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FINAL TECHNICAL MEMORANDUM FOR NO FURTHER ACTION AT POTENTIAL SOURCE OF CONTAMINATION 31 TEMPORARY COLLECTION POINT NAS CECIL FIELD FL

7/1/2000

TETRA TECH NUS INC

Technical Memorandum
for
No Further Action

Potential Source of Contamination 31
Temporary Collection Point

Naval Air Station Cecil Field
Jacksonville, Florida

Southern Division
Naval Facilities Engineering Command
Contract Number N62467-94-D-0888

Contract Task Order 0078

July 2000

Rev. 0
07/00

TECHNICAL MEMORANDUM FOR NO FURTHER ACTION

POTENTIAL SOURCE OF CONTAMINATION 31 TEMPORARY COLLECTION POINT

NAVAL AIR STATION CECIL FIELD JACKSONVILLE, FLORIDA

COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

Submitted to:
Southern Division
Naval Facilities Engineering Command
2155 Eagle Drive
North Charleston, South Carolina 29406

Submitted by:
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CONTRACT NUMBER N62467-94-D-0888
CONTRACT TASK ORDER 0078

JULY 2000

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The professional opinions rendered in this decision document identified as Technical Memorandum for No Further Action, Potential Source of Contamination 31, Naval Air Station Cecil Field, Jacksonville, Florida were developed in accordance with commonly accepted procedures consistent with applicable standards of practice. Decision documents are based on information obtained from others and under the supervision of the signing engineer. If conditions are determined to exist differently than those described in this document, then the undersigned professional engineer should be notified to evaluate the effects of any additional information on this project described in this report.

Mark P. Speranza

Mark Speranza, P.E.
Professional Engineer No. PE0050304

Date: 9/28/00

Mark Speranza

CERTIFICATION OF TECHNICAL
DATA CONFORMITY

The Contractor, Tetra Tech NUS, Inc., hereby certifies that, to the best of its knowledge and belief, the technical data delivered herewith under Contract No. N62467-94-D-0888 are complete and accurate and comply with all requirements of this contract.

DATE: July 14, 2000

NAME AND TITLE OF CERTIFYING OFFICIAL: Mark Speranza, P.E.
Task Order Manager

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ACRONYMS

ABB-ES	ABB Environmental Services, Inc.
AOI	Area of Interest
BaP	Benzo(a)pyrene
BCT	BRAC Cleanup Team
bgs	Below ground surface
BRAC	Base Realignment and Closure
CLEAN	Comprehensive Long-Term Environmental Action Navy
COPC	Contaminant of potential concern
CTO	Contract Task Order
EBS	Environmental Baseline Survey
ELCR	Excess lifetime cancer risk
ER-L	Effects range - low
ER-M	Effects range - medium
ESV	Ecological screening value
FAC	Florida Administrative Code
FDEP	Florida Department of Environmental Protection
GCTL	Groundwater Cleanup Target Level
HI	Hazard index
HLA	Harding Lawson Associates
HQ	Hazard quotient
IBDS	Inorganic Background Data Set
LOAEL	Low observable adverse effects level
mg/kg	Milligram per kilogram
MOE	Ministry of the Environment
NAS	Naval Air Station
NOAA	National Oceanic and Atmospheric Administration
NOAEL	No observable adverse effects level
OU	Operable Unit
PAH	Polynuclear aromatic hydrocarbon
PEC	Probable effects concentration
PEL	Probable effects level
PRE	Preliminary risk evaluation
PSC	Potential source of contamination
QA/QC	Quality assurance/quality control
RAC	Remedial action contractor

RI	Remedial Investigation
SAR	Sampling and Analysis Report
SCTL	Soil Cleanup Target Level
SOUTHNAVFACENGCOM	Southern Division Naval Facilities Engineering Command
TEC	Threshold effects concentration
TEL	Threshold effects level
TRV	Toxicity reference value
TtNUS	Tetra Tech NUS, Inc.
UET	Upper effects threshold
U.S. EPA	United States Environmental Protection Agency

1.0 INTRODUCTION

This Technical Memorandum for Potential Source of Contamination (PSC) 31, Temporary Collection Point, at Naval Air Station (NAS) Cecil Field, has been prepared by Tetra Tech NUS, Inc. (TtNUS) for the Department of the Navy Southern Division, Naval Facilities Engineering Command (SOUTHNAVFACENGCOM). The work was conducted under the Comprehensive Long-Term Environmental Action Navy (CLEAN) Program, Contract Number N62467-94-D-0888, Contract Task Order (CTO) 0078. The Base Realignment and Closure (BRAC) Cleanup Team (BCT) has elected to delineate, excavate, and dispose of soil at PSC 31 that is contaminated with polynuclear aromatic hydrocarbons (PAHs), specifically benzo(a)pyrene (BaP).

TtNUS performed four sampling events at PSC 31 between April and October 1999 to supplement the results of previous investigations and to delineate the extent of PAH-contaminated soil. The results of these field investigations were used to develop a Dig and Haul Package (remedial design plan) for a removal action consisting of soil excavation and off-site disposal of the PAH-contaminated soil.

This technical memorandum presents information from the previous investigations, and summarizes the related field operations, results, conclusions, and recommendations of the PSC investigation conducted by TtNUS during 1999 and the activities related to the removal action as described in the Source Removal Report for PSC 31 (CH2M Hill, 2000). The results of the investigations and the subsequent removal action indicate that no further action is needed at this site.

2.0 SITE DESCRIPTION

2.1 PHYSICAL SETTING

PSC 31 was formerly referred to in the BRAC NAS Cecil Field Environmental Baseline Survey (EBS) (ABB-ES, 1994) as Area of Interest (AOI) 31 - South Temporary Collection Point. PSC 31 is located off 1st Street, within the restricted area of the east-west flightline of NAS Cecil Field Main Base. It is southwest of Hangar 860 and north of Building 868, at the western end of the flightline taxiway as shown on Figures 2-1 and 2-2. A nearby drainage ditch and pond are located to the west of PSC 31.

2.2 SITE HISTORY

PSC 31 was previously used as a staging area for hazardous wastes generated in Hangar 860. These wastes were temporarily collected in this area before they were picked up for disposal. During the EBS (ABB-ES, 1994), a temporary hazardous waste storage shelter was discovered in the area of the previous hazardous waste collection point. Although there were no signs of stressed vegetation in the area during the EBS, the vegetation was reportedly stressed when the area was used as a hazardous waste collection point.

2.3 SITE GEOLOGY AND HYDROGEOLOGY

PSC 31 is located between Operable Unit (OU) 3, Site 7 and Site 37. No site-specific subsurface investigation was performed. The geological and hydrogeological characteristics of the site are assumed to be similar to those described in the Remedial Investigation (RI) Reports for OU 3, Sites 7 and 8 (ABB-ES, 1997) and OU9, Sites 36 and 37 (TtNUS, 1999).

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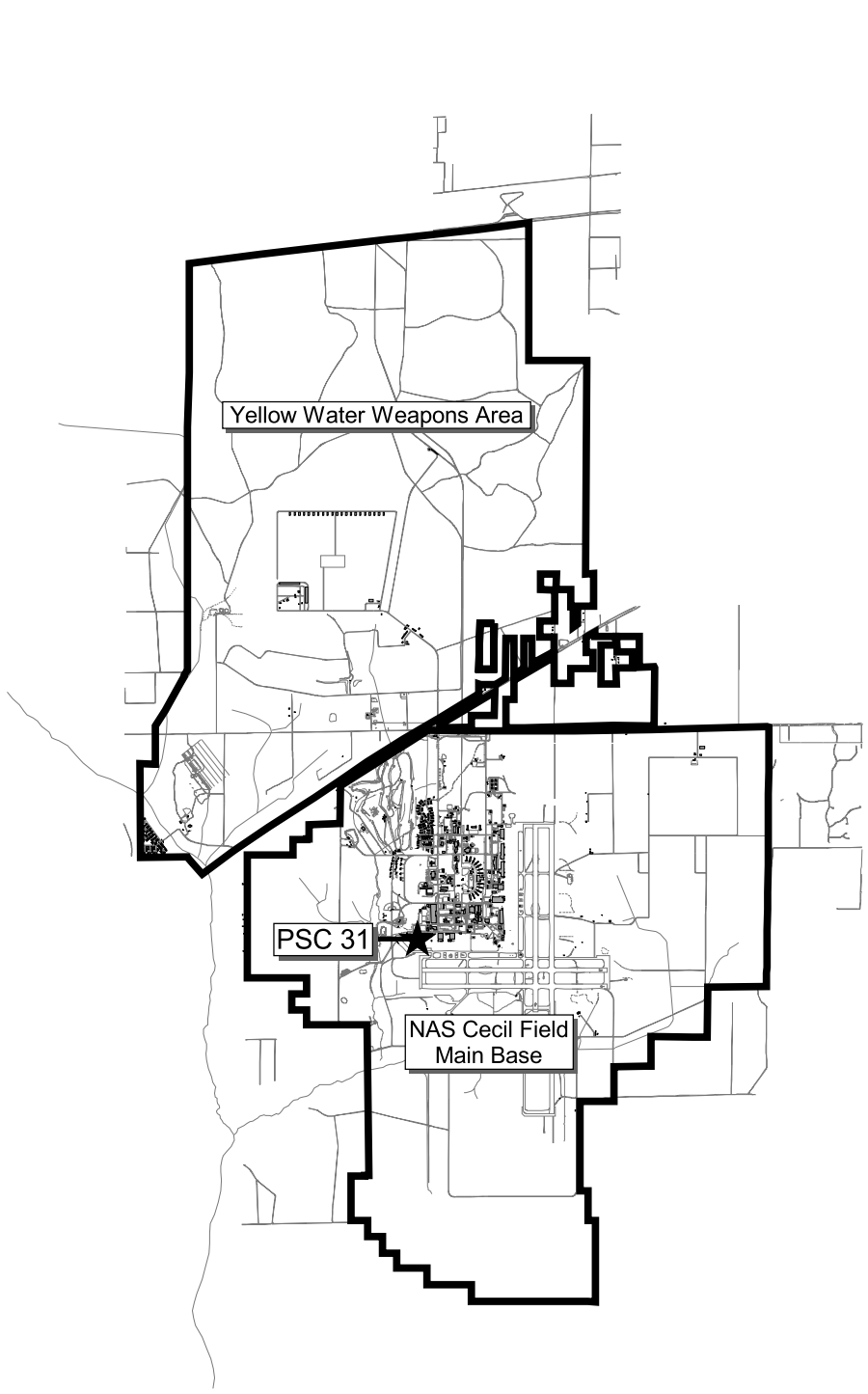

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COST/SCHEDULE-AREA			APPROVED BY DATE
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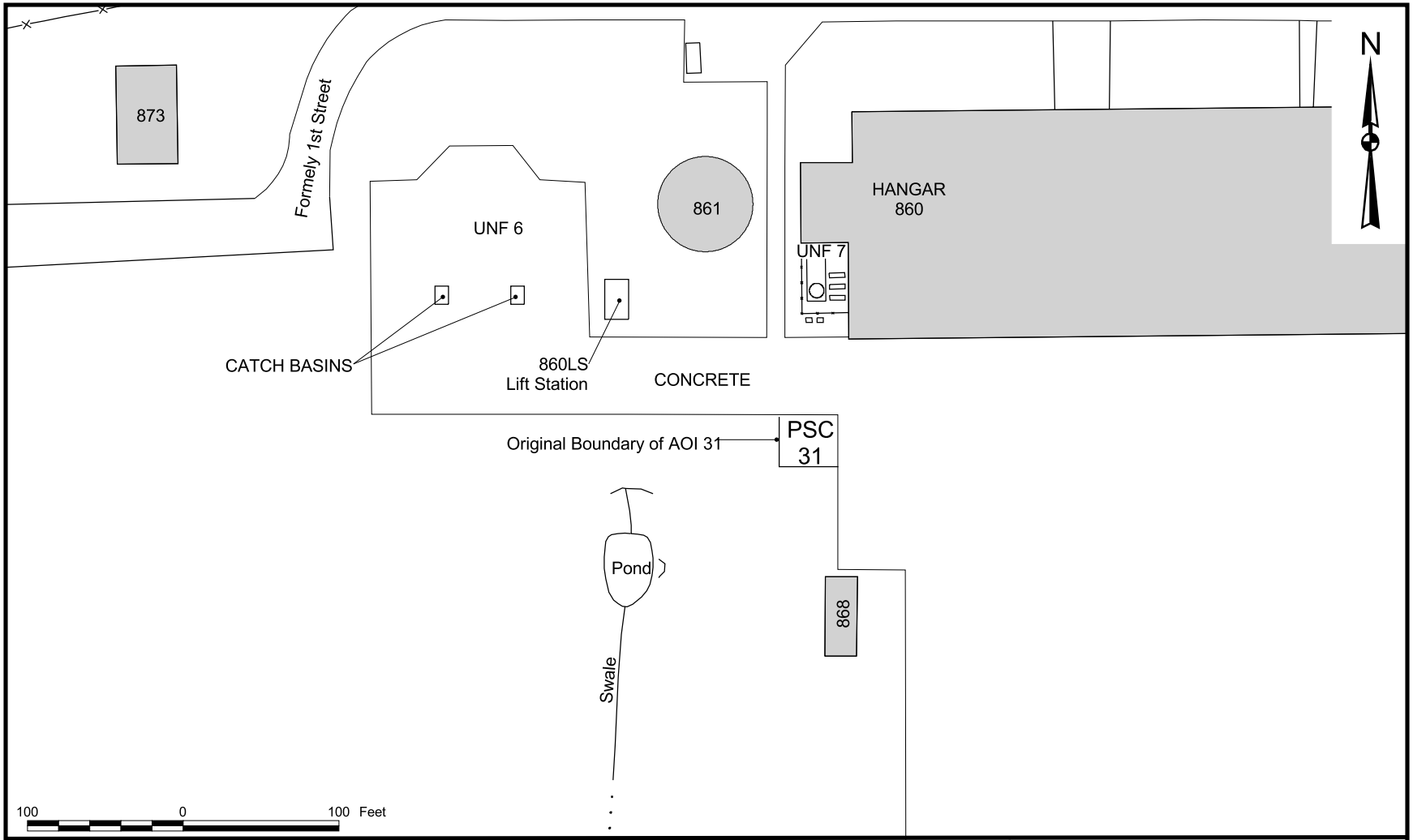

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3.0 PREVIOUS INVESTIGATIONS

Environmental investigations at PSC 31 (formerly AOI 31) began in 1993 as part of a base-wide EBS. The following reports describe the results of investigations conducted prior to the TtNUS investigation at this site:

- EBS Report (ABB-ES, 1994)
- Sampling and Analysis Report (SAR), Area of Interest 31 (HLA, 1999)

A summary of sampling locations and analytical data from the previous investigations is shown on Figure 3-1. The SAR (HLA, 1999) indicated the following:

- Although several organic compounds, pesticides, and inorganic analytes were detected in soil samples collected in the study area, only BaP was detected at a concentration in excess of the Florida Department of Environmental Protection (FDEP) Soil Cleanup Target Level (SCTL) for residential exposure.

- Elevated concentrations of BaP in surface soil could represent a potential hazard to human health or the environment under a residential land-use scenario. Therefore, the color code for this site was Yellow.

- The human health preliminary risk evaluation (PRE) calculated an excess lifetime cancer risk of 6.0×10^{-6} for the detected BaP concentration, using a residential surface soil exposure scenario.

- Further evaluation was is recommended to delineate the extent of elevated benzo(a)pyrene concentrations in surface soil at the site. Further evaluation of surface water and sediment in the drainage ditch to the west of the site was also recommended.

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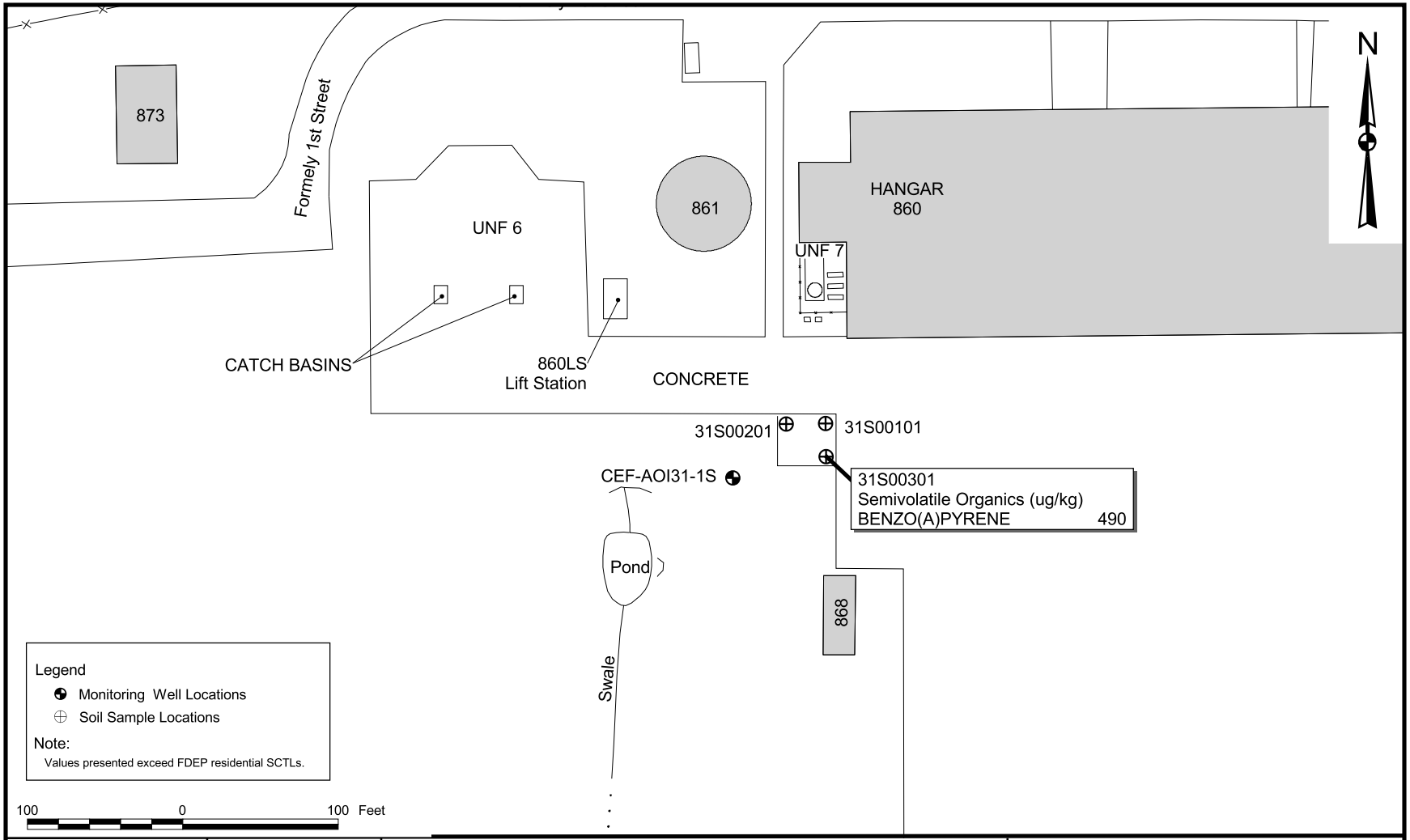

DRAWN BY MJJ	DATE 29Jun00	SAMPLE LOCATIONS AND ANALYTICAL DATA FROM PREVIOUS INVESTIGATIONS PSC 31 - TEMPORARY COLLECTION POINT TECHNICAL MEMORANDUM NAVAL AIR STATION CECIL FIELD JACKSONVILLE, FLORIDA	CONTRACT NUMBER 0039
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4.0 FIELD INVESTIGATIONS

The TtNUS field investigation at PSC 31, Temporary Collection Point, was performed in four phases. The objective of these sampling activities was to delineate PAH contamination that exceeded FDEP SCTLs and to resample previous locations where the data reflected elevated laboratory detection limits for PAHs in excess of the FDEP SCTLs.

