▽** 1t.
TOC elev.: 1t.	**Monitor instrument/OVD type:** Porta-FID		**Geologist:** Jeff Tarr

Depth (ft.)	Headspace Field GC BTEX (ppb)	Sample	Recovery	Headspace (ppm)	Geologic Description and Remarks	Lithologic symbol	Soil class.	Blows/6-in.
59	ND		40%	4	(80-82') SILTY-SAND: Light brown to greenish-gray, very fine to fine grained, with traces of green clay, medium dense. Hydropunch groundwater sample analyzed at 59'.		SM	15,18,22,30
64								
69	N/A		20%	5	(70-72') CLAYEY-SAND: Light gray sand with green clay, fine grained sand with silt, very dense sand and stiff clay.		SC	50,90,50 (1")
74								
79	N/A		80%	ND	(80-82') CLAYEY-SAND: Light gray to greenish-gray, fine to medium grained, medium dense sand, very soft green clay stringers, traces of large quartz. Hydropunch groundwater sample analyzed at 80'.			10,20,28,30
84								
89	N/A		40%	2	(90-91') SAND: Light brown to greenish-gray, coarse grained sand to fine grained gravel. (91-92') CLAYEY-SAND: Greenish-gray to light gray with very large quartz gravel, very dense. (100-102') NO SAMPLE COLLECTED. Hydropunch groundwater sample analyzed at 98'.		GC	40,80,100,STOP
94								
98	N/A		N/A	N/A				N/A
104								

Project: NAS Cecil Field **Technical Memorandum**	**Hydropunch I.D.:** HP-15	
Site: North Fuel Farm Deep Plume	**Client:** SOUTHNAVFACENGCOM	**Project no.:** 08518.41
Drilling contractor: Alliance Environmental Services, Inc.	**Drill rig:** ATV, B-57	**Drilling method:** Mud Rotary
Installation date: 11/03/84	**Completion date:** 11/04/84	**Well development date:** N/A
Casing ID: N/A	**Screened Int.:** N/A	**Total depth:** 921t.
TOC elev.: ft.	**Monitor instrument/OVD type:** Porta-FID	**Initial depth to ▽** ft.
		Geologist: Jeff Tarr

Depth (ft.)	Headspace Field GC BTEX (ppb)	Sample	Recovery	Headspace (ppm)	Geologic Description and Remarks	Lithologic symbol	Soil class.	Blows/6-in.
5							SM	
10	ND		80%	ND	(10-12') SILTY-SAND: Dark brown, very fine to fine grained, medium dense, with trace organics.			8,17,17,17
15								
20	ND		100%	3	(20-22') SILTY-SAND: Light brown, very fine to fine grained, loose. Hydropunch groundwater sample analyzed at 20'.			3,2,3,2
25								
30	ND		50%	2	(30-32') SILTY-SAND: Light brown, very fine to fine grained, very dense sand with trace green clay.			17,40,110,STOP
35								
40	N/A		50%	ND	(40-42') SILTY-SAND: Light brown to light gray with traces of green clay. Hydropunch groundwater sample analyzed at 40'.			N/A
45								
50	ND		50%	ND	(50-52') SILTY-SAND: Light brown to light gray, very fine to fine grained, very dense with traces of green clay.			18,38,32,48

Project: NAS Cecil Field **Technical Memorandum**	**Hydropunch I.D.:** HP-15	
Site: North Fuel Farm Deep Plume	**Client:** SOUTHNAVFACENGCOM	**Project no.:** 08516.41
Drilling contractor: Alliance Environmental Services, Inc.	**Drill rig:** ATV, B-57	**Drilling method:** Mud Rotary
Installation date: 11/03/94	**Completion date:** 11/04/94	**Well development date:** N/A
Casing ID: N/A	**Screened int.:** N/A	**Total depth:** 821t.
TOC elev.: ft.	**Monitor instrument/OVD type:** Porta-FID	**Initial depth to ∇** ft.
		Geologist: Jeff Tarr