Phase I sampling and analysis of soil, sediment, and surface water was performed in April and May 1999 and consisted of collection of the following.

- Four surface soil samples were collected from a 0- to 1-foot depth interval to identify the horizontal extent of contamination and one soil sample was collected from a 1- to 2-foot depth interval at the former location (31S00301) of the BaP detection to identify the vertical extent of contamination. One of the surface soil samples was collected at a point 15 feet south of the original BaP detection to delineate extent in the southward direction.

- Two of the surface soil samples were collected to resample locations where previous samples were analyzed by a method with an elevated detection limit.

- Two sediment samples and one surface water sample were collected from the nearby ditch and pond to the southwest to investigate that contaminant migration pathway.

Phase II sampling and analysis of soil and sediment was performed in June and July 1999 and included the following.

- Two surface soil samples were collected from a 0- to 1-foot depth interval at locations 15 feet south and 15 feet west of the Phase I sample CEF-P31-SS-004. In addition, one surface soil sample was collected from a 0- to 1-foot depth interval at a location 15 feet west of Phase I sample CEF-P31-SS-002.

- One subsurface soil sample was collected from a 2- to 3-foot depth interval from the CEF-P31-SS-001 location. This location was chosen because it had the highest detected concentration of benzo(a)pyrene, and the depth was chosen because a 1- to 2-foot interval sample from a nearby location also had a benzo(a)pyrene concentration in excess of the FDEP criteria.

- Two sediment samples were collected from the ditch and pond in the southwestern portion of the site at locations 15 feet north and 15 feet south of the Phase I sample CEF-P31-SD-001.

Phase III sampling and analysis of soil was performed in August 1999 and consisted of collection of the following.

- Two surface soil samples were collected from a 0- to 1-foot depth interval at locations approximately 15 feet south and 15 feet west of the Phase II sample CEF-P31-SS-102.

Phase IV sampling and analysis of soil was performed in October 1999 and included the following.

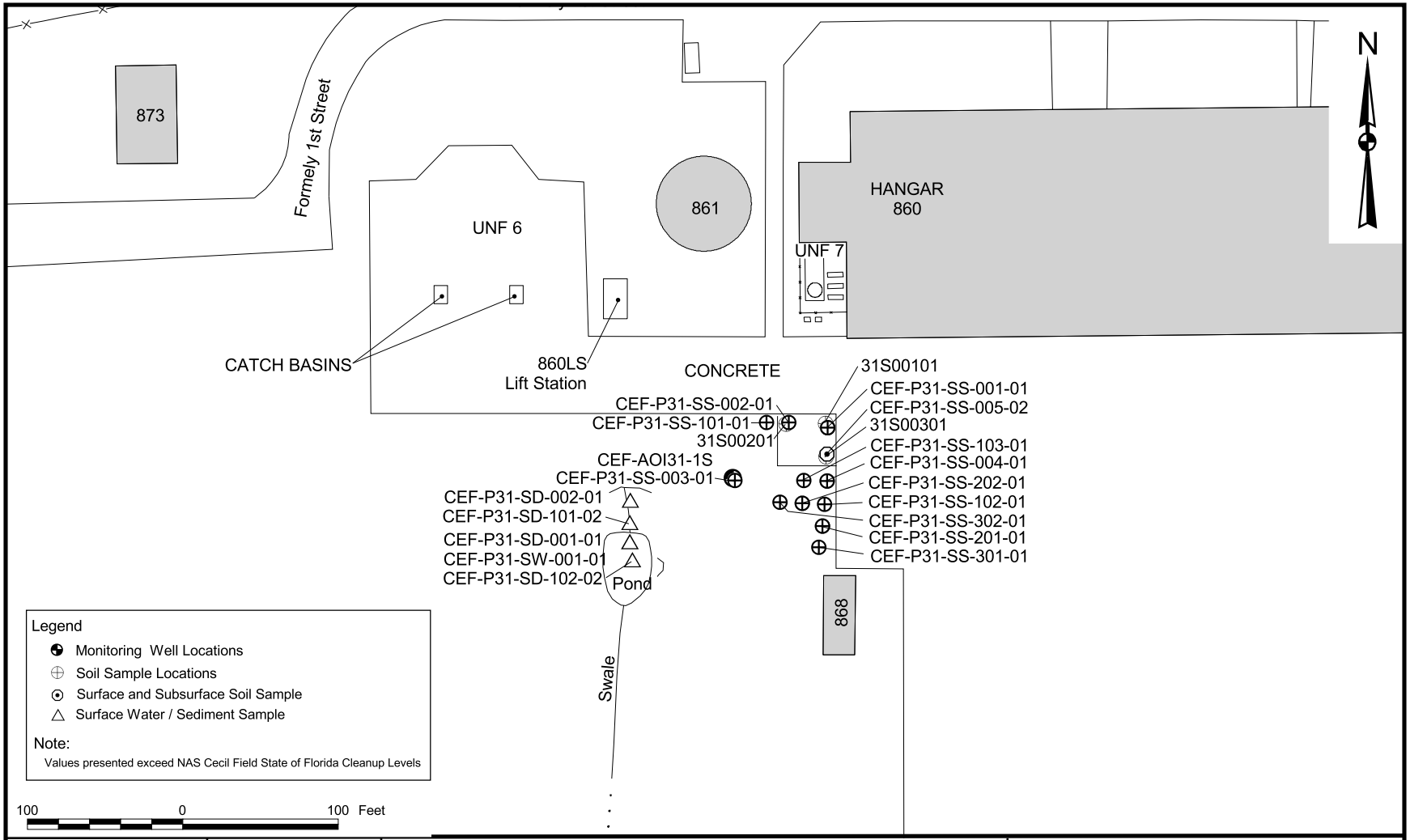
- One surface soil sample was collected from a 0- to 1-foot depth interval at a location approximately 15 feet south of the Phase III sample at CEF-P31-SS-201. In addition, one surface soil sample was collected from a 0- to 1-foot depth interval at a location approximately 15 feet west of the Phase III sample at CEF-P31-SS-202.

- One subsurface soil sample was collected from a 2- to 3- foot depth interval at the CEF-P31-SS-201 location.

Sampling locations from the four field investigation phases are shown in Figure 4-1. Analytical results are discussed in Section 5.0 and are included in Appendix A.

Soil and sediment samples were collected as grab samples using disposable trowels. Sampling activities were performed in accordance with the procedures described in the U.S. Environmental Protection Agency (U.S. EPA) Region IV Environmental Investigations Standard Operating Procedures and Quality Assurance Manual (U.S. EPA Region IV, 1996) and the NAS Cecil Field Base-Wide Generic Work Plan (TtNUS, 1998). As agreed by the BCT, no rinsate and trip blanks were collected. In addition, field blanks were not collected because the sampling equipment was disposable.

All samples were analyzed for PAHs by U.S. EPA Method SW-846 Method 8310. ACCUTEST SOUTHEAST, in Orlando, Florida, performed the analyses.



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5.0 NATURE AND EXTENT OF CONTAMINATION

Analytical results for the soil samples collected during the four phased field investigation are shown on Table 5-1, and complete laboratory data are included in Appendix A. Table 5-1 also compares the results to the FDEP SCTL for the most stringent of the residential direct exposure or the leachability to groundwater criteria (FDEP, 1999). As indicated by the shading in Table 5-1, BaP was the only PAH that exceeded its respective FDEP SCTL. Figure 5-1 shows the locations of the sampling points where sample results exceeded the FDEP SCTL for BaP.

The results of the sampling and analysis identified the horizontal and vertical extent of BaP contamination in excess of the SCTL. Based on the results of the sampling and analysis, a remedial design (dig and haul package) was prepared for excavation of the delineated area of BaP contamination (TtNUS, 2000).

A single area of 3,350 square feet was excavated to a depth of 2 feet. The resulting volume of soil removed was approximately 248 cubic yards (394 tons). The excavation limits are shown on Figure 5-1. Details of the excavation are summarized in Section 7.0.

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TABLE 5-1

SURFACE SOIL ANALYTICAL RESULTS
PSC 31, TEMPORARY COLLECTION POINT
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

PARAMETER	FDEP SCTLs[1]		PHASE I / APRIL 1999					
			CEF-P31-					
	Residential Direct Exposure	Leachability to Groundwater	SS-001-01	SS-002-01	SS-003-01	SS-004-01	SS-004-D	SS-005-02
POLYCYCLIC AROMATIC HYDROCARBONS (ug/kg)								
Acenaphthene	1,900,000	2,100	287	ND	ND	164	ND	114
Acenaphthylene	1,100,000	27,000	ND	ND	ND	ND	ND	ND
Anthracene	18,000.00	2,500,000	ND	ND	ND	ND	ND	ND
Benzo(a)anthracene	1,400	3,200	519	170	36	239	255	156
Benzo(a)pyrene	100	8,000	**670**	**500**	42.9	**342**	**346**	**209**
Benzo(b)fluoranthene	1,400	10,000	991	533	69	462	480	302
Benzo(g,h,i)perylene	2,300,000	32,000,000	796	463	ND	351	345	272
Benzo(k)fluoranthene	15,000	25,000	414	236	45.1	180	204	126
Chrysene	140,000	77,000	752	372	ND	408	437	300
Dibenzo(a,h)anthracene	100	30,000	ND	97.8	ND	ND	ND	ND
Fluoranthene	2,900,000	1,200,000	938	298	74.7	485	581	393
Indeno(1,2,3-cd)pyrene	1,500	28,000	908	514	ND	380	381	315
1-Methylnaphthalene	68,000	2,100	ND	ND	ND	ND	172	ND
2-Methylnaphthalene	83,000	6,100	319	ND	ND	ND	106	ND
Naphthalene	40,000	17,000	ND	ND	ND	ND	ND	ND
Phenanthrene	2,000,000	250,000	166	ND	ND	ND	ND	ND
Pyrene	2,200,000	880,000	1,260	357	110	585	714	479

TABLE 5-1

SURFACE SOIL ANALYTICAL RESULTS
PSC 31, TEMPORARY COLLECTION POINT
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

PARAMETER	FDEP SCTLs[1]		PHASE II / JUNE 1999				
			CEF-P31-				
	Residential Direct Exposure	Leachability to Groundwater	SS-101-01	SS-102-01	SS-103-01	SS-104-01	SS-104-D
POLYCYCLIC AROMATIC HYDROCARBONS (ug/kg)							
Acenaphthene	1,900,000	2,100	ND	64	ND	ND	ND
Acenaphthylene	1,100,000	27,000	ND	ND	ND	ND	ND
Anthracene	18,000.00	2,500,000	ND	8.2	ND	ND	ND
Benzo(a)anthracene	1,400	3,200	9.5	55	9	ND	ND
Benzo(a)pyrene	100	8,000	14	**110**	16	ND	ND
Benzo(b)fluoranthene	1,400	10,000	39	170	35	ND	ND
Benzo(g,h,i)perylene	2,300,000	32,000,000	38	180	39	ND	ND
Benzo(k)fluoranthene	15,000	25,000	14	77	14	ND	ND
Chrysene	140,000	77,000	10	59	12	ND	ND
Dibenzo(a,h)anthracene	100	30,000	ND	ND	ND	ND	ND
Fluoranthene	2,900,000	1,200,000	20	84	14	ND	ND
Indeno(1,2,3-cd)pyrene	1,500	28,000	23	100	23	ND	ND
1-Methylnaphthalene	68,000	2,100	ND	ND	ND	ND	ND
2-Methylnaphthalene	83,000	6,100	ND	ND	ND	ND	ND
Naphthalene	40,000	17,000	ND	41	ND	ND	ND
Phenanthrene	2,000,000	250,000	ND	9.8	ND	ND	ND
Pyrene	2,200,000	880,000	22	97	23	ND	ND

TABLE 5-1

SURFACE SOIL ANALYTICAL RESULTS
PSC 31, TEMPORARY COLLECTION POINT
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

PARAMETER	FDEP SCTLs[1]		PHASE III / AUGUST 1999			PHASE IV / OCTOBER 1999		
			CEF-P31-					
	Residential Direct Exposure	Leachability to Groundwater	SS-201-01	SS-202-01	SS-202-D	SS-301-01	SS-302-01	SS-303-03
POLYCYCLIC AROMATIC HYDROCARBONS (ug/kg)								
Acenaphthene	1,900,000	2,100	441	ND	ND	ND	ND	ND
Acenaphthylene	1,100,000	27,000	ND	ND	ND	ND	ND	ND
Anthracene	18,000.00	2,500,000	ND	ND	ND	ND	ND	ND
Benzo(a)anthracene	1,400	3,200	537	21.6	34.9	41.1	42.2	ND
Benzo(a)pyrene	100	8,000	**919**	26.5	50.4	28.6	46.1	ND
Benzo(b)fluoranthene	1,400	10,000	938	38.3	69.8	ND	45.3	ND
Benzo(g,h,i)perylene	2,300,000	32,000,000	644	ND	ND	ND	25.1	ND
Benzo(k)fluoranthene	15,000	25,000	437	16	27.1	ND	ND	ND
Chrysene	140,000	77,000	880	31.7	56.8	ND	52.3	ND
Dibenzo(a,h)anthracene	100	30,000	ND	37.7	49.4	ND	ND	ND
Fluoranthene	2,900,000	1,200,000	1,860	70.1	82.7	ND	ND	ND
Indeno(1,2,3-cd)pyrene	1,500	28,000	734	ND	ND	ND	100	ND
1-Methylnaphthalene	68,000	2,100	ND	ND	ND	ND	ND	ND
2-Methylnaphthalene	83,000	6,100	ND	ND	ND	ND	ND	ND
Naphthalene	40,000	17,000	ND	ND	ND	ND	ND	ND
Phenanthrene	2,000,000	250,000	411	ND	ND	ND	ND	ND
Pyrene	2,200,000	880,000	1,670	64.5	74.1	ND	45.9	ND

FDEP = Florida Department of Environmental Protection

1 SCTLs = Soil Target Cleanup Levels, Florida Administrative Code (F.A.C.) 62-777 (FDEP, 1999)

2 NAS Cecil Field Inorganic Background Data Set (HLA, 1998)

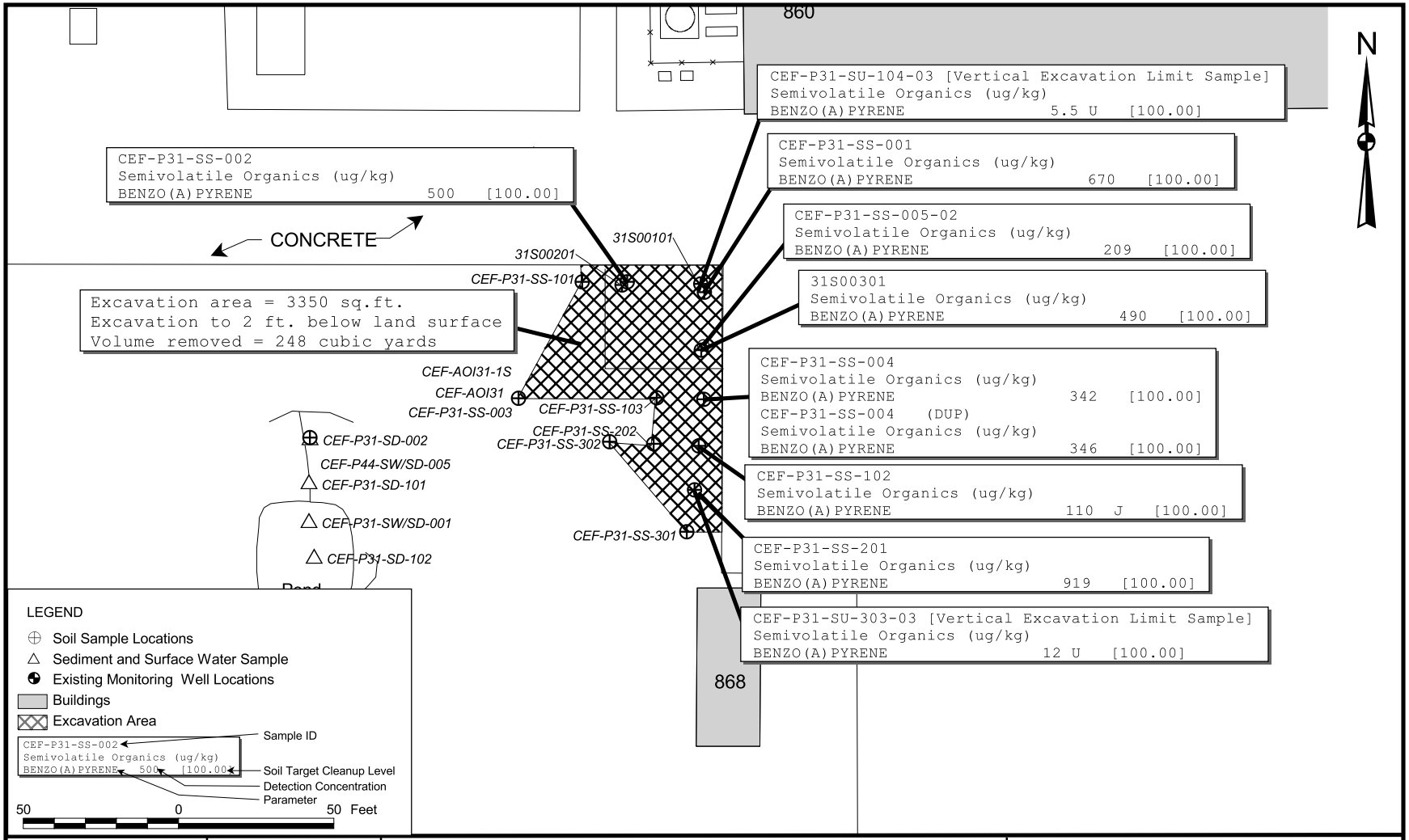
* = Excavation limits were determined using a benzo(a)pyrene concentration of greater than 400 ug/kg, determined based on statistical analysis.

Bolded values indicate a positive detection. Shaded values exceed STCLs.

TABLE 5-2

SEDIMENT ANALYTICAL RESULTS
PSC 31, TEMPORARY COLLECTION POINT
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

PARAMETER	PHASE I / APRIL 1999		PHASE II / JUNE 1999	
	CEF-P31-			
	SD-001-01	SD-002-01	SD-101-02	SD-102-02
POLYCYCLIC AROMATIC HYDROCARBONS (ug/kg)				
Acenaphthene	659	ND	150	130
Acenaphthylene	4,860	ND	ND	ND
Anthracene	ND	ND	13.0	ND
Benzo(a)anthracene	301	ND	43.0	53.0
Benzo(a)pyrene	342	43.3	55.0	51.0
Benzo(b)fluoranthene	1,080	125	110	130
Benzo(g,h,i)perylene	381	ND	90.0	42.0
Benzo(k)fluoranthene	416	36.1	37.0	58.0
Chrysene	617	49.0	88.0	69.0
Dibenzo(a,h)anthracene	ND	ND	16.0	12.0
Fluoranthene	779	48.9	120	190
Indeno(1,2,3-cd)pyrene	380	91.6	62.0	76.0
1-Methylnaphthalene	ND	ND	ND	ND
2-Methylnaphthalene	797	ND	ND	ND
Naphthalene	ND	ND	87.0	61.0
Phenanthrene	ND	ND	21.0	24.0
Pyrene	775	71.3	130	42.0



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COST/SCHEDULE-AREA

SCALE
AS NOTED

CONTAMINANTS GREATER THAN CRITERIA
AND LIMITS OF SOIL EXCAVATION
PSC 31 - TEMPORARY COLLECTION POINT
TECHNICAL MEMORANDUM
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

CONTRACT NUMBER
0039

APPROVED BY DATE

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FIGURE 5-1

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6.0 RISK EVALUATION

6.1 PRELIMINARY RISK EVALUATION

The SAR prepared by HLA (HLA, 1999) included a PRE to assess the potential risk to human and ecological receptors posed by contaminants in groundwater, surface water, and surface soil. As part of the PRE, primary exposure pathways were evaluated to determine those pathways that potentially contribute to human health and ecological risks.

6.1.1 Human Heath Preliminary Risk Evaluation

The detected organic compounds and inorganic analytes were compared to readily available risk-based screening levels to assess the likelihood of adverse human health effects associated with potential exposure to surface soil or groundwater. The concentrations of individual samples were screened against the NAS Cecil Field site-specific Inorganic Background Data Set (IBDS) and the FDEP criteria, as proposed in Florida Administrative Code (FAC) Chapter 62-777. The remediation goals for inorganic analytes for any site should never be less than the IBDS values. However, if a FDEP criterion is greater than the IBDS value, the FDEP criterion is regarded as the remediation goal.

The results of the groundwater sampling at PSC 31 indicated that no inorganic analytes or organic compounds were detected at concentrations in excess of FDEP Groundwater Cleanup Target Levels (GCTLs) or IBDS values. Therefore, no hazard index (HI) or excess lifetime cancer risk (ELCR) was calculated in association with a potential groundwater exposure scenario. The results of the surface soil sampling by HLA at PSC 31 indicated that only BaP was detected at a concentration in excess of FDEP SCTLs. An ELCR of $6x10^{-6}$ was calculated in association with a residential surface soil exposure scenario (HLA, 1999).

The subsequent excavation of 2 feet of soil (see Section 7.0) removed all of the samples that exhibited concentrations of BaP greater than the FDEP SCTL. The excavation was backfilled with clean soil and therefore all human health risk has been eliminated.

6.1.2 Ecological Preliminary Risk Evaluation

Because PSC 31 is located within the restricted area of the east-west flightline surrounded by maintained grass, ecological receptors that might occasionally use the study area are likely limited to terrestrial species that are tolerant to human and industrial activity. Due to the limited extent and significance of the habitat associated with the study area, no further ecological risk evaluation for surface soil was conducted. An exposure pathway from groundwater to surface water is likely to exist for the drainage

ditch immediately west of the study area; however, because no inorganic analytes or organic compounds were detected in groundwater at concentrations exceeding screening criteria, no further ecological PRE for groundwater was conducted (HLA, 1999).

6.2 ECOLOGICAL RISKS

A screening ecological risk assessment was conducted to evaluate the potential risks to ecological receptors at PSC 31. The ecological assessment was conducted in accordance with the guidance described by U.S. EPA Region IV and the Navy for steps 1-3a of ecological risk assessments. Steps 1-3a consist of the following:

Step 1	Screening-Level Problem Formulation and Ecological Effects Evaluation
Step 2	Screening-Level Exposure Estimate and Risk Evaluation
Step 3a	Refinement of Preliminary Contaminants of Concern

6.2.1 Problem Formulation and Ecological Effects Evaluation

A drainage ditch runs northward on the western side of PSC 31. This man-made drainage ditch receives runoff from the area southwest of Building 860. The ditch directs runoff northward into a small ponded area where surface water is then directed from the pond northwest through an underground culvert to an outfall at PSC 44. A discussion of contamination at PSC 44 is not included in this assessment and will be evaluated in a future report. Because of potential redevelopment of this site, the future status of the pond is presently not known. However, while the pond's status may affect risk management decisions, it does not impact this ecological risk assessment.

A large area of mowed grass surrounds the drainage ditch. The grassy area extends south and west to an aircraft taxiway. Areas paved with concrete and used for storage and maintenance of aircraft are located north and east of the grassy area. Shrubs and small trees, including willow (*Salix* spp), saltbush (*Baccharis halimifolia*), wax myrtle (*Myrica cerifera*), and elderberry (*Sambucus canadensis*), have become established along the edges of the drainage ditch. The resulting strip of vegetation is approximately 35 feet wide at its southern end and gradually widens to approximately 60 feet at the pond. Vegetation in the ditch includes a variety of wetland-associated species such as pickerelweed (*Pontederia cordata*), arrowhead (*Sagittaria* spp.), and various rushes, sedges, vines, and weeds. The bottom of the drainage ditch is almost totally covered with a dense layer of vegetation resulting in little open water. Surface water in the ditch is usually stagnant to slow moving and covers an area 2 to 4 feet wide and approximately 3 to 6 inches deep. The pond covers an area of 45 feet x 30 feet, is approximately 3 to 4 feet deep, and is surrounded by the same types of small trees, shrubs, vines, and weeds as are found along the edges of the ditch.

The ditch and pond provide limited habitat for aquatic invertebrates, minnows (larger fish presumably exist in the pond), various reptiles, amphibians, piscivorous birds, and mammals such as the raccoon (*Procyon lotor*).

The nature and extent of contamination were discussed in Section 5.0. Aquatic organisms in the pond and ditch, as well as wildlife that utilize these aquatic habitats, could be exposed to contaminants through direct contact with surface water and sediments, incidental ingestion of surface water and sediments, and consumption of contaminated food items. Since only PAHs (BaP) were found to exceed screening criteria in previous investigations, ecological screening performed at PSC 31 was limited to these analyses.

PAH compounds detected in surface water and sediment samples collected from the pond and ditch were assessed. The objective of this assessment was to determine if exposure to PAHs present in surface water and sediment is likely to result in declines in ecological receptor populations.

6.2.2 Exposure Estimate and Risk Calculation

Maximum concentrations of PAHs detected in sediment were compared to conservative ecological screening values (ESVs) to determine if the analytes should be selected as ecological contaminants of potential concern (COPCs). The sediment ESVs used for the initial screening were those established by U.S. EPA Region IV and the FDEP. The ESV for BaP was used as a surrogate for high molecular weight PAHs when ESVs were not available for those compounds, in accordance with U.S. EPA Region IV practice.

PAH compounds were not detected in surface water at PSC 31 (Appendix A). Thus, the selection of surface water ESVs was not applicable.

Toxic doses of COPCs were also compared to modeled ingested doses for representative receptors. The methods used to model the doses that representative receptors could receive, as well as the selection of toxicity reference values (TRVs), are described in Appendix B.

6.2.3 Refinement of Preliminary Contaminants of Concern

Subsequent to the initial screening, other factors were considered to further refine COPCs. These factors included toxicological evaluation of COPCs, frequency of detection, and comparisons of COPCs to alternate guidelines.

6.2.4 Results and Discussion

Maximum concentrations of 13 PAHs exceeded ESVs (Table 6-1). With the exception of 2-methylnaphthalene, acenaphthene, acenaphthylene, and benzo(b)fluoranthene, hazard quotients (HQs) were relatively low. Maximum concentrations of these four compounds (as well as most other PAHs) were in sample SD-001-01. Few PAH concentrations exceeded ESVs in other sediment samples.

Toxicological data for benzo(b)fluoranthene are sparse, and the HQ shown for this compound in Table 6-1 is based on a comparison of its maximum concentration to the ESV of benzo(a)pyrene. Concentrations of benzo(b)fluoranthene in the other sediment samples (110, 125, and 130 µg/kg) only slightly exceeded the FDEP and U.S. EPA Region IV screening value for benzo(a)pyrene (88 µg/kg) and were not elevated relative to other guidelines for benzo(a)pyrene (Table 6-2). The maximum concentration of benzo(b)fluoranthene (1080 µg/kg) exceeded most guidelines for benzo(a)pyrene but was less than the effects range-median (ER-M).

Concentrations of 2-methylnaphthalene, acenaphthene, and acenaphthylene were elevated relative to most guidelines only in sample SD-001-01. Concentrations of these three compounds in sample SD-001-01 exceeded all guidelines (Table 6-2). Thus, measured concentrations of these compounds indicate potential risks to sediment dwelling receptors in the vicinity of this sample.

Because PAHs usually occur in mixtures rather than individually, an evaluation of total PAH concentrations is appropriate. Total PAH concentrations were as follows:

SD-001-01: 11,387 µg/kg
SD-002-01: 465.2 µg/kg
SD-101-02: 1,022 µg/kg
SD-102-02: 938 µg/kg

The ESV for total PAHs of 1684 µg/kg established by FDEP and U.S. EPA Region IV was exceeded in sample SD-001-01. However, the concentration in this sample was less than most guidelines for total PAHs, including the ER-M and FDEP's probable effects level (Table 6-2).

The results of food chain modeling using maximum detected concentrations as exposure point concentrations are presented in Table 6-3. Acenaphthylene was the only PAH with an HQ greater than 1.0. The maximum HQ for acenaphthylene, however, was relatively low, with a value of 1.67 for the raccoon and 1.38 for the bullfrog. Although not shown in Table 6-3, the maximum HQ for acenaphthylene using the average sediment concentration (1264 µg/kg) would be 0.44 for the raccoon and 0.36 for the bullfrog.

The raccoon and kingfisher have large home ranges, but the HQs were calculated by assuming that these representative receptors foraged exclusively at PSC 31. All HQs in Table 6-3 would be considerably less if more realistic area-use factors were used.

In conclusion, measured concentrations of some PAH compounds indicate potential risks to sediment-dwelling receptors in the vicinity of sample SD-001-01. PAHs were not elevated in other sediment samples, two of which were collected approximately 15 feet from sample SD-001-01 (Figure 4-1). Thus, the area in which potential ecological risks exist is extremely small. In addition, the pond and associated drainage ditch are of limited value as aquatic habitat, due to their small areal extent and their isolated existence within an area utilized for aircraft maintenance and operations. Furthermore, PAH compounds would not be expected to significantly bioaccumulate in higher organisms at the concentrations observed here. For these reasons, PAH compounds in sediments are not believed to pose significant potential risks to ecological receptors.

TABLE 6-1

ECOLOGICAL HAZARD QUOTIENTS FOR SEDIMENT ANALYTES
PSC 31
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

Analyte	Frequency of Detection	Range of Detections	Location of Maximum Concentration	Average Concentration	Ecological Screening Value	Maximum Hazard Quotient [a]
Semivolatile Organics (µg/kg)						
2-Methylnaphthalene	3 / 4	61 - 797	CEF-P31-SD-001	259	20.2	39.5
Acenaphthene	3 / 4	130 - 659	CEF-P31-SD-001	257	6.71	98.2
Acenaphthylene	1 / 4	4860	CEF-P31-SD-001	1264	5.87	827.9
Anthracene	1 / 4	13	CEF-P31-SD-101	75	46.9	0.3
Benzo(a)anthracene	3 / 4	43 - 301	CEF-P31-SD-001	103	74.8	4.0
Benzo(a)pyrene	4 / 4	43.3 - 342	CEF-P31-SD-001	123	88.8	3.9
Benzo(b)fluoranthene	4 / 4	110 - 1080	CEF-P31-SD-001	361	88.8[b]	12.2
Benzo(g,h,i)perylene	3 / 4	42 - 381	CEF-P31-SD-001	132	88.8[b]	4.3
Benzo(k)fluoranthene	4 / 4	36.1 - 416	CEF-P31-SD-001	137	88.8[b]	4.7
Chrysene	4 / 4	49 - 617	CEF-P31-SD-001	206	108	5.7
Dibenzo(a,h)anthracene	2 / 4	12 - 16	CEF-P31-SD-101	18	6.22	2.6
Fluoranthene	4 / 4	48.9 - 779	CEF-P31-SD-001	284	113	6.9
Indeno(1,2,3-cd)pyrene	4 / 4	62 - 380	CEF-P31-SD-001	152	88.8[b]	4.3
Phenanthrene	2 / 4	21 - 24	CEF-P31-SD-102	83	86.7	0.3
Pyrene	4 / 4	42 - 775	CEF-P31-SD-001	255	153	5.1

a Maximum Hazard Quotient = Maximum Concentration ÷ Ecological Screening Value
b Benzo(a)pyrene used as a surrogate

TABLE 6-2

**COMPARISON OF SEDIMENT CHEMICALS OF POTENTIAL CONCERN (COPCs)
TO VARIOUS GUIDELINES
PSC 31
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA**

COPC	Maximum	ESV	ER-L/ER-M	FDEP TEL/PEL	TEC/PEC	Ontario MOE	UET	Other
SEMIVOLATILE ORGANIC COMPOUNDS (µg/kg)								
2-Methylnaphthalene	797	20.2	70/670	20.2/201	NA	NA	NA	NA
Acenaphthene	659	6.71	16/500	6.71/88.9	NA	NA	290	620[a]
Acenaphthylene	4860	5.87	44/640	5.87/128	NA	NA	160	NA
Benzo(a)anthracene	301	74.8	261/1600	74.8/693	260/4200	320/14800	500	31.7[b]/385[b]
Benzo(a)pyrene	342	88.8	430/1600	88.8/763	350/394	370/14400	700	31.9[b]/782[b]
Benzo(b)fluoranthene	1080	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	381	NA	NA	NA	290/6300	170/3200	300	NA
Benzo(k)fluoranthene	416	NA	NA	NA	NA	240/13400	13400	NA
Chrysene	617	108	384/2800	108/846	500/5200	340/4600	800	57.1[b]/862[b]
Dibenzo(a,h)anthracene	16	6.22	63.4/260	6.22/135	NA/28	60/1300	100	NA
Fluoranthene	779	113	600/5100	113/1494	64/834	750/10200	1500	2900 [a] 111[b]/2355[b]
Indeno(1,2,3-cd)pyrene	380	NA	NA	NA	78/837	200/3200	330	NA
Pyrene	775	153	665/2600	153/1398	570/3225	490/8500	1000	53[b]/875[b]
Total PAHs	11387	1684	4022/44792	1684/16770	3553/13660	4000/100000	12000	NA

NA	Not Available
ESV	Initial Ecological Screening Value.
ER-L & ER-M	Effects Range-Low and Effects Range-Median
FDEP TEL & PEL	Threshold Effects Level and Probable Effects Level
TEC & PEC	Threshold Effects Concentration and Probable Effects Concentration, Assessment and Remediation of Contaminated Sediments Program
Ontario MOE	Ontario Ministry of the Environment: Lowest Effect Level / Severe Effect Level
NOAA UET	Upper Effects Threshold in freshwater sediments derived by NOAA

a Sediment Quality Criteria.
b NOAA Threshold Effects Level & Probable Effects Level in freshwater sediments.

TABLE 6-3

RESULTS OF FOOD CHAIN MODELING
PSC 31
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

Ecological Contaminant of Potential Concern	Raccoon		Kingfisher		Bullfrog	
	NOAEL HQ	LOAEL HQ	NOAEL HQ	LOAEL HQ	NOAEL HQ	LOAEL HQ
SEMIVOLATILE ORGANIC COMPOUNDS						
2-METHYLNAPHTHALENE	3.57E-01	3.57E-02	5.18E-02	5.18E-03	2.26E-01	2.26E-02
ACENAPHTHENE	7.31E-02	3.65E-02	1.24E-02	1.24E-03	5.79E-02	5.79E-03
ACENAPHTHYLENE	**1.67E+00**	8.37E-01	3.16E-01	3.16E-02	**1.38E+00**	1.38E-01
BENZO(A)ANTHRACENE	4.34E-02	4.34E-03	5.67E-03	5.67E-04	2.65E-02	2.65E-03
BENZO(A)PYRENE	4.93E-02	4.93E-03	6.45E-03	6.45E-04	3.01E-02	3.01E-03
BENZO(B)FLUORANTHENE	1.56E-01	1.56E-02	2.04E-02	2.04E-03	9.49E-02	9.49E-03
BENZO(G,H,I)PERYLENE	1.71E-01	1.71E-02	2.48E-02	2.48E-03	1.08E-01	1.08E-02
BENZO(K)FLUORANTHENE	6.00E-02	6.00E-03	7.84E-03	7.84E-04	3.66E-02	3.66E-03
CHRYSENE	8.90E-02	8.90E-03	1.16E-02	1.16E-03	5.42E-02	5.42E-03
DIBENZO(A,H)ANTHRACENE	1.77E-03	8.87E-04	3.02E-04	3.02E-05	1.41E-03	1.41E-04
FLUORANTHENE	1.12E-01	1.12E-02	1.47E-02	1.47E-03	6.85E-02	6.85E-03
INDENO(1,2,3-CD)PYRENE	5.48E-02	5.48E-03	7.16E-03	7.16E-04	3.34E-02	3.34E-03
PYRENE	1.12E-01	1.12E-02	1.46E-02	1.46E-03	6.81E-02	6.81E-03

Note: Bolded values indicate HQs greater than 1.0
NOAEL - No observable adverse-effects level
LOAEL - Low observable adverse-effects level
HQ - Hazard Quotient

7.0 REMEDIAL ACTIVITIES

The Navy's Remedial Action Contractor (RAC), CH2MHill Contractors, Inc., conducted the source removal activities for PSC 31 from March 1 through March 7, 2000. The RAC characterized, transported, and disposed of 394.1 tons of excavated PAH-contaminated soil and restored the site to pre-excavation conditions. The excavated soil was transported and disposed off site on March 7 and 8, 2000.