Depth (ft.)	Headspace Field GC BTEX (ppb)	Sample	Recovery	Headspace (ppm)	Geologic Description and Remarks	Lithologic symbol	Soil class.	Blows/6-in.
59	ND		100%	ND	(60-62') SILTY-SAND: Light brown, very fine to fine grained, loose to medium dense. Hydropunch groundwater sample analyzed at 60'.		SM	3,4,8,18
64								
69	ND		70%	ND	(70-72') CLAYEY-SAND: Light brown to greenish-gray, very fine to fine grained sand with green clay stringers, very dense sand and stiff clay (90% sand, 10% clay).		SC	50,78,52,90
74								
79	ND		100%	ND	(80-82') SAND: Light brown, medium to fine grained, poorly graded, medium dense to loose. Hydropunch groundwater sample analyzed at 80'.		SP	3,8,11,17
84								
89	6.9		50%	ND	(90-92') SAND: Light brown to greenish-gray, coarse grained sand to fine grained gravel, well graded, dense, trace fines. (100-102') NO SAMPLE COLLECTED. Hydropunch groundwater sample analyzed at 100'.		GW	40,87,100,STOP
94								
99	N/A		N/A	N/A				N/A
104								

TITLE: Cecil Field, North Fuel Farm	**LOG of WELL:** CEF 076-28D	**BORING NO.**
CLIENT: SOUTHNAVFACENGCOM		**PROJECT NO:** 7525-20
CONTRACTOR: National Petroleum Testing Consultants, Inc.	**DATE STARTED:** 8/08/91	**COMPLTD:** 8/08/91
METHOD: HSA	**CASE SIZE:** 2 Inch	**SCREEN INT.:** 80' to 90'	**PROTECTION LEVEL:** D
TOC ELEV.: 77.77 FT.	**MONITOR INST.:**	**TOT DPTH:** 90FT.	**DPTH TO ▽** 2.99 FT.
LOGGED BY: J. Koch	**WELL DEVELOPMENT DATE:** 8/09/91		**SITE:** NAS Cecil, North Fuel Farm

DEPTH FT.	LABORATORY SAMPLE ID.	SAMPLE	RECOVERY	HEADSPACE (ppm)	SOIL/ROCK DESCRIPTION AND COMMENTS	LITHOLOGIC SYMBOL	SOIL CLASS	BLOWS/6-IN	WELL DATA
15			70%	G.C.	SAND: light brown, fine grain		SP		
20			70%	G.C.	SAND: light brown, fine grain				
25			40%	G.C.	SAND: light brown, fine grain				
30			50%	G.C.	SAND: light brown, fine grain				
35			50%	G.C.	SAND: light brown to gray - green, fine grain				
40			50%	G.C.	SAND: gray - green, fine grain				
45			60%	G.C.	SAND: gray - green, fine grain				
50			50%	G.C.	SAND: gray - green, fine grain				
55			40%	G.C.	CLAYEY SAND: gray - green, fine grain		SC		
60			50%	G.C.	CLAYEY SAND: gray - green, fine grain				
65			50%	G.C.	CLAYEY SAND: gray - green, fine grain				
70			50%	G.C.	CLAYEY SAND: gray - green, fine grain				
75			60%	G.C.	CLAYEY SAND: gray - green, fine grain				
90			70%	G.C.	CLAYEY SAND: gray - green, fine grain, shell fragments				

TITLE: NAS Cecil Field North Fuel Farm Area		**LOG of WELL:** CEF-076-39D	**BORING NO.**
CLIENT: SOUTHNAVFACENGCOM			**PROJECT NO:** 08518.40
CONTRACTOR: None		**DATE STARTED:** 05/10/94	**COMPLTD:** 05/10/94
METHOD: Hollow Stem Auger	**CASE SIZE:** 8 in./2 in.	**SCREEN INT.:** 55.0-65.0 ft.	**PROTECTION LEVEL:** D
TOC ELEV.: FT.	**MONITOR INST.:** Porta FID	**TOT DPTH:** 65.0FT.	**DPTH TO ▽** 4 * FT.
LOGGED BY: J. Tarr	**WELL DEVELOPMENT DATE:**		**SITE:** North Fuel Farm