The soil was excavated using a mini-excavator and was stockpiled, bermed, and covered before it was loaded into trucks, provided by Pritchett Trucking, for transportation and disposal. Soils were excavated to the horizontal excavation limits shown on Figure 5-1 and the vertical excavation limit of 2 feet below ground surface (bgs), as specified in the Dig and Haul Package for PSC 31 (TtNUS, 2000). The excavated soil was transported to Kedish/Underground Utility Contractors in Kingsland, Georgia.

The material used to backfill the excavation was clean fill obtained from the Dallas Harts Borrow Pit in Jacksonville, Florida. The site was then graded and seeded with a mixture of rye and bahia grass. No confirmatory sampling and analyses were required based on the specifications outlined in the Dig and Haul Package for PSC 31. A final inspection was conducted on March 15, 2000.

Detailed information on the remedial activities, including photographs, copies of the soil manifests, certificates of disposal, and certificate of clean fill, are provided in the Source Removal Report (CH2M Hill, 2000).

8.0 CONCLUSIONS AND RECOMMENDATION

8.1 CONCLUSIONS

Conclusions pertaining to PSC 31, Temporary Collection Point are as follows:

- Areas of soil where benzo(a)pyrene was detected at concentrations in excess of the FDEP SCTL have been excavated and disposed at a permitted solid waste disposal facility.
- The excavated area was restored to pre-excavation conditions with clean fill.
- Benzo(a)pyrene concentrations in the soil samples collected outside the excavation area were not in excess of the FDEP SCTL.
- Since the removal action has been conducted, no contaminants or pathways pose a threat to the public health, welfare, or the environment.
- No significant potential risks to ecological receptors are expected from sediment and surface water at PSC 31.

8.2 RECOMMENDATION

The soil removal action conducted at PSC 31 is protective of human health and the environment and utilized permanent solutions for the site. Since the removal action is complete, the recommendation for PSC 31 is No Further Action.

It is also recommended that the color classification of PSC 31 be changed from Yellow to Dark Green to denote that releases of hazardous substances have occurred, and remedial actions to protect human health and the environment have been taken.

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APPENDIX A

ANALYTICAL LABORATORY RESULTS

PHASE I ANALYTICAL RESULTS

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

PITT-06-9-167

TO: **M. SPERANZA** **DATE:** **JUNE 25,1999**

FROM: **TERRI L. SOLOMON** **COPIES:** **DV FILE**

SUBJECT: **ORGANIC DATA VALIDATION – POLYNUCLEAR AROMATIC HYDROCARBONS**
CTO 078 –NAS CECIL FIELD, FLORIDA
SDG – F4081

SAMPLES: 8/Soils/

CEF-P31-SD-001-01	CEF-P31-SD-002-01	CEF-P31-SS-001-01
CEF-P31-SS-002-01	CEF-P31-SS-003-01	CEF-P31-SS-004-01
CEF-P31-SS-005-02	CEF-P31-SS-DUP01	

1/Aqueous/

CEF-P31-SW-001-01

Overview

The sample set for CTO 078, Cecil Field, SDG F4081, consists of eight (8) soil and sediment samples environmental samples and one (1) aqueous environmental sample. One (1) field duplicate pair (CEF-P31-SS-004-01 / CEF-P31-SS-DUP01) was included within this SDG.

All samples were analyzed for polynuclear aromatic hydrocarbons (PAHs). The samples were collected by Tetra Tech NUS on April 29, 1999 and analyzed by Accutest under Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria. All analyses were conducted using SW-846 method 8310. These data were evaluated based on the following parameters:

* • Data Completeness
* • Holding Times
  • Initial and Continuing Calibration Results
* • Laboratory Blank Analyses
* • Surrogate Recoveries
* • Field Duplicate Results
* • Detection Limits

* - All quality control criteria were met for this parameter.

The attached Table 1 summarizes the validation recommendations which were based on the following information:

PAH Analyses

The initial and continuing calibration %RSDs for chrysene were > 15% quality control limit. The positive results reported for chrysene were qualified as estimated, "J".

The initial and continuing calibration %RSDs for phenanthrene were > 15% quality control limit affecting sample CEF-P31-SD-001-01. However, no validation action was required as the sample result was nondetected.

The percent solids for sample P31-SD-001-01 was < 30%. Therefore, the positive results reported for the aforementioned sample were qualified as estimated, "J".

Notes

A comparison of field duplicate pair, CEF-P31-SS-004-01 / CEF-P31-SS-DUP01, is included in Appendix C.

Executive Summary

Laboratory Performance: The initial and continuing calibration %RSDs for chrysene were > 15% quality control limit.

Other Factors Affecting Data Quality: None.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Organic Review", February 1994 and the NFESC document entitled "Navy Installation Restoration Laboratory Quality Assurance Guide " (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."

Terri Solomon

Tetra Tech NUS
Terri L. Solomon
Chemist

Tetra Tech NUS
Joseph A. Samchuck
Quality Assurance Officer

ACCUTEST

Report of Analysis

Client Sample ID:	CEF-P31-SW-001-01		
Lab Sample ID:	F4081-8	**Date Sampled:**	04/29/99
Matrix:	AQ - Ground Water	**Date Received:**	04/30/99
Method:	SW846 8310	**Percent Solids:**	n/a
Project:	NAS Cecil Field-PSC 31		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1		1	06/06/99	AMA	05/06/99	M:OP1176	M:GC1110
Run #2							

CAS No.	Compound	Result	RDL	Units	Q
83-32-9	Acenaphthene	ND	1.0	ug/l	
208-96-8	Acenaphthylene	ND	1.0	ug/l	
120-12-7	Anthracene	ND	1.0	ug/l	
56-55-3	Benzo (a) anthracene	ND	0.15	ug/l	
50-32-8	Benzo (a) pyrene	ND	0.15	ug/l	
205-99-2	Benzo (b) fluoranthene	ND	0.15	ug/l	
191-24-2	Benzo (g,h,i) perylene	ND	0.15	ug/l	
207-08-9	Benzo (k) fluoranthene	ND	0.15	ug/l	
218-01-9	Chrysene	ND	0.15	ug/l	
53-70-3	Dibenz(a,h)anthracene	ND	0.15	ug/l	
206-44-0	Fluoranthene	ND	1.0	ug/l	
86-73-7	Fluorene	ND	1.0	ug/l	
193-39-5	Indeno (1,2,3-cd) pyrene	ND	0.15	ug/l	
90-12-0	1-Methylnaphthalene	ND	1.0	ug/l	
91-57-6	2-Methylnaphthalene	ND	1.0	ug/l	
91-20-3	Naphthalene	ND	1.0	ug/l	
85-01-8	Phenanthrene	ND	1.0	ug/l	
129-00-0	Pyrene	ND	1.0	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
84-15-1	o-Terphenyl	87%		20-160%

ND = Not detected
RDL = Reported Detection Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

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Report of Analysis

Client Sample ID:	CEF-P31-SD-001-01		
Lab Sample ID:	F4081-6	**Date Sampled:**	04/29/99
Matrix:	SO - Soil	**Date Received:**	04/30/99
Method:	SW846 8310	**Percent Solids:**	25.4
Project:	NAS Cecil Field-PSC 31		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	LC4161.D	1	05/14/99	AMA	05/06/99	M:OP1207	M:GLC3
Run #2							

CAS No.	Compound	Result	RDL	Units	Q
83-32-9	Acenaphthene	659	390	ug/kg	
208-96-8	Acenaphthylene	4860	390	ug/kg	
120-12-7	Anthracene	ND	390	ug/kg	
56-55-3	Benzo (a) anthracene	301	59	ug/kg	
50-32-8	Benzo (a) pyrene	342	59	ug/kg	
205-99-2	Benzo (b) fluoranthene	1080	59	ug/kg	
191-24-2	Benzo (g,h,i) perylene	381	59	ug/kg	
207-08-9	Benzo (k) fluoranthene	416	59	ug/kg	
218-01-9	Chrysene	617	59	ug/kg	
53-70-3	Dibenz(a,h)anthracene	ND	59	ug/kg	
206-44-0	Fluoranthene	779	59	ug/kg	
86-73-7	Fluorene	ND	390	ug/kg	
193-39-5	Indeno (1,2,3-cd) pyrene	380	59	ug/kg	
90-12-0	1-Methylnaphthalene	ND	390	ug/kg	
91-57-6	2-Methylnaphthalene	797	390	ug/kg	
91-20-3	Naphthalene	ND	390	ug/kg	
85-01-8	Phenanthrene [a]	ND	390	ug/kg	
129-00-0	Pyrene	775	59	ug/kg	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
84-15-1	o-Terphenyl	63%		20-130%

(a) Fluoresence signal reported due to matrix interference.

ND = Not detected
RDL = Reported Detection Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

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Report of Analysis

Client Sample ID:	CEF-P31-SD-002-01		
Lab Sample ID:	F4081-7	**Date Sampled:**	04/29/99
Matrix:	SO - Soil	**Date Received:**	04/30/99
Method:	SW846 8310	**Percent Solids:**	55.9
Project:	NAS Cecil Field-PSC 31		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	LC4162.D	1	05/14/99	AMA	05/06/99	M:OP1207	M:GLC3
Run #2							

CAS No.	Compound	Result	RDL	Units	Q
83-32-9	Acenaphthene	ND	180	ug/kg	
208-96-8	Acenaphthylene	ND	180	ug/kg	
120-12-7	Anthracene	ND	180	ug/kg	
56-55-3	Benzo (a) anthracene	ND	27	ug/kg	
50-32-8	Benzo (a) pyrene	43.3	27	ug/kg	
205-99-2	Benzo (b) fluoranthene	125	27	ug/kg	
191-24-2	Benzo (g,h,i) perylene	ND	27	ug/kg	
207-08-9	Benzo (k) fluoranthene	36.1	27	ug/kg	
218-01-9	Chrysene	49.0	27	ug/kg	
53-70-3	Dibenz(a,h)anthracene	ND	27	ug/kg	
206-44-0	Fluoranthene	48.9	27	ug/kg	
86-73-7	Fluorene	ND	180	ug/kg	
193-39-5	Indeno (1,2,3-cd) pyrene	91.6	27	ug/kg	
90-12-0	1-Methylnaphthalene	ND	180	ug/kg	
91-57-6	2-Methylnaphthalene	ND	180	ug/kg	
91-20-3	Naphthalene	ND	180	ug/kg	
85-01-8	Phenanthrene	ND	180	ug/kg	
129-00-0	Pyrene	71.3	27	ug/kg	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
84-15-1	o-Terphenyl	85%		20-130%

ND = Not detected
RDL = Reported Detection Limit
E = Indicates value exceeds calibration range

J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

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Report of Analysis

Client Sample ID:	CEF-P31-SS-001-01		
Lab Sample ID:	F4081-1	**Date Sampled:**	04/29/99
Matrix:	SO - Soil	**Date Received:**	04/30/99
Method:	SW846 8310	**Percent Solids:**	94.7
Project:	NAS Cecil Field-PSC 31		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	LC4156.D	1	05/14/99	AMA	05/06/99	M:OP1207	M:GLC3
Run #2							

CAS No.	Compound	Result	RDL	Units	Q
83-32-9	Acenaphthene	287	110	ug/kg	
208-96-8	Acenaphthylene	ND	110	ug/kg	
120-12-7	Anthracene	ND	110	ug/kg	
56-55-3	Benzo (a) anthracene	519	16	ug/kg	
50-32-8	Benzo (a) pyrene	670	16	ug/kg	
205-99-2	Benzo (b) fluoranthene	991	16	ug/kg	
191-24-2	Benzo (g,h,i) perylene	796	16	ug/kg	
207-08-9	Benzo (k) fluoranthene	414	16	ug/kg	
218-01-9	Chrysene	752	16	ug/kg	
53-70-3	Dibenz(a,h)anthracene	ND	16	ug/kg	
206-44-0	Fluoranthene	938	16	ug/kg	
86-73-7	Fluorene	ND	110	ug/kg	
193-39-5	Indeno (1,2,3-cd) pyrene	908	16	ug/kg	
90-12-0	1-Methylnaphthalene	ND	110	ug/kg	
91-57-6	2-Methylnaphthalene	319	110	ug/kg	
91-20-3	Naphthalene	ND	110	ug/kg	
85-01-8	Phenanthrene	166	110	ug/kg	
129-00-0	Pyrene	1260	16	ug/kg	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
84-15-1	o-Terphenyl	74%		20-130%

ND = Not detected
RDL = Reported Detection Limit
E = Indicates value exceeds calibration range

J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

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Report of Analysis

Client Sample ID:	CEF-P31-SS-002-01		
Lab Sample ID:	F4081-2	**Date Sampled:**	04/29/99
Matrix:	SO - Soil	**Date Received:**	04/30/99
Method:	SW846 8310	**Percent Solids:**	96.0
Project:	NAS Cecil Field-PSC 31		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	LC4157.D	1	05/14/99	AMA	05/06/99	M:OP1207	M:GLC3
Run #2							

CAS No.	Compound	Result	RDL	Units	Q
83-32-9	Acenaphthene	ND	100	ug/kg	
208-96-8	Acenaphthylene	ND	100	ug/kg	
120-12-7	Anthracene	ND	100	ug/kg	
56-55-3	Benzo (a) anthracene	170	16	ug/kg	
50-32-8	Benzo (a) pyrene	500	16	ug/kg	
205-99-2	Benzo (b) fluoranthene	533	16	ug/kg	
191-24-2	Benzo (g,h,i) perylene	463	16	ug/kg	
207-08-9	Benzo (k) fluoranthene	236	16	ug/kg	
218-01-9	Chrysene	372	16	ug/kg	
53-70-3	Dibenz(a,h)anthracene	97.8	16	ug/kg	
206-44-0	Fluoranthene	298	16	ug/kg	
86-73-7	Fluorene	ND	100	ug/kg	
193-39-5	Indeno (1,2,3-cd) pyrene	514	16	ug/kg	
90-12-0	1-Methylnaphthalene	ND	100	ug/kg	
91-57-6	2-Methylnaphthalene	ND	100	ug/kg	
91-20-3	Naphthalene	ND	100	ug/kg	
85-01-8	Phenanthrene	ND	100	ug/kg	
129-00-0	Pyrene	357	16	ug/kg	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
84-15-1	o-Terphenyl	61%		20-130%

ND = Not detected
RDL = Reported Detection Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

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Report of Analysis

Client Sample ID:	CEF-P31-SS-003-01		
Lab Sample ID:	F4081-3	**Date Sampled:**	04/29/99
Matrix:	SO - Soil	**Date Received:**	04/30/99
Method:	SW846 8310	**Percent Solids:**	96.3
Project:	NAS Cecil Field-PSC 31		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	LC4158.D	1	05/14/99	AMA	05/06/99	M:OP1207	M:GLC3
Run #2							

CAS No.	Compound	Result	RDL	Units	Q
83-32-9	Acenaphthene	ND	100	ug/kg	
208-96-8	Acenaphthylene	ND	100	ug/kg	
120-12-7	Anthracene	ND	100	ug/kg	
56-55-3	Benzo (a) anthracene	36.0	16	ug/kg	
50-32-8	Benzo (a) pyrene	42.9	16	ug/kg	
205-99-2	Benzo (b) fluoranthene	69.0	16	ug/kg	
191-24-2	Benzo (g,h,i) perylene	ND	16	ug/kg	
207-08-9	Benzo (k) fluoranthene	45.1	16	ug/kg	
218-01-9	Chrysene	ND	16	ug/kg	
53-70-3	Dibenz(a,h)anthracene	ND	16	ug/kg	
206-44-0	Fluoranthene	74.7	16	ug/kg	
86-73-7	Fluorene	ND	100	ug/kg	
193-39-5	Indeno (1,2,3-cd) pyrene	ND	16	ug/kg	
90-12-0	1-Methylnaphthalene	ND	100	ug/kg	
91-57-6	2-Methylnaphthalene	ND	100	ug/kg	
91-20-3	Naphthalene	ND	100	ug/kg	
85-01-8	Phenanthrene	ND	100	ug/kg	
129-00-0	Pyrene	110	16	ug/kg	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
84-15-1	o-Terphenyl	90%		20-130%

ND = Not detected
RDL = Reported Detection Limit
E = Indicates value exceeds calibration range

J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

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Report of Analysis

Client Sample ID:	CEF-P31-SS-004-01		
Lab Sample ID:	F4081-4	**Date Sampled:**	04/29/99
Matrix:	SO - Soil	**Date Received:**	04/30/99
Method:	SW846 8310	**Percent Solids:**	95.4
Project:	NAS Cecil Field-PSC 31		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	LC4159.D	1	05/14/99	AMA	05/06/99	M:OP1207	M:GLC3
Run #2							

CAS No.	Compound	Result	RDL	Units	Q
83-32-9	Acenaphthene	164	100	ug/kg	
208-96-8	Acenaphthylene	ND	100	ug/kg	
120-12-7	Anthracene	ND	100	ug/kg	
56-55-3	Benzo (a) anthracene	239	16	ug/kg	
50-32-8	Benzo (a) pyrene	342	16	ug/kg	
205-99-2	Benzo (b) fluoranthene	462	16	ug/kg	
191-24-2	Benzo (g,h,i) perylene	351	16	ug/kg	
207-08-9	Benzo (k) fluoranthene	180	16	ug/kg	
218-01-9	Chrysene	408	16	ug/kg	
53-70-3	Dibenz(a,h)anthracene	ND	16	ug/kg	
206-44-0	Fluoranthene	485	16	ug/kg	
86-73-7	Fluorene	ND	100	ug/kg	
193-39-5	Indeno (1,2,3-cd) pyrene	380	16	ug/kg	
90-12-0	1-Methylnaphthalene	ND	100	ug/kg	
91-57-6	2-Methylnaphthalene	ND	100	ug/kg	
91-20-3	Naphthalene	ND	100	ug/kg	
85-01-8	Phenanthrene	ND	100	ug/kg	
129-00-0	Pyrene	585	16	ug/kg	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
84-15-1	o-Terphenyl	46%		20-130%

ND = Not detected
RDL = Reported Detection Limit
E = Indicates value exceeds calibration range

J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

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Report of Analysis

Client Sample ID:	CEF-P31-SS-005-02		
Lab Sample ID:	F4081-5	**Date Sampled:**	04/29/99
Matrix:	SO - Soil	**Date Received:**	04/30/99
Method:	SW846 8310	**Percent Solids:**	95.8
Project:	NAS Cecil Field-PSC 31		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	LC4160.D	1	05/14/99	AMA	05/06/99	M:OP1207	M:GLC3
Run #2							

CAS No.	Compound	Result	RDL	Units	Q
83-32-9	Acenaphthene	114	100	ug/kg	
208-96-8	Acenaphthylene	ND	100	ug/kg	
120-12-7	Anthracene	ND	100	ug/kg	
56-55-3	Benzo (a) anthracene	156	16	ug/kg	
50-32-8	Benzo (a) pyrene	209	16	ug/kg	
205-99-2	Benzo (b) fluoranthene	302	16	ug/kg	
191-24-2	Benzo (g,h,i) perylene	272	16	ug/kg	
207-08-9	Benzo (k) fluoranthene	126	16	ug/kg	
218-01-9	Chrysene	300	16	ug/kg	
53-70-3	Dibenz(a,h)anthracene	ND	16	ug/kg	
206-44-0	Fluoranthene	393	16	ug/kg	
86-73-7	Fluorene	ND	100	ug/kg	
193-39-5	Indeno (1,2,3-cd) pyrene	315	16	ug/kg	
90-12-0	1-Methylnaphthalene	ND	100	ug/kg	
91-57-6	2-Methylnaphthalene	ND	100	ug/kg	
91-20-3	Naphthalene	ND	100	ug/kg	
85-01-8	Phenanthrene	ND	100	ug/kg	
129-00-0	Pyrene	479	16	ug/kg	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
84-15-1	o-Terphenyl	89%		20-130%

ND = Not detected
RDL = Reported Detection Limit
E = Indicates value exceeds calibration range

J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

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Report of Analysis

Client Sample ID:	CEF-P31-SS-DUP01		
Lab Sample ID:	F4081-9	**Date Sampled:**	04/29/99
Matrix:	SO - Soil	**Date Received:**	04/30/99
Method:	SW846 8310	**Percent Solids:**	96.0
Project:	NAS Cecil Field-PSC 31		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	LC4163.D	1	05/14/99	AMA	05/06/99	M:OP1207	M:GLC3
Run #2							

CAS No.	Compound	Result	RDL	Units	Q
83-32-9	Acenaphthene	ND	100	ug/kg	
208-96-8	Acenaphthylene	ND	100	ug/kg	
120-12-7	Anthracene	ND	100	ug/kg	
56-55-3	Benzo (a) anthracene	255	16	ug/kg	
50-32-8	Benzo (a) pyrene	346	16	ug/kg	
205-99-2	Benzo (b) fluoranthene	480	16	ug/kg	
191-24-2	Benzo (g,h,i) perylene	345	16	ug/kg	
207-08-9	Benzo (k) fluoranthene	204	16	ug/kg	
218-01-9	Chrysene	437	16	ug/kg	
53-70-3	Dibenz(a,h)anthracene	ND	16	ug/kg	
206-44-0	Fluoranthene	581	16	ug/kg	
86-73-7	Fluorene	ND	100	ug/kg	
193-39-5	Indeno (1,2,3-cd) pyrene	381	16	ug/kg	
90-12-0	1-Methylnaphthalene	172	100	ug/kg	
91-57-6	2-Methylnaphthalene	106	100	ug/kg	
91-20-3	Naphthalene	ND	100	ug/kg	
85-01-8	Phenanthrene	ND	100	ug/kg	
129-00-0	Pyrene	714	16	ug/kg	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
84-15-1	o-Terphenyl	74%		20-130%

ND = Not detected
RDL = Reported Detection Limit
E = Indicates value exceeds calibration range

J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

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CTO078 - NAS CECIL FIELD
WATER DATA
Accutest, NJ
SDG: F4081

SAMPLE NUMBER:	CEF-P31-SW-001-01											
SAMPLE DATE:	04/29/99			/ /			/ /			/ /		
LABORATORY ID:	F4081-8											
QC_TYPE:	NORMAL											
% SOLIDS:	0.0 %			100.0 %			100.0 %			100.0 %		
UNITS:	UG/L											
FIELD DUPLICATE OF:												
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
POLYNUCLEAR AROMATIC HYDROCARBONS												
1-METHYLNAPHTHALENE	1	U										
2-METHYLNAPHTHALENE	1	U										
ACENAPHTHENE	1	U										
ACENAPHTHYLENE	1	U										
ANTHRACENE	1	U										
BENZO(A)ANTHRACENE	0.15	U										
BENZO(A)PYRENE	0.15	U										
BENZO(B)FLUORANTHENE	0.15	U										
BENZO(G,H,I)PERYLENE	0.15	U										
BENZO(K)FLUORANTHENE	0.15	U										
CHRYSENE	0.15	U										
DIBENZO(A,H)ANTHRACENE	0.15	U										
FLUORANTHENE	1	U										
FLUORENE	1	U										
INDENO(1,2,3-CD)PYRENE	0.15	U										
NAPHTHALENE	1	U										
PHENANTHRENE	1	U										
PYRENE	1	U										

CTO078 - NAS CECIL FIELD
SOIL DATA
Accutest, NJ
SDG: F4081

SAMPLE NUMBER:	CEF-P31-SD-001-01			CEF-P31-SD-002-01			CEF-P31-SS-001-01			CEF-P31-SS-002-01		
SAMPLE DATE:	04/29/99			04/29/99			04/29/99			04/29/99		
LABORATORY ID:	F4081-6			F4081-7			F4081-1			F4081-2		
QC_TYPE:	NORMAL			NORMAL			NORMAL			NORMAL		
% SOLIDS:	25.4 %			55.9 %			94.7 %			96.0 %		
UNITS:	UG/KG			UG/KG			UG/KG			UG/KG		
FIELD DUPLICATE OF:												
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
POLYNUCLEAR AROMATIC HYDROCARBONS												
1-METHYLNAPHTHALENE	390	U		180	U		110	U		100	U	
2-METHYLNAPHTHALENE	797	J	Y	180	U		319			100	U	
ACENAPHTHENE	659	J	Y	180	U		287			100	U	
ACENAPHTHYLENE	4860	J	Y	180	U		110	U		100	U	
ANTHRACENE	390	U		180	U		110	U		100	U	
BENZO(A)ANTHRACENE	301	J	Y	27	U		519			170		
BENZO(A)PYRENE	342	J	Y	43.3			670			500		
BENZO(B)FLUORANTHENE	1080	J	Y	125			991			533		
BENZO(G,H,I)PERYLENE	381	J	Y	27	U		796			463		
BENZO(K)FLUORANTHENE	416	J	Y	36.1			414			236		
CHRYSENE	617	J	CY	49.0	J	C	752	J	C	372	J	C
DIBENZO(A,H)ANTHRACENE	59	U		27	U		16	U		97.8		
FLUORANTHENE	779	J	Y	48.9			938			298		
FLUORENE	390	U		180	U		110	U		100	U	
INDENO(1,2,3-CD)PYRENE	380	J	Y	91.6			908			514		
NAPHTHALENE	390	U		180	U		110	U		100	U	
PHENANTHRENE	390	U		180	U		166			100	U	
PYRENE	775	J	Y	71.3			1260			357		

CTO078 - NAS CECIL FIELD
SOIL DATA
Accutest, NJ
SDG: F4081

SAMPLE NUMBER:	CEF-P31-SS-003-01			CEF-P31-SS-004-01			CEF-P31-SS-005-02			CEF-P31-SS-DUP01		
SAMPLE DATE:	04/29/99			04/29/99			04/29/99			04/29/99		
LABORATORY ID:	F4081-3			F4081-4			F4081-5			F4081-9		
QC_TYPE:	NORMAL			NORMAL			NORMAL			NORMAL		
% SOLIDS:	96.3 %			95.4 %			95.8 %			96.0 %		
UNITS:	UG/KG			UG/KG			UG/KG			UG/KG		
FIELD DUPLICATE OF:										CEF-P31-SS-004-01		
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
POLYNUCLEAR AROMATIC HYDROCARBONS												
1-METHYLNAPHTHALENE	100	U		100	U		100	U		172		
2-METHYLNAPHTHALENE	100	U		100	U		100	U		110		
ACENAPHTHENE	100	U		164			114			100	U	
ACENAPHTHYLENE	100	U		100	U		100	U		100	U	
ANTHRACENE	100	U		100	U		100	U		100	U	
BENZO(A)ANTHRACENE	36.0			239			156			255		
BENZO(A)PYRENE	42.9			342			209			346		
BENZO(B)FLUORANTHENE	69.0			462			302			480		
BENZO(G,H,I)PERYLENE	16	U		351			272			345		
BENZO(K)FLUORANTHENE	45.1			180			126			204		
CHRYSENE	16	U		408	J	C	300	J	C	437	J	C
DIBENZO(A,H)ANTHRACENE	16	U		16	U		16	U		16	U	
FLUORANTHENE	74.7			485			393			581		
FLUORENE	100	U		100	U		100	U		100	U	
INDENO(1,2,3-CD)PYRENE	16	U		380			315			381		
NAPHTHALENE	100	U		100	U		100	U		100	U	
PHENANTHRENE	100	U		100	U		100	U		100	U	
PYRENE	110			585			479			714		

Qualifier Codes:

A = Lab Blank Contamination
B = Field Blank Contamination
C = Calibration (i.e., % RSDs, %Ds, ICVs, CCVs, RPDs, RRFs, etc.) Noncompliance
D = MS/MSD Noncompliance
E = LCS/LCSD Noncompliance
F = Lab Duplicate Imprecision
G = Field Duplicate Imprecision
H = Holding Time Exceedance
I = ICP Serial Dilution Noncompliance
J = GFAA PDS - GFAA MSA's $r < 0.995$
K = ICP Interference - include ICSAB % R's
L = Instrument Calibration Range Exceedance
M = Sample Preservation
N = Internal Standard Noncompliance
O = Poor Instrument Performance (i.e., base-time drifting)
P = Uncertainty near detection limit (< 2 x IDL for inorganics and <CRQL for organics)
Q = Other problems (can encompass a number of issues)
R = Surrogates Recovery Noncompliance
S = Pesticide/PCB Resolution
T = % Breakdown Noncompliance for DDT and Endrin
U = Pest/PCB D% between columns for positive results
V = Non-linear calibrations, tuning $r < 0.995$ (correlation coefficient)
W = EMPC result
X = Signal to noise response drop
Y = % Solid content is less than 30%

PHASE II ANALYTICAL RESULTS

Tetra Tech NUS

INTERNAL CORRESPONDENCE

PITT-08-9-008

TO:	**M. SPERANZA**	**DATE:**	**AUGUST 2, 1999**
FROM:	**GRETCHEN PHIPPS**	**COPIES:**	**DV FILE**

SUBJECT: **ORGANIC DATA VALIDATION –PAHs**
CTO 078 - NAS, CECIL FIELD
SDG – F4416

SAMPLES: 5/Soils/

CEF-P31-SS-101-01 CEF-P31-SS-102-01
CEF-P31-SS-103-01 CEF-P31-SS-104-01
CEF-P31-SS-DU02

2/Sediments/

CEF-P31-SD-101-02 CEF-P31-SD-102-02

Overview

The sample set for CTO 078, NAS Cecil Field, SDG F4416, consists of five (5) soil and (2) sediment environmental samples. One (1) field duplicate pair (CEF-P31-SS-104-01 / CEF-P31-SS-DU02) was included within this SDG.

The samples were analyzed for polynuclear aromatic hydrocarbons (PAHs). The samples were collected by Tetra Tech NUS on June 29, 1999 and analyzed by Accutest Laboratory. All analyses were performed in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance / Quality Control (QA/QC) criteria. PAH analyses were conducted using SW 846 method 8310.

The data was evaluated based on the following parameters:

- * Data Completeness
- Calibration Verifications
- * Holding Times
- * Laboratory Blank Analyses
- * Field Duplicate Analyses
- * Detection Limits
- * Surrogate Recoveries

* - All quality control criteria were met for this parameter.

Calibration Verifications

The %Ds for benzo(a)pyrene on both columns were >15% quality control limit affecting samples CEF-P31-SD-101-02, CEF-P31-SD-102-02, CEF-P31-SS-101-01 and CEF-P31-SS-102-01. The positive results reported for benzo(a)pyrene in the affected samples were qualified as estimated, "J".

The %Ds for anthracene, benzo(a)pyrene, naphthalene, 1-methylnaphthalene, 2-methylnaphthalene and pyrene on one column were >15% quality control limit affecting several samples. No validation action was taken on this basis.

Notes

All result reported for field duplicate pair (CEF-P31-SS-104-01 / CEF-P31-SS-DU02)were nondetected. Therefore, a comparison was not included in Appendix C.

Executive Summary

Laboratory Performance: The %Ds for benzo(a)pyrene on both columns were >15% quality control limit affecting samples CEF-P31-SD-101-02, CEF-P31-SD-102-02, CEF-P31-SS-101-01 and CEF-P31-SS-102-01.

Other Factors Affecting Data Quality: None.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Organic Review", February 1994 and the NFESC document entitles "Navy Installation Restoration Laboratory Quality Assurance Guide." (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."

Gretchen A Phipps

Tetra Tech NUS
Gretchen A. Phipps

Tetra Tech NUS
Joseph A. Samchuck
Quality Control Officer

Report of Analysis

Client Sample ID:	CEF-P31-SD-101-02		
Lab Sample ID:	F4416-1	**Date Sampled:**	06/29/99
Matrix:	SO - Soil	**Date Received:**	06/30/99
Method:	EPA 8310	**Percent Solids:**	54.5
Project:	NAS Cecil Field		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1 [a]		1	07/19/99	SUB	n/a	n/a	R6943
Run #2							

CAS No.	Compound	Result	RDL	Units	Q
83-32-9	Acenaphthene	150	57	ug/kg	
208-96-8	Acenaphthylene	ND	120	ug/kg	
120-12-7	Anthracene	13	8.5	ug/kg	
56-55-3	Benzo(a)anthracene	43	8.5	ug/kg	
50-32-8	Benzo(a)pyrene	55	8.5	ug/kg	
205-99-2	Benzo(b)fluoranthene	110	8.5	ug/kg	
191-24-2	Benzo(g,h,i)perylene	90	11	ug/kg	
207-08-9	Benzo(k)fluoranthene	37	8.5	ug/kg	
218-01-9	Chrysene	88	8.5	ug/kg	
53-70-3	Dibenzo(a,h)anthracene	16	16	ug/kg	
206-44-0	Fluoranthene	120	11	ug/kg	
86-73-7	Fluorene	ND	11	ug/kg	
193-39-5	Indeno(1,2,3-cd)pyrene	62	8.5	ug/kg	
91-20-3	Naphthalene	ND	57	ug/kg	
90-12-0	1-Methylnaphthalene	ND	57	ug/kg	
91-57-6	2-Methylnaphthalene	87	57	ug/kg	
85-01-8	Phenanthrene	21	8.5	ug/kg	
129-00-0	Pyrene	130	11	ug/kg	

(a) Analyzed By Accutest Southeast Subcontract Lab.

00013

ND = Not detected
RDL = Reported Detection Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	CEF-P31-SD-102-02		
Lab Sample ID:	F4416-2	**Date Sampled:**	06/29/99
Matrix:	SO - Soil	**Date Received:**	06/30/99
Method:	EPA 8310	**Percent Solids:**	51.1
Project:	NAS Cecil Field		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1 [a]		1	07/19/99	SUB	n/a	n/a	R6943
Run #2							

CAS No.	Compound	Result	RDL	Units	Q
83-32-9	Acenaphthene	130	46	ug/kg	
208-96-8	Acenaphthylene	ND	94	ug/kg	
120-12-7	Anthracene	ND	6.9	ug/kg	
56-55-3	Benzo(a)anthracene	53	6.9	ug/kg	
50-32-8	Benzo(a)pyrene	51	6.9	ug/kg	
205-99-2	Benzo(b)fluoranthene	130	6.9	ug/kg	
191-24-2	Benzo(g,h,i)perylene	42	9.4	ug/kg	
207-08-9	Benzo(k)fluoranthene	58	6.9	ug/kg	
218-01-9	Chrysene	69	6.9	ug/kg	
53-70-3	Dibenzo(a,h)anthracene	12	12	ug/kg	
206-44-0	Fluoranthene	190	9.4	ug/kg	
86-73-7	Fluorene	ND	9.4	ug/kg	
193-39-5	Indeno(1,2,3-cd)pyrene	76	6.9	ug/kg	
91-20-3	Naphthalene	ND	46	ug/kg	
90-12-0	1-Methylnaphthalene	ND	46	ug/kg	
91-57-6	2-Methylnaphthalene	61	46	ug/kg	
85-01-8	Phenanthrene	24	6.9	ug/kg	
129-00-0	Pyrene	42	9.4	ug/kg	

(a) Analyzed By Accutest Southeast Subcontract Lab.

00017

ND = Not detected
RDL = Reported Detection Limit
E = Indicates value exceeds calibration range

J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	CEF-P31-SS-101-01		
Lab Sample ID:	F4416-3	**Date Sampled:**	06/29/99
Matrix:	SO - Soil	**Date Received:**	06/30/99
Method:	EPA 8310	**Percent Solids:**	90.4
Project:	NAS Cecil Field		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1 [a]		1	07/19/99	SUB	n/a	n/a	R6943
Run #2							

CAS No.	Compound	Result	RDL	Units	Q
83-32-9	Acenaphthene	ND	37	ug/kg	
208-96-8	Acenaphthylene	ND	75	ug/kg	
120-12-7	Anthracene	ND	5.6	ug/kg	
56-55-3	Benzo(a)anthracene	9.5	5.6	ug/kg	
50-32-8	Benzo(a)pyrene	14	5.6	ug/kg	
205-99-2	Benzo(b)fluoranthene	39	5.6	ug/kg	
191-24-2	Benzo(g,h,i)perylene	38	7.5	ug/kg	
207-08-9	Benzo(k)fluoranthene	14	5.6	ug/kg	
218-01-9	Chrysene	10	5.6	ug/kg	
53-70-3	Dibenzo(a,h)anthracene	ND	9.3	ug/kg	
206-44-0	Fluoranthene	20	7.5	ug/kg	
86-73-7	Fluorene	ND	7.5	ug/kg	
193-39-5	Indeno(1,2,3-cd)pyrene	23	5.6	ug/kg	
91-20-3	Naphthalene	ND	37	ug/kg	
90-12-0	1-Methylnaphthalene	ND	37	ug/kg	
91-57-6	2-Methylnaphthalene	ND	37	ug/kg	
85-01-8	Phenanthrene	ND	5.6	ug/kg	
129-00-0	Pyrene	22	7.5	ug/kg	

(a) Analyzed By Accutest Southeast Subcontract Lab.