DEPTH FT.	LABORATORY SAMPLE ID.	SAMPLE	RECOVERY	HEADSPACE (ppm)	SOIL/ROCK DESCRIPTION AND COMMENTS	LITHOLOGIC SYMBOL	SOIL CLASS	BLOWS/6-IN	WELL DATA
5			60%	12	SAND: Brown-black, fine grained, very dense, poorly graded, no petroleum odor.		SM	17,35,37,37	
10			60%	8	SAND: Brown-black, fine grained, poorly graded with some gravels, no petroleum odor.		SP	5,10,21,33	
15			50%	12	SAND: Brown, fine grained, poorly graded, no petroleum odor.		SM	8,11,17,17	
20			50%	20	SAND: Greenish-brown, fine grained, poorly graded, slight petroleum odor.			8,9,10,11	
25					* = approximate depth				

 ABB ENVIRONMENTAL SERVICES, INC.

TITLE: NAS Cecil Field North Fuel Farm Area		**LOG of WELL:** CEF-076-39D	**BORING NO.**
CLIENT: SOUTHNAVFACENGCOM			**PROJECT NO:** 08518.40
CONTRACTOR: None		**DATE STARTED:** 05/10/94	**COMPLTD:** 05/10/94
METHOD: Hollow Stem Auger	**CASE SIZE:** 6 In./2 In.	**SCREEN INT.:** 55.0-65.0 ft.	**PROTECTION LEVEL:** D
TOC ELEV.: FT.	**MONITOR INST.:** Porta FID	**TOT DPTH:** 65.0FT.	**DPTH TO ▽** 4 * FT.
LOGGED BY: J. Tarr	**WELL DEVELOPMENT DATE:**		**SITE:** North Fuel Farm

DEPTH FT.	LABORATORY SAMPLE ID.	SAMPLE	RECOVERY	HEADSPACE (ppm)	SOIL/ROCK DESCRIPTION AND COMMENTS	LITHOLOGIC SYMBOL	SOIL CLASS	BLOWS/6-IN	WELL DATA
					Continued from PAGE 1				
			70%	28	SAND: Greenish-gray, fine grained, well washed, poorly graded, slight hydrocarbon odor.		SM	8,12,15,23	
30			0%	NA	No sample recovery.			28,>50 (4")	
35			0%	NA	No sample recovery.			48,>50 (3")	
40			20%	90	SAND: Traces of thin clay stringers, greenish-gray, very dense, fine grained, poorly graded, sand 98%, clay 2%.			30,>50 (2")	
45			20%	45	SAND: Greenish-gray with occasional clay nodules, fine grained, poorly graded, very dense.			42,>50 (3")	
50					* = approximate depth				

 ABB ENVIRONMENTAL SERVICES, INC.

TITLE: NAS Cecil Field North Fuel Farm Area		**LOG of WELL:** CEF-076-39D	**BORING NO.**
CLIENT: SOUTHNAVFACENGCOM			**PROJECT NO:** 08518.40
CONTRACTOR: None		**DATE STARTED:** 05/10/94	**COMPLTD:** 05/10/94
METHOD: Hollow Stem Auger	**CASE SIZE:** 8 In./2 In.	**SCREEN INT.:** 55.0-65.0 ft.	**PROTECTION LEVEL:** D
TOC ELEV.: FT.	**MONITOR INST.:** Porta FID	**TOT DPTH:** 65.0FT.	**DPTH TO ▽** 4 * FT.
LOGGED BY: J. Tarr	**WELL DEVELOPMENT DATE:**		**SITE:** North Fuel Farm

DEPTH FT.	LABORATORY SAMPLE ID.	SAMPLE	RECOVERY	HEADSPACE (ppm)	SOIL/ROCK DESCRIPTION AND COMMENTS	LITHOLOGIC SYMBOL	SOIL CLASS	BLOWS/6-IN	WELL DATA
					Continued from PAGE 2				
			20%	280	SAND: Greenish-gray with minor clay nodules, fine grained, dense sand with medium ggrained quartz grains, sand 98%, clay 2%.		SM	19,42,>50	
55			50%	1300	CLAYEY SAND: Greenish-gray, fine grained, dense sand with soft, plastic clay, stong hydrocarbon odor, sand 80%, clay 20%.		SC	1,4,30,42	
60			50%	1200	CLAYEY SAND: Greenish gray, fine grained dense sand with soft, plastic clay, strong hydrocarbon odor, sand 80%, clay 20%.			11,49,>50	
65									
70					* = approximate depth				
75									

 ABB ENVIRONMENTAL SERVICES, INC.