00021

ND = Not detected
RDL = Reported Detection Limit
E = Indicates value exceeds calibration range

J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	CEF-P31-SS-102-01		
Lab Sample ID:	F4416-4	**Date Sampled:**	06/29/99
Matrix:	SO - Soil	**Date Received:**	06/30/99
Method:	EPA 8310	**Percent Solids:**	84.6
Project:	NAS Cecil Field		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1 [a]		1	07/19/99	SUB	n/a	n/a	R6943
Run #2							

CAS No.	Compound	Result	RDL	Units	Q
83-32-9	Acenaphthene	64	37	ug/kg	
208-96-8	Acenaphthylene	ND	74	ug/kg	
120-12-7	Anthracene	8.2	5.5	ug/kg	
56-55-3	Benzo(a)anthracene	55	5.5	ug/kg	
50-32-8	Benzo(a)pyrene	110	5.5	ug/kg	
205-99-2	Benzo(b)fluoranthene	170	5.5	ug/kg	
191-24-2	Benzo(g,h,i)perylene	180	7.4	ug/kg	
207-08-9	Benzo(k)fluoranthene	77	5.5	ug/kg	
218-01-9	Chrysene	59	5.5	ug/kg	
53-70-3	Dibenzo(a,h)anthracene	ND	9.2	ug/kg	
206-44-0	Fluoranthene	84	7.4	ug/kg	
86-73-7	Fluorene	ND	7.4	ug/kg	
193-39-5	Indeno(1,2,3-cd)pyrene	100	5.5	ug/kg	
91-20-3	Naphthalene	ND	37	ug/kg	
90-12-0	1-Methylnaphthalene	ND	37	ug/kg	
91-57-6	2-Methylnaphthalene	41	37	ug/kg	
85-01-8	Phenanthrene	9.8	5.5	ug/kg	
129-00-0	Pyrene	97	7.4	ug/kg	

(a) Analyzed By Accutest Southeast Subcontract Lab.

00025

ND = Not detected
RDL = Reported Detection Limit
E = Indicates value exceeds calibration range

J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	CEF-P31-SS-103-01		
Lab Sample ID:	F4416-5	**Date Sampled:**	06/29/99
Matrix:	SO - Soil	**Date Received:**	06/30/99
Method:	EPA 8310	**Percent Solids:**	89.8
Project:	NAS Cecil Field		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1 [a]		1	07/19/99	SUB	n/a	n/a	R6943
Run #2							

CAS No.	Compound	Result	RDL	Units	Q
83-32-9	Acenaphthene	ND	39	ug/kg	
208-96-8	Acenaphthylene	ND	80	ug/kg	
120-12-7	Anthracene	ND	6.0	ug/kg	
56-55-3	Benzo(a)anthracene	9.0	6.0	ug/kg	
50-32-8	Benzo(a)pyrene	16	6.0	ug/kg	
205-99-2	Benzo(b)fluoranthene	35	6.0	ug/kg	
191-24-2	Benzo(g,h,i)perylene	39	8.0	ug/kg	
207-08-9	Benzo(k)fluoranthene	14	6.0	ug/kg	
218-01-9	Chrysene	12	6.0	ug/kg	
53-70-3	Dibenzo(a,h)anthracene	ND	9.0	ug/kg	
206-44-0	Fluoranthene	14	8.0	ug/kg	
86-73-7	Fluorene	ND	8.0	ug/kg	
193-39-5	Indeno(1,2,3-cd)pyrene	23	6.0	ug/kg	
91-20-3	Naphthalene	ND	39	ug/kg	
90-12-0	1-Methylnaphthalene	ND	39	ug/kg	
91-57-6	2-Methylnaphthalene	ND	39	ug/kg	
85-01-8	Phenanthrene	ND	6.0	ug/kg	
129-00-0	Pyrene	23	8.0	ug/kg	

(a) Analyzed By Accutest Southeast Subcontract Lab.

00029

ND = Not detected
RDL = Reported Detection Limit
E = Indicates value exceeds calibration range

J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	CEF-P31-SS-104-01		
Lab Sample ID:	F4416-6	**Date Sampled:**	06/29/99
Matrix:	SO - Soil	**Date Received:**	06/30/99
Method:	EPA 8310	**Percent Solids:**	91.8
Project:	NAS Cecil Field		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1 [a]		1	07/19/99	SUB	n/a	n/a	R6943
Run #2							

CAS No.	Compound	Result	RDL	Units	Q
83-32-9	Acenaphthene	ND	36	ug/kg	
208-96-8	Acenaphthylene	ND	74	ug/kg	
120-12-7	Anthracene	ND	5.5	ug/kg	
56-55-3	Benzo(a)anthracene	ND	5.5	ug/kg	
50-32-8	Benzo(a)pyrene	ND	5.5	ug/kg	
205-99-2	Benzo(b)fluoranthene	ND	5.5	ug/kg	
191-24-2	Benzo(g,h,i)perylene	ND	7.4	ug/kg	
207-08-9	Benzo(k)fluoranthene	ND	5.5	ug/kg	
218-01-9	Chrysene	ND	5.5	ug/kg	
53-70-3	Dibenzo(a,h)anthracene	ND	9.1	ug/kg	
206-44-0	Fluoranthene	ND	7.4	ug/kg	
86-73-7	Fluorene	ND	7.4	ug/kg	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	5.5	ug/kg	
91-20-3	Naphthalene	ND	36	ug/kg	
90-12-0	1-Methylnaphthalene	ND	36	ug/kg	
91-57-6	2-Methylnaphthalene	ND	36	ug/kg	
85-01-8	Phenanthrene	ND	5.5	ug/kg	
129-00-0	Pyrene	ND	7.4	ug/kg	

(a) Analyzed By Accutest Southeast Subcontract Lab.

00053

ND = Not detected
RDL = Reported Detection Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	CEF-P31-SS-DU0202		
Lab Sample ID:	F4416-7	**Date Sampled:**	06/29/99
Matrix:	SO - Soil	**Date Received:**	06/30/99
Method:	EPA 8310	**Percent Solids:**	89.4
Project:	NAS Cecil Field		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1 [a]		1	07/19/99	SUB	n/a	n/a	R6943
Run #2							

CAS No.	Compound	Result	RDL	Units	Q
83-32-9	Acenaphthene	ND	38	ug/kg	
208-96-8	Acenaphthylene	ND	76	ug/kg	
120-12-7	Anthracene	ND	5.7	ug/kg	
56-55-3	Benzo(a)anthracene	ND	5.7	ug/kg	
50-32-8	Benzo(a)pyrene	ND	5.7	ug/kg	
205-99-2	Benzo(b)fluoranthene	ND	5.7	ug/kg	
191-24-2	Benzo(g,h,i)perylene	ND	7.6	ug/kg	
207-08-9	Benzo(k)fluoranthene	ND	5.7	ug/kg	
218-01-9	Chrysene	ND	5.7	ug/kg	
53-70-3	Dibenzo(a,h)anthracene	ND	9.4	ug/kg	
206-44-0	Fluoranthene	ND	7.6	ug/kg	
86-73-7	Fluorene	ND	7.6	ug/kg	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	5.7	ug/kg	
91-20-3	Naphthalene	ND	38	ug/kg	
90-12-0	1-Methylnaphthalene	ND	38	ug/kg	
91-57-6	2-Methylnaphthalene	ND	38	ug/kg	
85-01-8	Phenanthrene	ND	5.7	ug/kg	
129-00-0	Pyrene	ND	7.6	ug/kg	

(a) Analyzed By Accutest Southeast Subcontract Lab.

ND = Not detected
RDL = Reported Detection Limit
E = Indicates value exceeds calibration range

J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

CTO078 - NAS CECIL FIELD
SOIL DATA
Accutest, NJ
SDG: F4416

SAMPLE NUMBER:	CEF-P31-SD-101-02			CEF-P31-SD-102-02			CEF-P31-SS-101-01			CEF-P31-SS-102-01		
SAMPLE DATE:	06/29/99			06/29/99			06/29/99			06/29/99		
LABORATORY ID:	F4416-1			F4416-2			F4416-3			F4416-4		
QC_TYPE:	NORMAL			NORMAL			NORMAL			NORMAL		
% SOLIDS:	54.5 %			51.1 %			90.4 %			84.6 %		
UNITS:	UG/KG			UG/KG			UG/KG			UG/KG		
FIELD DUPLICATE OF:												
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
POLYNUCLEAR AROMATIC HYDROCARBONS												
1-METHYLNAPHTHALENE	57	U		46	U		37	U		37	U	
2-METHYLNAPHTHALENE	87			61			37	U		41		
ACENAPHTHENE	150			130			37	U		64		
ACENAPHTHYLENE	120	U		94	U		75	U		74	U	
ANTHRACENE	13			6.9	U		5.6	U		8.2		
BENZO(A)ANTHRACENE	43			53			9.5			55		
BENZO(A)PYRENE	55	J	C	51	J	C	14	J	C	110	J	C
BENZO(B)FLUORANTHENE	110			130			39			170		
BENZO(G,H,I)PERYLENE	90			42			38			180		
BENZO(K)FLUORANTHENE	37			58			14			77		
CHRYSENE	88			69			10			59		
DIBENZO(A,H)ANTHRACENE	16			12			9.3	U		9.2	U	
FLUORANTHENE	120			190			20			84		
FLUORENE	11	U		9.4	U		7.5	U		7.4	U	
INDENO(1,2,3-CD)PYRENE	62			76			23			100		
NAPHTHALENE	57	U		46	U		37	U		37	U	
PHENANTHRENE	21			24			5.6	U		9.8		
PYRENE	130			42			22			97		

CTO078 - NAS CECIL FIELD
SOIL DATA
Accutest, NJ
SDG: F4416

SAMPLE NUMBER:	CEF-P31-SS-103-01	CEF-P31-SS-104-03	CEF-P31-SS-DU02	
SAMPLE DATE:	06/29/99	06/29/99	06/29/99	/ /
LABORATORY ID:	F4416-5	F4416-6	F4416-7	
QC_TYPE:	NORMAL	NORMAL	NORMAL	
% SOLIDS:	89.8 %	91.8 %	89.4 %	100.0 %
UNITS:	UG/KG	UG/KG	UG/KG	
FIELD DUPLICATE OF:			CEF-P31-SS-104-03	

	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
POLYNUCLEAR AROMATIC HYDROCARBONS												
1-METHYLNAPHTHALENE	39	U		36	U		38	U				
2-METHYLNAPHTHALENE	39	U		36	U		38	U				
ACENAPHTHENE	39	U		36	U		38	U				
ACENAPHTHYLENE	80	U		74	U		76	U				
ANTHRACENE	6	U		5.5	U		5.7	U				
BENZO(A)ANTHRACENE	9			5.5	U		5.7	U				
BENZO(A)PYRENE	16			5.5	U		5.7	U				
BENZO(B)FLUORANTHENE	35			5.5	U		5.7	U				
BENZO(G,H,I)PERYLENE	39			7.4	U		7.6	U				
BENZO(K)FLUORANTHENE	14			5.5	U		5.7	U				
CHRYSENE	12			5.5	U		5.7	U				
DIBENZO(A,H)ANTHRACENE	9	U		9.1	U		9.4	U				
FLUORANTHENE	14			7.4	U		7.6	U				
FLUORENE	8	U		7.4	U		7.6	U				
INDENO(1,2,3-CD)PYRENE	23			5.5	U		5.7	U				
NAPHTHALENE	39	U		36	U		38	U				
PHENANTHRENE	6	U		5.5	U		5.7	U				
PYRENE	23			7.4	U		7.6	U				

Qualifier Codes:

A = Lab Blank Contamination
B = Field Blank Contamination
C = Calibration (i.e., % RSDs, %Ds, ICVs, CCVs, RPDs, RRFs, etc.) Noncompliance
D = MS/MSD Noncompliance
E = LCS/LCSD Noncompliance
F = Lab Duplicate Imprecision
G = Field Duplicate Imprecision
H = Holding Time Exceedance
I = ICP Serial Dilution Noncompliance
J = GFAA PDS - GFAA MSA's $r < 0.995$
K = ICP Interference - include ICSAB % R's
L = Instrument Calibration Range Exceedance
M = Sample Preservation
N = Internal Standard Noncompliance
O = Poor Instrument Performance (i.e., base-time drifting)
P = Uncertainty near detection limit (< 2 x IDL for inorganics and <CRQL for organics)
Q = Other problems (can encompass a number of issues)
R = Surrogates Recovery Noncompliance
S = Pesticide/PCB Resolution
T = % Breakdown Noncompliance for DDT and Endrin
U = Pest/PCB D% between columns for positive results
V = Non-linear calibrations, tuning $r < 0.995$ (correlation coefficient)
W = EMPC result
X = Signal to noise response drop
Y = % Solid content is less than 30%

PHASE III ANALYTICAL RESULTS

Tetra Tech NUS

INTERNAL CORRESPONDENCE

PITT-09-9-098

TO: MR. M. SPERANZA

DATE: SEPTEMBER 11, 1999

FROM: JUSTIN ORBICH

CC: DV FILE

SUBJECT: ORGANIC DATA VALIDATION – PAH
CTO 078 – NAS CECIL FIELD
SDG F4741

SAMPLES: 3/Solid

CEF-P31-SS-201-01
CEF-P31-SS-DU03
CEF-P31-SS-202-01

OVERVIEW

The sample set for CTO 078, SDG F4741 Naval Air Station (NAS) Cecil Field; Florida consists of three (3) solid environmental samples. The samples were analyzed Polynuclear Aromatic Hydrocarbon (PAH) organic compounds. One (1) field duplicate pair (CEF-P31-SS-202-01/CEF-P31-SS-DU03) was included within this SDG.

The samples were collected by Tetra Tech, NUS on August 17th, 1999 and analyzed by Accutest Laboratories. All analyses were performed in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria and analyzed according to SW 846 Method 8310 analytical and reporting protocols. The data in this SDG was validated with regard to the following parameters:

* • Data Completeness
* • Holding Times
* • Initial/continuing calibrations
* • Laboratory method/field quality control blank results
* • Detection Limits
  • Field Duplicate Precision

The symbol (*) indicates that all quality control criteria were met for this parameter. Problems affecting data quality are discussed below; documentation supporting these findings is presented in Appendix C. Qualified analytical results are presented in Appendix A.

PAH FRACTION

The continuing calibration Percent Difference (%D) exceeded the 25% quality control for 2-methylnaphthalene on 08/28/99 at 0104 on both columns. No action was warranted since only nondetected results were reported.

The Field Duplicate Pair (CEF-P31-SS-202-01/CEF-P31-SS-DU03) exceeded the Relative Percent Differences (RPDs) quality control limit for several compounds. The positive results were qualified as estimated (J).

MEMO TO: **MR. M. SPERANZA**
DATE: **SEPTEMBER 11, 1999 – PAGE 2**

EXECUTIVE SUMMARY

Laboratory performance: The continuing calibration %D exceeded the quality control limit for 2-methylnaphthalene.

Other Factors Affecting Data Quality: The Field Duplicate Pair RPDs exceeded the quality control limits for several compounds.

The data for these analyses were reviewed with reference to the EPA Functional Guidelines for Organic Data Validation (February, 1994), and the NFESC guidelines "Navy Installation Restoration Program Laboratory Quality Assurance Guide" (February, 1996). The text of this report has been formulated to address only those problems affecting data quality.

"I attest that the data referenced herein was validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."

Justin Orbich

Chemist/Data Validator
Tetra Tech, NUS

Joseph A. Samchuck

Data Validation Quality Assurance Officer
Tetra Tech, NUS

Attachments:
1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation

Report of Analysis

Client Sample ID:	CEF-P31-SS-201-01		
Lab Sample ID:	F4741-1	Date Sampled:	08/17/99
Matrix:	SO - Soil	Date Received:	08/19/99
Method:	SW846 8310	Percent Solids:	94.1
Project:	NAS Cecil Field-PSC 31		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1 [a]	LC5531.D	1	08/27/99	AMA	08/23/99	M:OP1402	M:GLC23
Run #2							

CAS No.	Compound	Result	RL	Units	Q
83-32-9	Acenaphthene	441	70	ug/kg	
208-96-8	Acenaphthylene	ND	70	ug/kg	
120-12-7	Anthracene	ND	70	ug/kg	
56-55-3	Benzo (a) anthracene	537	10	ug/kg	
50-32-8	Benzo (a) pyrene	919	10	ug/kg	
205-99-2	Benzo (b) fluoranthene	938	10	ug/kg	
191-24-2	Benzo (g,h,i) perylene	644	10	ug/kg	
207-08-9	Benzo (k) fluoranthene	437	10	ug/kg	
218-01-9	Chrysene	880	10	ug/kg	
53-70-3	Dibenz(a,h)anthracene	ND	10	ug/kg	
206-44-0	Fluoranthene	1860	10	ug/kg	
86-73-7	Fluorene	ND	70	ug/kg	
193-39-5	Indeno (1,2,3-cd) pyrene	734	10	ug/kg	
90-12-0	1-Methylnaphthalene	ND	70	ug/kg	
91-57-6	2-Methylnaphthalene	ND	70	ug/kg	
91-20-3	Naphthalene	ND	70	ug/kg	
85-01-8	Phenanthrene	411	70	ug/kg	
129-00-0	Pyrene	1670	10	ug/kg	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
84-15-1	o-Terphenyl	73%		20-130%

(a) Sample contains asphalt particles.