TITLE: NAS Cecil Field North Fuel Farm Area		**LOG of WELL:** CEF-076-40D	**BORING NO.**
CLIENT: SOUTHNAVFACENGCOM			**PROJECT NO:** 08516.40
CONTRACTOR: None		**DATE STARTED:** 05/11/94	**COMPLTD:** 05/14/94
METHOD: Hollow Stem Auger	**CASE SIZE:** 2 In./8 In.	**SCREEN INT.:** 45.0-55.0 ft.	**PROTECTION LEVEL:** D
TOC ELEV.: FT.	**MONITOR INST.:** Porta FID	**TOT DPTH:** 55.0FT.	**DPTH TO ▽** 4 * FT.
LOGGED BY: J. Tarr	**WELL DEVELOPMENT DATE:**		**SITE:** North Fuel Farm

DEPTH FT.	LABORATORY SAMPLE ID.	SAMPLE	RECOVERY	HEADSPACE (ppm)	SOIL/ROCK DESCRIPTION AND COMMENTS	LITHOLOGIC SYMBOL	SOIL CLASS	BLOWS/6-IN	WELL DATA
5			80%	13	SAND: Dark brown-black, fine grained, very dense, poorly graded.		SM	17,40,43,45	
10			50%	7	SAND: Light brown, fine grained with silt, very dense, poorly graded.			12,33,>50 (4")	
15			60%	13	SAND: Light brown, fine grained, poorly graded, medium dense, no hydrocarbon odor.			9,9,11,15	
20			90%	13	SAND: Light brown, fine grained, poorly graded, medium dense, well washed, slight hydrocarbon odor, trace of green clay nodules.			17,20,25,25	
25					* = approximate depth		SP		

TITLE: NAS Cecil Field North Fuel Farm Area		**LOG of WELL:** CEF-076-40D	**BORING NO.**
CLIENT: SOUTHNAVFACENGCOM			**PROJECT NO:** 08516.40
CONTRACTOR: None		**DATE STARTED:** 05/11/94	**COMPLTD:** 05/14/94
METHOD: Hollow Stem Auger	**CASE SIZE:** 2 In./8 In.	**SCREEN INT.:** 45.0-55.0 ft.	**PROTECTION LEVEL:** D
TOC ELEV.: FT.	**MONITOR INST.:** Porta FID	**TOT DPTH:** 55.0FT.	**DPTH TO ▽** 4 * FT.
LOGGED BY: J. Tarr	**WELL DEVELOPMENT DATE:**		**SITE:** North Fuel Farm

DEPTH FT.	LABORATORY SAMPLE ID.	SAMPLE	RECOVERY	HEADSPACE (ppm)	SOIL/ROCK DESCRIPTION AND COMMENTS	LITHOLOGIC SYMBOL	SOIL CLASS	BLOWS/6-IN	WELL DATA
					Continued from PAGE 1				
			90%	7	SAND: Top 1.5 ft brown, mg with some fg, poorly graded, very well washed. Bottom .5 ft greenish-gray, no hydrocarbon odor.		SP	13,23,30,45	
30			50%	4	SAND: Brown, fine grained, poorly graded, very well washed, very dense, no hydrocarbon odor.		SM	17,35,>50	
35			<5%	ND	SAND: Brown, fine grained with silt, very dense, hard, well washed, poorly graded.			28,>50 (3")	
40			40%	32	SAND: Light gray, fine grained, well washed, poorly graded, very dense with hydrocarbon odor.			30,50,>50 (1")	
45			30%	120	SAND: Light gray, fine grained, well washed, poorly graded, very dense with strong hydrocarbon odor.			19,48,>50 (4")	
50					* = approximate depth				

 ABB ENVIRONMENTAL SERVICES, INC.