ND = Not detected
RL = Reporting Limit
E = Indicates value exceeds calibration range
J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	CEF-P31-SS-202-01		
Lab Sample ID:	F4741-2	Date Sampled:	08/17/99
Matrix:	SO - Soil	Date Received:	08/19/99
Method:	SW846 8310	Percent Solids:	94.4
Project:	NAS Cecil Field-PSC 31		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	LC5532.D	1	08/27/99	AMA	08/23/99	M:OP1402	M:GLC23
Run #2							

CAS No.	Compound	Result	RL	Units	Q
83-32-9	Acenaphthene	ND	70	ug/kg	
208-96-8	Acenaphthylene	ND	70	ug/kg	
120-12-7	Anthracene	ND	70	ug/kg	
56-55-3	Benzo (a) anthracene	21.6	10	ug/kg	
50-32-8	Benzo (a) pyrene	26.5	10	ug/kg	
205-99-2	Benzo (b) fluoranthene	38.3	10	ug/kg	
191-24-2	Benzo (g,h,i) perylene	ND	10	ug/kg	
207-08-9	Benzo (k) fluoranthene	16.0	10	ug/kg	
218-01-9	Chrysene	31.7	10	ug/kg	
53-70-3	Dibenz(a,h)anthracene	37.7	10	ug/kg	
206-44-0	Fluoranthene	70.1	10	ug/kg	
86-73-7	Fluorene	ND	70	ug/kg	
193-39-5	Indeno (1,2,3-cd) pyrene	ND	10	ug/kg	
90-12-0	1-Methylnaphthalene	ND	70	ug/kg	
91-57-6	2-Methylnaphthalene	ND	70	ug/kg	
91-20-3	Naphthalene	ND	70	ug/kg	
85-01-8	Phenanthrene	ND	70	ug/kg	
129-00-0	Pyrene	64.5	10	ug/kg	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
84-15-1	o-Terphenyl	39%		20-130%

ND = Not detected
RL = Reporting Limit
E = Indicates value exceeds calibration range

J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	CEF-P31-SS-DU03		
Lab Sample ID:	F4741-3	Date Sampled:	08/17/99
Matrix:	SO - Soil	Date Received:	08/19/99
Method:	SW846 8310	Percent Solids:	93.5
Project:	NAS Cecil Field-PSC 31		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	LC5533.D	1	08/27/99	AMA	08/23/99	M:OP1402	M:GLC23
Run #2							

CAS No.	Compound	Result	RL	Units	Q
83-32-9	Acenaphthene	ND	71	ug/kg	
208-96-8	Acenaphthylene	ND	71	ug/kg	
120-12-7	Anthracene	ND	71	ug/kg	
56-55-3	Benzo (a) anthracene	34.9	11	ug/kg	
50-32-8	Benzo (a) pyrene	50.4	11	ug/kg	
205-99-2	Benzo (b) fluoranthene	69.8	11	ug/kg	
191-24-2	Benzo (g,h,i) perylene	ND	11	ug/kg	
207-08-9	Benzo (k) fluoranthene	27.1	11	ug/kg	
218-01-9	Chrysene	56.8	11	ug/kg	
53-70-3	Dibenz(a,h)anthracene	49.4	11	ug/kg	
206-44-0	Fluoranthene	82.7	11	ug/kg	
86-73-7	Fluorene	ND	71	ug/kg	
193-39-5	Indeno (1,2,3-cd) pyrene	ND	11	ug/kg	
90-12-0	1-Methylnaphthalene	ND	71	ug/kg	
91-57-6	2-Methylnaphthalene	ND	71	ug/kg	
91-20-3	Naphthalene	ND	71	ug/kg	
85-01-8	Phenanthrene	ND	71	ug/kg	
129-00-0	Pyrene	74.1	11	ug/kg	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
84-15-1	o-Terphenyl	33%		20-130%

ND = Not detected
RL = Reporting Limit
E = Indicates value exceeds calibration range

J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

CTO078 - NAS CECIL FIELD
SOIL DATA
Accutest, NJ
SDG: F4741

SAMPLE NUMBER:	CEF-P31-SS-201-01			CEF-P31-SS-202-01			CEF-P31-SS-DU03			/ /		
SAMPLE DATE:	08/17/99			08/17/99			08/17/99					
LABORATORY ID:	F4741-1			F4741-2			F4741-3					
QC_TYPE:	NORMAL			NORMAL			NORMAL					
% SOLIDS:	94.1 %			94.4 %			93.5 %			100.0 %		
UNITS:	UG/KG			UG/KG			UG/KG 202					
FIELD DUPLICATE OF:							CEF-P31-SS-~~201~~-01					
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
POLYNUCLEAR AROMATIC HYDROCARBONS												
1-METHYLNAPHTHALENE	70	U		70	U		71	U				
2-METHYLNAPHTHALENE	70	U		70	U		71	U				
ACENAPHTHENE	441			70	U		71	U				
ACENAPHTHYLENE	70	U		70	U		71	U				
ANTHRACENE	70	U		70	U		71	U				
BENZO(A)ANTHRACENE	537			21.6			34.9					
BENZO(A)PYRENE	919			26.5	J	G	50.4	J	G			
BENZO(B)FLUORANTHENE	938			38.3	J	G	69.8	J	G			
BENZO(G,H,I)PERYLENE	644			10	U		11	U				
BENZO(K)FLUORANTHENE	437			16	J	G	27.1	J	G			
CHRYSENE	880			31.7	J	G	56.8	J	G			
DIBENZO(A,H)ANTHRACENE	10	U		37.7			49.4					
FLUORANTHENE	1860			70.1			82.7					
FLUORENE	70	U		70	U		71	U				
INDENO(1,2,3-CD)PYRENE	734			10	U		11	U				
NAPHTHALENE	70	U		70	U		71	U				
PHENANTHRENE	411			70	U		71	U				
PYRENE	1670			64.5			74.1					

Qualifier Codes:

A = Lab Blank Contamination
B = Field Blank Contamination
C = Calibration (i.e., % RSDs, %Ds, ICVs, CCVs, RPDs, RRFs, etc.) Noncompliance
D = MS/MSD Noncompliance
E = LCS/LCSD Noncompliance
F = Lab Duplicate Imprecision
G = Field Duplicate Imprecision
H = Holding Time Exceedance
I = ICP Serial Dilution Noncompliance
J = GFAA PDS - GFAA MSA's $r < 0.995$
K = ICP Interference - include ICSAB % R's
L = Instrument Calibration Range Exceedance
M = Sample Preservation
N = Internal Standard Noncompliance
O = Poor Instrument Performance (i.e., base-time drifting)
P = Uncertainty near detection limit (< 2 x IDL for inorganics and <CRQL for organics)
Q = Other problems (can encompass a number of issues)
R = Surrogates Recovery Noncompliance
S = Pesticide/PCB Resolution
T = % Breakdown Noncompliance for DDT and Endrin
U = Pest/PCB D% between columns for positive results
V = Non-linear calibrations, tuning $r < 0.995$ (correlation coefficient)
W = EMPC result
X = Signal to noise response drop
Y = % Solid content is less than 30%

PHASE IV ANALYTICAL RESULTS

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

PITT-10-9-259

TO: **MR. M. SPERANZA** **DATE: OCTOBER 29, 1999**

FROM: **JUSTIN ORBICH** **CC: DV FILE**

SUBJECT: **ORGANIC DATA VALIDATION – PAH**
CTO 078 – NAS CECIL FIELD
SDG F5000

SAMPLES: 3/Soil

CEF-P31-SS-301-01 CEF-P31-SS-302-01
CEF-P31-SU-303-03

OVERVIEW

The sample set for CTO 078, SDG F5000 Naval Air Station (NAS) Cecil Field; Florida consists of three (3) aqueous environmental samples. The samples were analyzed for Polynuclear Aromatic Hydrocarbon (PAH) plus 1-methylnaphthalene and 2-methylnaphthalene organic compounds. No field duplicate pairs were included within this SDG.

The samples were collected by Tetra Tech, NUS on October 1st, 1999 and analyzed by Accutest Laboratories. All analyses were performed in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria and analyzed according to SW 846 Method 8310 analytical and reporting protocols. The data in this SDG was validated with regard to the following parameters:

* • Data Completeness
* • Holding Times
* • Initial/continuing calibrations
* • Laboratory method/field quality control blank results
* • Detection Limits
* • Field Duplicate Precision

The symbol (*) indicates that all quality control criteria were met for this parameter. Problems affecting data quality are discussed below; documentation supporting these findings is presented in Appendix C. Qualified analytical results are presented in Appendix A.

PAH FRACTION

It should be noted the laboratory analyzed the samples at a 5X dilution.

MEMO TO: **MR. M. SPERANZA**
DATE: **OCTOBER 29, 1999 – PAGE 2**

EXECUTIVE SUMMARY

Laboratory performance: None.

Other Factors Affecting Data Quality: None.

The data for these analyses were reviewed with reference to the EPA Functional Guidelines for Organic Data Validation (February, 1994), and the NFESC "Navy Installation Restoration Program Laboratory Quality Assurance Guide" (February, 1996). The text of this report has been formulated to address only those problems affecting data quality.

"I attest that the data referenced herein was validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."

Justin Orbich

Chemist/Data Validator
Tetra Tech, NUS

Joseph A. Samchuck

Data Validation Quality Assurance Officer
Tetra Tech, NUS

Attachments:
1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation

ACCUTEST

Report of Analysis

Client Sample ID:	CEF-P31-SS-301-01		
Lab Sample ID:	F5000-2	**Date Sampled:**	10/01/99
Matrix:	SO - Soil	**Date Received:**	10/02/99
Method:	SW846 8310	**Percent Solids:**	83.0
Project:	NAS Cecil Field-PSC 31		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	LC6357.D	1	10/13/99	AMA	10/07/99	M:OP1475	M:GLC36
Run #2							

CAS No.	Compound	Result	RDL	Units	Q
83-32-9	Acenaphthene	ND	80	ug/kg	
208-96-8	Acenaphthylene	ND	80	ug/kg	
120-12-7	Anthracene	ND	80	ug/kg	
56-55-3	Benzo (a) anthracene	ND	12	ug/kg	
50-32-8	Benzo (a) pyrene	41.1	12	ug/kg	
205-99-2	Benzo (b) fluoranthene	28.6	12	ug/kg	
191-24-2	Benzo (g,h,i) perylene	ND	12	ug/kg	
207-08-9	Benzo (k) fluoranthene	ND	12	ug/kg	
218-01-9	Chrysene	ND	12	ug/kg	
53-70-3	Dibenz(a,h)anthracene	ND	12	ug/kg	
206-44-0	Fluoranthene	ND	12	ug/kg	
86-73-7	Fluorene	ND	80	ug/kg	
193-39-5	Indeno (1,2,3-cd) pyrene	ND	12	ug/kg	
90-12-0	1-Methylnaphthalene	ND	80	ug/kg	
91-57-6	2-Methylnaphthalene	ND	80	ug/kg	
91-20-3	Naphthalene	ND	80	ug/kg	
85-01-8	Phenanthrene	ND	80	ug/kg	
129-00-0	Pyrene	ND	12	ug/kg	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
84-15-1	o-Terphenyl	51%		20-130%

ND = Not detected
RDL = Reported Detection Limit
E = Indicates value exceeds calibration range

J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

000004

ACCUTEST

Report of Analysis

Client Sample ID:	CEF-P31-SS-302-01		
Lab Sample ID:	F5000-3	**Date Sampled:**	10/01/99
Matrix:	SO - Soil	**Date Received:**	10/02/99
Method:	SW846 8310	**Percent Solids:**	75.1
Project:	NAS Cecil Field-PSC 31		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	LC6358.D	1	10/13/99	AMA	10/07/99	M:OP1475	M:GLC36
Run #2							

CAS No.	Compound	Result	RDL	Units	Q
83-32-9	Acenaphthene	ND	84	ug/kg	
208-96-8	Acenaphthylene	ND	84	ug/kg	
120-12-7	Anthracene	ND	84	ug/kg	
56-55-3	Benzo (a) anthracene	42.2	13	ug/kg	
50-32-8	Benzo (a) pyrene	46.1	13	ug/kg	
205-99-2	Benzo (b) fluoranthene	45.3	13	ug/kg	
191-24-2	Benzo (g,h,i) perylene	25.1	13	ug/kg	
207-08-9	Benzo (k) fluoranthene	ND	13	ug/kg	
218-01-9	Chrysene	52.3	13	ug/kg	
53-70-3	Dibenz(a,h)anthracene	ND	13	ug/kg	
206-44-0	Fluoranthene	ND	13	ug/kg	
86-73-7	Fluorene	ND	84	ug/kg	
193-39-5	Indeno (1,2,3-cd) pyrene	ND	13	ug/kg	
90-12-0	1-Methylnaphthalene	ND	84	ug/kg	
91-57-6	2-Methylnaphthalene	ND	84	ug/kg	
91-20-3	Naphthalene	ND	84	ug/kg	
85-01-8	Phenanthrene	ND	84	ug/kg	
129-00-0	Pyrene	45.9	13	ug/kg	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
84-15-1	o-Terphenyl	57%		20-130%

ND = Not detected
RDL = Reported Detection Limit
E = Indicates value exceeds calibration range

J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

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ACCUTEST

Report of Analysis

Client Sample ID:	CEF-P31-SU-303-03		
Lab Sample ID:	F5000-1	**Date Sampled:**	10/01/99
Matrix:	SO - Soil	**Date Received:**	10/02/99
Method:	SW846 8310	**Percent Solids:**	83.7
Project:	NAS Cecil Field-PSC 31		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	LC6356.D	1	10/13/99	AMA	10/07/99	M:OP1475	M:GLC36
Run #2							

CAS No.	Compound	Result	RDL	Units	Q
83-32-9	Acenaphthene	ND	80	ug/kg	
208-96-8	Acenaphthylene	ND	80	ug/kg	
120-12-7	Anthracene	ND	80	ug/kg	
56-55-3	Benzo (a) anthracene	ND	12	ug/kg	
50-32-8	Benzo (a) pyrene	ND	12	ug/kg	
205-99-2	Benzo (b) fluoranthene	ND	12	ug/kg	
191-24-2	Benzo (g,h,i) perylene	ND	12	ug/kg	
207-08-9	Benzo (k) fluoranthene	ND	12	ug/kg	
218-01-9	Chrysene	ND	12	ug/kg	
53-70-3	Dibenz(a,h)anthracene	ND	12	ug/kg	
206-44-0	Fluoranthene	ND	12	ug/kg	
86-73-7	Fluorene	ND	80	ug/kg	
193-39-5	Indeno (1,2,3-cd) pyrene	ND	12	ug/kg	
90-12-0	1-Methylnaphthalene	ND	80	ug/kg	
91-57-6	2-Methylnaphthalene	ND	80	ug/kg	
91-20-3	Naphthalene	ND	80	ug/kg	
85-01-8	Phenanthrene	ND	80	ug/kg	
129-00-0	Pyrene	ND	12	ug/kg	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
84-15-1	o-Terphenyl	52%		20-130%

ND = Not detected
RDL = Reported Detection Limit
E = Indicates value exceeds calibration range

J = Indicates an estimated value
B = Indicates analyte found in associated method blank
N = Indicates presumptive evidence of a compound

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CTO078 - NAS CECIL FIELD
SOIL DATA
Accutest, NJ
SDG: F5000

SAMPLE NUMBER:	CEF-P31-SS-301-01			CEF-P31-SS-302-01			CEF-P31-SU-303-03					
SAMPLE DATE:	10/01/99			10/01/99			10/01/99			/ /		
LABORATORY ID:	F5000-2			F5000-3			F5000-1					
QC_TYPE:	NORMAL			NORMAL			NORMAL					
% SOLIDS:	83.0 %			75.1 %			83.7 %			100.0 %		
UNITS:	UG/KG			UG/KG			UG/KG					
FIELD DUPLICATE OF:												
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
POLYNUCLEAR AROMATIC HYDROCARBONS												
1-METHYLNAPHTHALENE	80	U		84	U		80	U				
2-METHYLNAPHTHALENE	80	U		84	U		80	U				
ACENAPHTHENE	80	U		84	U		80	U				
ACENAPHTHYLENE	80	U		84	U		80	U				
ANTHRACENE	80	U		84	U		80	U				
BENZO(A)ANTHRACENE	12	U		42.2			12	U				
BENZO(A)PYRENE	41.1			46.1			12	U				
BENZO(B)FLUORANTHENE	28.6			45.3			12	U				
BENZO(G,H,I)PERYLENE	12	U		25.1			12	U				
BENZO(K)FLUORANTHENE	12	U		13	U		12	U				
CHRYSENE	12	U		52.3			12	U				
DIBENZO(A,H)ANTHRACENE	12	U		13	U		12	U				
FLUORANTHENE	12	U		13	U		12	U				
FLUORENE	80	U		84	U		80	U				
INDENO(1,2,3-CD)PYRENE	12	U		13	U		12	U				
NAPHTHALENE	80	U		84	U		80	U				
PHENANTHRENE	80	U		84	U		80	U				
PYRENE	12	U		45.9			12	U				

Qualifier Codes:

A = Lab Blank Contamination
B = Field Blank Contamination
C = Calibration (i.e., % RSDs, %Ds, ICVs, CCVs, RPDs, RRFs, etc.) Noncompliance
D = MS/MSD Noncompliance
E = LCS/LCSD Noncompliance
F = Lab Duplicate Imprecision
G = Field Duplicate Imprecision
H = Holding Time Exceedance
I = ICP Serial Dilution Noncompliance
J = GFAA PDS - GFAA MSA's $r < 0.995$
K = ICP Interference - include ICSAB % R's
L = Instrument Calibration Range Exceedance
M = Sample Preservation
N = Internal Standard Noncompliance
O = Poor Instrument Performance (i.e., base-time drifting)
P = Uncertainty near detection limit (< 2 x IDL for inorganics and <CRQL for organics)
Q = Other problems (can encompass a number of issues)
R = Surrogates Recovery Noncompliance
S = Pesticide/PCB Resolution
T = % Breakdown Noncompliance for DDT and Endrin
U = Pest/PCB D% between columns for positive results
V = Non-linear calibrations, tuning $r < 0.995$ (correlation coefficient)
W = EMPC result
X = Signal to noise response drop
Y = % Solid content is less than 30%

APPENDIX B

FOOD CHAIN MODELING

APPENDIX B
FOOD CHAIN MODELING

Contaminant exposure via the food chain was modeled to investigate potential risks to representative receptors. Toxicity reference values (TRVs), which are contaminant doses associated with adverse effects on growth, survival, and reproduction, were obtained for comparison to doses that the receptors may receive in the environment. TRVs were preferentially selected that represent a threshold for sublethal effects, such as impairment of reproduction or growth. Since toxicity data for the specific receptors chosen herein were usually not available, toxicity data from laboratory species were extrapolated to receptor species. The TRVs were preferentially obtained from ORNL wildlife toxicity data (Sample et al., 1996).

TRVs used in this ecological risk assessment and their sources are presented in Table B-1 for the raccoon (representative mammal). TRVs for birds were obtained from a study by Trust et al (1993) in which adult and nestling European starlings (*Sturnus vulgaris*) were dosed with various concentrations of a PAH compound [7,12-dimethylbenz(a)anthracene]. A NOAEL of 10/mg/kg/day and LOAEL of 100 mg/kg/day from the Trust et (1993) study were used to evaluate risks to birds that are exposed to PAH compounds. TRVs for the bullfrog were based on a NOAEL value of 0.3 mg/kg/day for PAHs, and were obtained from a spreadsheet provided by the EPA Environmental Response Team (ERT, 1997). The NOAEL was multiplied by 10 to derive an estimated LOAEL of 3 mg/kg/day.