TITLE: NAS Cecil Field North Fuel Farm Area		**LOG of WELL:** CEF-076-40D	**BORING NO.**
CLIENT: SOUTHNAVFACENGCOM			**PROJECT NO:** 08518.40
CONTRACTOR: None		**DATE STARTED:** 05/11/94	**COMPLTD:** 05/14/94
METHOD: Hollow Stem Auger	**CASE SIZE:** 2 In./8 In.	**SCREEN INT.:** 45.0-55.0 ft.	**PROTECTION LEVEL:** D
TOC ELEV.: FT.	**MONITOR INST.:** Porta FID	**TOT DPTH:** 55.0FT.	**DPTH TO ▽** 4 * FT.
LOGGED BY: J. Tarr	**WELL DEVELOPMENT DATE:**		**SITE:** North Fuel Farm

DEPTH FT.	LABORATORY SAMPLE ID.	SAMPLE	RECOVERY	HEADSPACE (ppm)	SOIL/ROCK DESCRIPTION AND COMMENTS	LITHOLOGIC SYMBOL	SOIL CLASS	BLOWS/6-IN	WELL DATA
					Continued from PAGE 2				
			20%	5	SAND: Light gray, fine grained, well washed, poorly graded, very dense with no hydrocarbon odor.		SM	18,>50 (4")	
55			40%	180	CLAYEY-SAND: Greenish-gray, sand is very dense with soft, plastic clay, hydrocarbon odor.		SC	7,14,25,25	
60									
65									
70									
75									

* = approximate depth

 ABB ENVIRONMENTAL SERVICES, INC.

TITLE: NAS Cecil Field North Fuel Farm Area		**LOG of WELL:** CEF-076-41D	**BORING NO.**
CLIENT: SOUTHNAVFACENGCOM			**PROJECT NO:** 08516.40
CONTRACTOR: None		**DATE STARTED:** 05/11/94	**COMPLTD:** 05/13/94
METHOD: Hollow Stem Auger	**CASE SIZE:** 6 in./2 in.	**SCREEN INT.:** 108.5-118.5 ft.	**PROTECTION LEVEL:** D
TOC ELEV.: FT.	**MONITOR INST.:** Porta FID	**TOT DPTH:** 118.5FT.	**DPTH TO ▽** 4 * FT.
LOGGED BY: J. Tarr	**WELL DEVELOPMENT DATE:**		**SITE:** North Fuel Farm

DEPTH FT.	LABORATORY SAMPLE ID.	SAMPLE	RECOVERY	HEADSPACE (ppm)	SOIL/ROCK DESCRIPTION AND COMMENTS	LITHOLOGIC SYMBOL	SOIL CLASS	BLOWS/6-IN	WELL DATA
5			60%	ND	SAND: Dark brown-black, fine grained, very dense.		SM	7,12,13,34	
10			40%	ND	SAND: Light brown, fine grained, loose-medium dense sand, poorly graded.			4,5,11,17	
15			50%	8	SAND: Light brown-green, fine grained, loose-medium dense, poorly graded, slight hydrocarbon odor.			5,5,8,11	
20			50%	3	SAND: Light brown-green/gray, fine grained, loose-medium dense, poorly graded, slight hydrocarbon odor.			3,7,11,14	
25					* = approximate depth				

 ABB ENVIRONMENTAL SERVICES, INC.

TITLE: NAS Cecil Field North Fuel Farm Area		**LOG of WELL:** CEF-076-41D	**BORING NO.**
CLIENT: SOUTHNAVFACENGCOM			**PROJECT NO:** 08518.40
CONTRACTOR: None		**DATE STARTED:** 05/11/94	**COMPLTD:** 05/13/94
METHOD: Hollow Stem Auger	**CASE SIZE:** 8 In./2 In.	**SCREEN INT.:** 108.5-118.5 ft.	**PROTECTION LEVEL:** D
TOC ELEV.: FT.	**MONITOR INST.:** Porta FID	**TOT DPTH:** 118.5FT.	**DPTH TO ▽** 4 * FT.
LOGGED BY: J. Tarr	**WELL DEVELOPMENT DATE:**		**SITE:** North Fuel Farm

DEPTH FT.	LABORATORY SAMPLE ID.	SAMPLE	RECOVERY	HEADSPACE (ppm)	SOIL/ROCK DESCRIPTION AND COMMENTS	LITHOLOGIC SYMBOL	SOIL CLASS	BLOWS/6-IN	WELL DATA
					Continued from PAGE 1				
			50%	5	SAND: Light brown-green/gray, fine grained, medium dense, well washed, poorly graded.		SM	8,12,24,40	
30			90%	10	SAND: Top half brown, bottom half greenish-gray, fine grained, well washed, poorly graded, hydrocarbon odor.			14,24,44,45	
35			50%	8	SAND: Light brown, fine grained, well washed, poorly graded, no hydrocarbon odor.			17,22,>50 (4")	
40			0%	NA	Unable to obtain sample. Appears to be sand, fine grained, greenish- gray.			20,>50 (4")	
45			90%	90	SAND: Greenish-gray, fine grained, well washed, poorly graded, very dense with strong hydrocarbon odor, possible petroleum stains.			17,20,30,35	
					* = approximate depth				
50									

TITLE: NAS Cecil Field North Fuel Farm Area		**LOG of WELL:** CEF-076-41D	**BORING NO.**
CLIENT: SOUTHNAVFACENGCOM			**PROJECT NO:** 08518.40
CONTRACTOR: None		**DATE STARTED:** 05/11/94	**COMPLTD:** 05/13/94
METHOD: Hollow Stem Auger	**CASE SIZE:** 8 in./2 in.	**SCREEN INT.:** 108.5-118.5 ft.	**PROTECTION LEVEL:** D
TOC ELEV.: FT.	**MONITOR INST.:** Porta FID	**TOT DPTH:** 118.5FT.	**DPTH TO ∇** 4 * FT.
LOGGED BY: J. Tarr	**WELL DEVELOPMENT DATE:**		**SITE:** North Fuel Farm

DEPTH FT.	LABORATORY SAMPLE ID.	SAMPLE	RECOVERY	HEADSPACE (ppm)	SOIL/ROCK DESCRIPTION AND COMMENTS	LITHOLOGIC SYMBOL	SOIL CLASS	BLOWS/6-IN	WELL DATA
					Continued from PAGE 2				
			80%	90	SAND: Light gray, fine grained, well washed, poorly graded, very dense with hydrocarbon odor.		SM	10,25,>50	
55			40%	1200	CLAYEY-SAND: Greenish-gray, sand/clay mixture, very strong hydrocarbon odor.		SC	10,12,20,25	
60			90%	150	CLAYEY-SAND: Gray-green, Mg-Fg, very dense, well washed.			13,43,30,45	
65			40%	370	CLAYEY-SAND: Greenish-gray with clay stringers. Clay is medium stiff, soft sand, Fg-Mg with hydrocarbon odor.			5,12,40,50	
70			40%	80	CLAYEY-SAND: Greenish-gray with clay stringers. Clay is soft with Fg-Mg sand, very dense, hydrocarbon odor.			10,28,>50 (5")	
75					* = approximate depth				

 ABB ENVIRONMENTAL SERVICES, INC.

TITLE: NAS Cecil Field North Fuel Farm Area	**LOG of WELL:** CEF-076-41D		**BORING NO.**
CLIENT: SOUTHNAVFACENGCOM			**PROJECT NO:** 08518.40
CONTRACTOR: None		**DATE STARTED:** 05/11/94	**COMPLTD:** 05/13/94
METHOD: Hollow Stem Auger	**CASE SIZE:** 6 in./2 in.	**SCREEN INT.:** 108.5-118.5 ft.	**PROTECTION LEVEL:** D
TOC ELEV.: FT.	**MONITOR INST.:** Porta FID	**TOT DPTH:** 118.5FT.	**DPTH TO ▽** 4 * FT.
LOGGED BY: J. Tarr	**WELL DEVELOPMENT DATE:**		**SITE:** North Fuel Farm