Representative Receptors

Representative ecological receptors used in the food chain model for PSC 31 consisted of the raccoon (*Procyon lotor*), belted kingfisher (*Ceryle alcyon*), and bullfrog (*Rana catesbeiana*), all of which are found at NAS Cecil Field and could forage at PSC 31. Information regarding these representative receptors is presented below and in Table B-2.

Raccoon (*Procyon lotor*)

The raccoon was selected as a representative mammalian that preys on aquatic organisms. The raccoon is found in a variety of habitats, and particularly in swamps, floodplain forests, and marshes. The raccoon is an opportunistic feeder that will consume terrestrial and aquatic plants and animals. Crustaceans are common forage items for raccoons while fish usually comprise less than 3 percent of the diet (EPA, 1993). The size of a raccoon's home range depends on factors such as age, sex, habitat, food sources, and season. A literature review of several studies reported home ranges of up to 6,000 acres, although values of 200 to 600 acres were most common (EPA, 1993). Raccoon home ranges on a Georgia coastal island were 160 acres for males and 96 acres for females (Lotze, 1979).

Belted kingfisher (*Ceryle alcyon*)

The kingfisher was selected as a representative avian piscivore. The species is common in Florida and its range includes most of North America. Kingfishers are typically found along rivers, streams, seacoasts, estuaries, and along the edges of lakes and ponds. Fish are the preferred prey, commonly comprising about 90 to 95 percent of the diet, and are usually less than 18 cm in length. Kingfishers will also consume crustaceans and other aquatic organisms when fish are sparse. Breeding populations in Florida are non-migratory. Territory size is variable but usually ranges from 0.4 to 2.2 km of shoreline (EPA, 1993).

Bullfrog (*Rana catesbeiana*)

The bullfrog was selected as a representative amphibian. It is common in Florida and the eastern United States. The bullfrog is an indiscriminate and aggressive predator, feeding on crayfish, insects, small fish, snails, and occasionally small birds, small mammals, and young snakes (EPA, 1993). Frogs are also quite sensitive to contaminants and thus, provide a conservative measure of potential risks.

Exposure Estimate And Risk Calculation

Chemicals whose maximum concentrations did not exceed ecological screening values (ESVs) were dropped from further consideration, while those that equaled or exceeded ESVs were retained as ecological chemicals of potential concern (COPCs). The following equation was then used to estimate contaminant intake from ingestion for representative wildlife species:

$$PD\ ingestion = [(C_{sediment} * FI * SA * F) + (C_{food} * F * FA * FI)]/WR$$

where:

PD	=	predicted dose from the ingestion food items and the incidental ingestion of sediment (mg/kg/day)
$C_{sediment}$	=	concentration in sediment (mg/kg)
FI	=	fractional intake (portion of home range that overlaps affected area; assumed to be 100%)
SA	=	portion of diet consisting of sediment
F	=	food consumed (kg/day)
FA	=	portion of diet consisting of prey
C_{food}	=	contaminant concentration in food (mg/kg)
WR	=	weight of receptor (kg)

Exposure parameters (e.g., body weight, ingestion rate) for the representative receptors are shown in Table C-2. Most exposure parameters were obtained from the *Wildlife Exposure Factors Handbook: Volumes I and II* (EPA, 1993). Wet weight food ingestion rates shown in Table C-2 were calculated as follows:

- raccoon: 856 grams of food/gram body weight/day (g/g bw/day) calculated using mammal equation for food ingestion (g/day): $0.235 \times bw^{0.822}$ (U.S. EPA, 1993); converted to wet weight assuming 75 percent water content in food items (aquatic organisms)
- kingfisher: 0.5 g/g/bw/day (U.S. EPA, 1993)
- bullfrog: 0.04 g/g bw/day (U.S. EPA, 1993)

Contaminant concentrations in food items of the raccoon, kingfisher, and bullfrog (C_{food} in the equation shown above) were calculated using sediment concentrations and biota sediment accumulation factors (BSAFs) (Table B-3). The BSAFs were preferentially obtained from *The Incidence and Severity of Sediment Contamination in Surface Waters of the United States* (EPA, 1997). If BSAFs were not available from EPA (1997), values were obtained from ERED (1998). Values of 1.0 were assumed where BSAFs were not available from either of these two sources.

The following equation (EPA, 1997) was used to estimate tissue concentrations (i.e., the theoretical bioaccumulation potential) in food items of the raccoon, kingfisher, and bullfrog:

$$TBP = BSAF(C_s/f_{oc})f_l$$

Where TBP = theoretical bioaccumulation potential (mg/kg)

C_s = chemical concentration in sediment (mg/kg)

BSAF = biota-sediment accumulation factor (ratio of the concentration of a chemical in tissue, normalized to lipid, to the concentration of the chemical in surface sediment, normalized to organic carbon)

f_{oc} = total organic carbon (TOC) content of sediment expressed as a decimal fraction

f_l = organism lipid content expressed as a decimal fraction

Site-specific tissue data were not available, so lipid values in food items of the raccoon, kingfisher, and bullfrog were assumed as follows. A lipid value of 1.3 percent was used for food items of the kingfisher, and was based on largemouth bass (*Micropterus salmoides*) (Sullivan and Otwell, 1992). This was the highest value from among three fish species [largemouth bass, bluegill (*Lepomis macrochirus*), and pumpkinseed (*Lepomis macrochirus*)] that are known to occur in creeks at NAS Cecil Field. Although adult largemouth bass would be too large to be preyed upon by the kingfisher, minnows and juvenile bass could be prey items. A lipid value of 2.2 percent was used for food items of the raccoon and bullfrog. This was the highest value available from among 12 crustacean species (Sullivan and Otwell, 1992).

Hazard quotients (HQs) are presented for each PAH compound that was a COPC at PSC 31 (Tables C-4 through C-6) and are defined as the ratio of the modeled dose to the TRV.

TABLE B-1

TOXICITY REFERENCE VALUES (TRVs) FOR THE RACCOON
PSC 31
NAS CECIL FIELD
JACKSONVILLE, FLORIDA

Chemical	Test Species	Endpoint	NOAEL Derived TRV (mg/kg/day)	LOAEL Derived TRV (mg/kg/day)	NOAEL Source	LOAEL Source
2-Methylnaphthalene [a]	Mouse	Reproduction	1	10	Sample et al., 1996	Sample et al., 1996
Acenaphthene	Mouse	Tumors	1.3	2.6	ERT, 1997	ERT, 1997
Acenaphthylene	Mouse	Tumors	1.3	2.6	ERT, 1997	ERT, 1997
Benzo(a)anthracene [a]	Mouse	Reproduction	1	10	Sample et al., 1996	Sample et al., 1996
Benzo(a)pyrene [a]	Mouse	Reproduction	1	10	Sample et al., 1996	Sample et al., 1996
Benzo(b)fluoranthene [a]	Mouse	Reproduction	1	10	Sample et al., 1996	Sample et al., 1996
Benzo(g,h,i)perylene [a]	Mouse	Reproduction	1	10	Sample et al., 1996	Sample et al., 1996
Benzo(k)fluoranthene [a]	Mouse	Reproduction	1	10	Sample et al., 1996	Sample et al., 1996
Chrysene [a]	Mouse	Reproduction	1	10	Sample et al., 1996	Sample et al., 1996
Dibenzo(a,h)anthracene	Mouse	Tumors	1.3	2.6	ERT, 1997	ERT, 1997
Fluoranthene [a]	Mouse	Reproduction	1	10	Sample et al., 1996	Sample et al., 1996
Indeno(1,2-cd)pyrene [a]	Mouse	Reproduction	1	10	Sample et al., 1996	Sample et al., 1996
Pyrene [a]	Mouse	Reproduction	1	10	Sample et al., 1996	Sample et al., 1996

a = Benzo(a)pyrene value used as a surrogate.

TABLE B-2

EXPOSURE PARAMETERS FOR REPRESENTATIVE ECOLOGICAL RECEPTORS
PSC 31
NAS CECIL FIELD
JACKSONVILLE, FLORIA

Receptor	Representative Group	Body Weight[1] (grams)	Water Ingestion[1] (grams/day)	Food Ingestion[1,2] (grams/day)	Assumed Diet for Exposure Assessment[1]	Home Range[1] (acres)
Raccoon (*Procyon lotor*)	Omnivorous Mammal	3990	344	856	90.6% aquatic invertebrates 9.4% sediment	96 to 160
Belted kingfisher (*Ceryle alcyon*)	Piscivorous Bird	136	15	68	100% fish soil, sdiment: none[3]	0.4 to 2.2 km[4]
Bullfrog (*Rana catesbeiana*)	Amphibian	249[5]	none	9.96	94.1% aquatic invertebrates 5.9% sediment[6]	23 square meters

Note: Although water ingestion rates are shown above, PAH compounds were not detected in surface water at PSC 31. Thus, surface water was not incorporated into the doses for representatives at PSC 31.

1Exposure parameters are from EPA (1993).

2 Food ingestion includes intended food items and incidentally ingested sediment. For example, a raccoon would be expected to consume 776 g invertebrates plus 80 g sediment per day.

3 Sample and Suter (1994).

4Kilometers of shoreline (home range acreage not available).

5Based on body weights in an Arkansas population.

6Based on Eastern painted turtle (sediment ingestion not available for bullfrog).

TABLE B-3

BIOTA SEDIMENT ACCUMULATION FACTORS
PSC 31
NAS CECIL FIELD, JACKSONVILLE, FLORIDA

Chemical	BSAF	Source
2-Methylnapthalene	1.0	*
Acenaphthene	0.29	Hansen, 1995
Acenaphthylene	0.0111	ERED, 1998
Benzo(a)anthracene	0.29	Hansen, 1995
Benzo(a)pyrene	0.29	Hansen, 1995
Benzo(b)fluoranthene	0.29	Hansen, 1995
Benzo(k)fluoranthene	0.29	Hansen, 1995
Benzo(g,h,i)perylene	0.0152	ERED, 1998
Chrysene	0.29	Hansen, 1995
Dibenzo(a,h)anthracene	0.29	Hansen, 1995
Fluoranthene	0.29	Hansen, 1995
Indeno(1,2,3-cd)pyrene	0.29	Hansen, 1995
Pyrene	0.29	Hansen, 1995

* When a BSAF was unavailable, 1.0 was used.

TABLE B-4

Raccoon

Body Weight	3.990 kg	
Food Ingestion Rate	0.856 kg/day	90.6 % of diet is prey (crustaceans), 9.4% of diet is sediment
Water Ingestion Rate	0.344 kg/day	

Maximum Concentrations

Chemical	Sediment Concentration (mg/kg)	Water Concentration (mg/L)	Crustacean Concentration (mg/kg)	Dose (mg/kg/day)	NOAEL (mg/kg/day)	LOAEL (mg/kg/day)	NOAEL HQ	LOAEL HQ
Semivolatile Organic Compounds								
2-METHYLNAPHTHALENE	0.797	0	1.7534	0.35688086	1	10	3.57E-01	3.57E-02
ACENAPHTHENE	0.659	0	0.420442	0.09501095	1.3	2.6	7.31E-02	3.65E-02
ACENAPHTHYLENE	4.860	0	10.692	2.17621202	1.3	2.6	1.67E+00	8.37E-01
BENZO(A)ANTHRACENE	0.301	0	0.192038	0.0433965	1	10	4.34E-02	4.34E-03
BENZO(A)PYRENE	0.342	0	0.218196	0.04930765	1	10	4.93E-02	4.93E-03
BENZO(B)FLUORANTHENE	1.080	0	0.68904	0.15570838	1	10	1.56E-01	1.56E-02
BENZO(G,H,I)PERYLENE	0.381	0	0.8382	0.17060428	1	10	1.71E-01	1.71E-02
BENZO(K)FLUORANTHENE	0.416	0	0.265408	0.05997656	1	10	6.00E-02	6.00E-03
CHRYSENE	0.617	0	0.393646	0.08895562	1	10	8.90E-02	8.90E-03
DIBENZO(A,H)ANTHRACENE	0.016	0	0.010208	0.00230679	1.3	2.6	1.77E-03	8.87E-04
FLUORANTHENE	0.779	0	0.497002	0.11231188	1	10	1.12E-01	1.12E-02
INDENO(1,2,3-CD)PYRENE	0.380	0	0.24244	0.05478628	1	10	5.48E-02	5.48E-03
PYRENE	0.775	0	0.49445	0.11173518	1	10	1.12E-01	1.12E-02

TABLE B-5

Kingfisher

Body Weight	0.1360000 kg	
Food Ingestion Rate	0.0680000 kg/day	prey = 100% fish
Water Ingestion Rate	0.0150000 kg/day	
Sediment Ingestion Rate	0.0000000 kg/day	

Maximum Concentrations

Chemical	Sediment Concentration (mg/kg)	Water Concentration (mg/L)	Fish Concentration (mg/kg)	Dose (mg/kg/day)	NOAEL (mg/kg/day)	LOAEL (mg/kg/day)	NOAEL HQ	LOAEL HQ
Semivolatile Organic Compounds								
2-METHYLNAPHTHALENE	0.797	0	1.0361	0.51805	10	100	5.18E-02	5.18E-03
ACENAPHTHENE	0.659	0	0.248443	0.124222	10	100	1.24E-02	1.24E-03
ACENAPHTHYLENE	4.86	0	6.318	3.159	10	100	3.16E-01	3.16E-02
BENZO(A)ANTHRACENE	0.301	0	0.113477	0.056739	10	100	5.67E-03	5.67E-04
BENZO(A)PYRENE	0.342	0	0.128934	0.064467	10	100	6.45E-03	6.45E-04
BENZO(B)FLUORANTHENE	1.08	0	0.40716	0.20358	10	100	2.04E-02	2.04E-03
BENZO(G,H,I)PERYLENE	0.381	0	0.4953	0.24765	10	100	2.48E-02	2.48E-03
BENZO(K)FLUORANTHENE	0.416	0	0.156832	0.078416	10	100	7.84E-03	7.84E-04
CHRYSENE	0.617	0	0.232609	0.116305	10	100	1.16E-02	1.16E-03
DIBENZO(A,H)ANTHRACENE	0.016	0	0.006032	0.003016	10	100	3.02E-04	3.02E-05
FLUORANTHENE	0.779	0	0.293683	0.146842	10	100	1.47E-02	1.47E-03
INDENO(1,2,3-CD)PYRENE	0.38	0	0.14326	0.07163	10	100	7.16E-03	7.16E-04
PYRENE	0.775	0	0.292175	0.146088	10	100	1.46E-02	1.46E-03

TABLE B-6

Bullfrog

Body Weight	0.2490000 kg	
Food Ingestion Rate	0.0099600 kg/day	94.1 % of diet is prey (crustaceans), 5.9% of diet is sediment
Water Ingestion Rate	0.0000000 kg/day	

Maximum Concentrations

Chemical	Sediment Concentration (mg/kg)	Water Concentration (mg/L)	Crustacean Concentration (mg/kg)	Dose (mg/kg/day)	NOAEL (mg/kg/day)	LOAEL (mg/kg/day)	NOAEL HQ_n	LOAEL HQ_l
Semivolatile Organic Compounds								
2-METHYLNAPHTHALENE	0.797	0	1.7534	0.06788	0.3	3	2.26E-01	2.26E-02
ACENAPHTHENE	0.659	0	0.420442	0.01738	0.3	3	5.79E-02	5.79E-03
ACENAPHTHYLENE	4.86	0	10.692	0.41392	0.3	3	1.38E+00	1.38E-01
BENZO(A)ANTHRACENE	0.301	0	0.192038	0.00794	0.3	3	2.65E-02	2.65E-03
BENZO(A)PYRENE	0.342	0	0.218196	0.00902	0.3	3	3.01E-02	3.01E-03
BENZO(B)FLUORANTHENE	1.08	0	0.68904	0.02848	0.3	3	9.49E-02	9.49E-03
BENZO(G,H,I)PERYLENE	0.381	0	0.8382	0.03245	0.3	3	1.08E-01	1.08E-02
BENZO(K)FLUORANTHENE	0.416	0	0.265408	0.01097	0.3	3	3.66E-02	3.66E-03
CHRYSENE	0.617	0	0.393646	0.01627	0.3	3	5.42E-02	5.42E-03
DIBENZO(A,H)ANTHRACENE	0.016	0	0.010208	0.00042	0.3	3	1.41E-03	1.41E-04
FLUORANTHENE	0.779	0	0.497002	0.02055	0.3	3	6.85E-02	6.85E-03
INDENO(1,2,3-CD)PYRENE	0.38	0	0.24244	0.01002	0.3	3	3.34E-02	3.34E-03
PYRENE	0.775	0	0.49445	0.02044	0.3	3	6.81E-02	6.81E-03

EXAMPLE CALCULATION OF HAZARD QUOTIENT FOR THE RACCOON USING THE MAXIMUM SEDIMENT CONCENTRATION OF ACENAPHTHENE

(See Appendix B text for definitions of the terms in the following two equations).

The predicted dose (PD) for all representative receptors = $[(C_{food} * F * FA * FI) + (C_{sediment}\ FI * SA * F)]/WR$

Concentrations of organic compounds in food items of the raccoon were derived from sediment data using the following equation: $TBP = BSAF(C_s/f_{oc})f_l$.

BSAF for acenaphthene = 0.29 (from Appendix B, Table B-3)
C_s = 0.659 mg/kg (Table B-4)
f_{oc} = assumed to be 1.0 percent = 0.01
f_l for crustaceans (assumed food of the raccoon) = 2.2 percent = 0.022 (see Appendix B text)

Using the above values, TBP = 0.29 * (0.659/0.01) * 0.022 = 0.4204 mg/kg. Thus, the predicted concentration of acenaphthene in food items (i.e., prey) of the raccoon (C_{food}) = 0.4204 mg/kg.

C_{food} = 0.4204 mg/kg (derivation shown above)
F = 0.856 kg/day (Table B-4)
FA = 90.6% = 0.906 (Table B-4)
SA = 9.4% = 0.094 (Table B-4)
FI = 100 percent = 1.0
WR = 3.99 kg (Table B-4)

Using the above values,
PD = [(0.4204 mg/kg * 0.856 kg/day * 0.906 * 1.0) + (0.659 mg/kg * 1.0 * 0.094 * 0.856 kg/day)] / 3.99 kg
PD = (0.3260 mg/day + 0.0530 mg/day) / 3.99 kg = 0.0950 mg/kg/day

The mammalian NOAEL for acenaphthene is 1.3 mg/kg/day (Table B-1).
Thus, the HQ (based on the NOAEL) = 0.0950 mg/kg/day ÷ 1.3 mg/kg/day = 0.0731.

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