DEPTH FT.	LABORATORY SAMPLE ID.	SAMPLE	RECOVERY	HEADSPACE (ppm)	SOIL/ROCK DESCRIPTION AND COMMENTS	LITHOLOGIC SYMBOL	SOIL CLASS	BLOWS/6-IN	WELL DATA
					Continued from PAGE 3				
			90%	120	CLAYEY-SAND: Top half light brown, bottom half dark gray, 20% clay, 80% sand, sand very porous Fg-Mg-Cg (mostly Mg), clay is soft plastic, strong hydrocarbon odor.		SC	9,19,27,33	
80			90%	50	CLAYEY-SAND: Contains shell fragments, 18% clay, 80% sand, 2% shells. Sand is dark gray on bottom 1/4 and brown on upper 3/4, mostly Mg with some fines and Cg. Clay is soft, plastic.			1,4	
85			50%	70	SAND, SHELL, CLAY: Greenish-gray clay with Mg-Cg sand with quartz, shell hash, and traces of white calcite. Shell 60%, sand 30%, and clay 10%.		GC	13,25,32,45	
90			50%	12	SAND, CLAY, SHELL: Greenish-gray clay with Mg-Cg sand with quartz, shells (coquina), and white calcite stringers, traces of gray limestone. Shell 60%, sand 20%, and clay 20%.			10,43,50,50	
95			50%	8	CLAY AND SHELL WITH PARTIALLY DOLOMITIZED COQUINA AND LIMESTONE: Greenish-gray to olive gray clay with soft, white calcareous lenses of dolomitised limestone. Dolomite/limestone 40%, clay 30%, coquina 30%.			4,10,28,40	
			50%	8	Same as above except increasing abundance of limestone. Stringers and traces of phosphate. Visible evidence of shell replacement. Limestone is pale yellow, and phosphate grains are sub-rounded to rounded, dark brown to black. Dolomite/limestone 40%, clay 30%, coquina 30%.			24,40,>50 (3")	
100									

TITLE: NAS Cecil Field North Fuel Farm Area		**LOG of WELL:** CEF-076-41D	**BORING NO.**
CLIENT: SOUTHNAVFACENGCOM			**PROJECT NO:** 08516.40
CONTRACTOR: None		**DATE STARTED:** 05/11/94	**COMPLTD:** 05/13/94
METHOD: Hollow Stem Auger	**CASE SIZE:** 6 in./2 in.	**SCREEN INT.:** 108.5-118.5 ft.	**PROTECTION LEVEL:** D
TOC ELEV.: FT.	**MONITOR INST.:** Porta FID	**TOT DPTH:** 118.5FT.	**DPTH TO ∇ 4 * FT.**
LOGGED BY: J. Tarr	**WELL DEVELOPMENT DATE:**		**SITE:** North Fuel Farm

DEPTH FT.	LABORATORY SAMPLE ID.	SAMPLE	RECOVERY	HEADSPACE (ppm)	SOIL/ROCK DESCRIPTION AND COMMENTS	LITHOLOGIC SYMBOL	SOIL CLASS	BLOWS/6-IN	WELL DATA
					Continued from PAGE 4				
			30%	5	CALCAREOUS CLAY WITH SHELLS: 100%. Greenish-gray clay with white calcite stringers. Traces of dolomite and phosphate.		GC	10,38,88,72	
							CL		
105			70%	5	SANDY CLAY: Greenish-gray with trace of shells and dolomite. Clay is slightly plastic and very hard. Clay 80%, sand 18%, shell/dolomite 2%.			7,9,23,50	
110			80%	ND	DOLOMITIC CLAYEY SAND: Greenish-gray to olive gray clay, very hard, pliable, with white calcite stringers, dolomite is pale yellow, hard, dense, well-cemented with some shell fragments visible. Trace of phosphates. Sand 40%, clay 20%, dolomite 18%, calcite 2%.		SC	12,16,47,>50 (5")	
115			50%	28	DOLOMITIC CLAYEY SAND: Same as above except increasing clay content, decreasing dolomite and no calcite. Trace of phosphates. Sand 80%, clay 30%, dolomite 10%.			20,42,>50 (5")	
120					Hit very hard layer, unable to drive split-spoon. Sample should be top of 100% dolomite and/or limestone.				
					* = approximate depth				
125									