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TECHNICAL MEMORANDUM FOR NO FURTHER ACTION AT POTENTIAL SOURCE OF CONTAMINATION 56 STORMWATER RETENTION POND NAS CECIL FIELD FL

2/8/2001

TETRA TECH NUS INC

Technical Memorandum
for
No Further Action

Potential Source of Contamination 56
Stormwater Retention Pond

Naval Air Station Cecil Field
Jacksonville, Florida

Southern Division
Naval Facilities Engineering Command

Contract Number N62467-94-D-0888

Contract Task Order 0078

February 2001

TECHNICAL MEMORANDUM
FOR NO FURTHER ACTION

POTENTIAL SOURCE OF CONTAMINATION 52
FACILITY 314

NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

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

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CONTRACT NUMBER N62467-94-D-0888
CONTRACT TASK ORDER 0078

FEBRUARY 2001

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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: February 8, 2001

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

The professional opinions rendered in this decision document identified as Technical Memorandum for No Further Action, Potential Source of Contamination 56, 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 the project described in this report.

Mark Speranza

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

Date: 2/8/01

Mark Speranza

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ACRONYMS

ATSDR	Agency for Toxic Substances and Disease Registry
BCT	BRAC Cleanup Team
BRAC	Base Realignment and Closure
CLEAN	Comprehensive Long-Term Environmental Action Navy
COPC	Chemical of potential concern
CTO	Contract Task Order
ER-M	Effects range-medium
ESV	Ecological Screening Value
FAC	Florida Administrative Code
FDEP	Florida Department of Environmental Protection
GCTL	Groundwater Cleanup Target Level
HLA	Harding Lawson Associates
HQ	Hazard quotient
IBDS	Inorganic Background Data Set
LOAEL	Low observable adverse effects level
mg/kg	milligram per kilogram
mg/L	milligram per liter
µg/kg	microgram per kilogram
µg/L	microgram per liter
NAS	Naval Air Station
NOAEL	No observable adverse effects level
PEC	Probable effects concentration
PEL	Probable effects level
PRE	Preliminary risk evaluation
PSC	Potential Source of Contamination
QA/QC	Quality Assurance / Quality Control
SCTL	Soil Cleanup Target Level
SOUTHNAVFACENGCOM	Southern Division Naval Facilities Engineering Command
SVOC	Semivolatile organic compound
SWCTLs	Surface Water Cleanup Target Levels
TCE	Trichloroethene
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
VOC	Volatile organic compound

1.0 INTRODUCTION

This technical memorandum for Potential Source of Contamination (PSC) 56, Stormwater Retention Pond near Building 815 and west of Building 1845, at Naval Air Station (NAS) Cecil Field in Jacksonville, Florida. Tetra Tech NUS, Inc. (TtNUS) prepared this technical memorandum 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 III (CLEAN) Program, Contract Number N62467-94-D-0888, Contract Task Order (CTO) 0078. The Base Realignment and Closure (BRAC) Cleanup Team (BCT) elected to resample and evaluate the stormwater pond (sediment, surface soil, and surface water) that were previously sampled by Golder Associates.

The Golder investigation identified contamination in the stormwater pond west of Building 1845, in soil south of Building 1845, and in groundwater south of Building 1845. TtNUS performed a field investigation of these areas in October 1999 to supplement the results of the Golder investigation. The results of the TtNUS investigation, described here, determined that the contamination in the stormwater pond, soil, and groundwater were not interrelated. Therefore, further investigation and discussion of the stormwater pond and soils would proceed as PSC 56. The groundwater contamination was pursued as a separate investigation under the Petroleum Tank Site Program (TtNUS, 2000). This investigation was described in the Sampling and Analysis Report for Building 815 Wash Rack Area (TtNUS, 2000).

This technical memorandum presents information from the previous investigation and the PSC investigation conducted in October 1999 by TtNUS at PSC 56, including related field operations, results, conclusions, and recommendations.

2.0 SITE DESCRIPTION

2.1 PHYSICAL SETTING

PSC 56 includes a stormwater retention pond west of Building 1845 and an area of soil south of Building 1845. The stormwater retention pond is bordered by a fence and a parking lot to the west and the Flight Line Facilities area to the east. The pond is southwest of Building 1845 and northwest of Building 815, as shown on Figures 2-1 and 2-2. A utility vault is located near the northeastern corner of the pond (Golder Associates, Inc., 1998).

2.2 SITE HISTORY

Building 1845 is a maintenance hangar. Floor drains in the building discharge into the pond. The utility vault appears to be the point at which effluent from the oil/water separators discharged to the pond (Golder Associates, Inc., 1998).

Golder Associates, on behalf of Northrop-Grumman, collected surface water and sediment samples from the stormwater retention pond in June 1998 and analyzed them for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and inorganics. Soil samples were also collected on the southern side of Building 1845. VOCs and inorganics were identified in the pond sediment, and VOCs were identified in soil (Golder Associates, Inc., 1998).

The BCT decided to further investigate the pond and soil. A sampling and analysis program was conducted by TtNUS to further delineate contamination identified during the previous sampling activity (TtNUS, 1999). A human health risk assessment and an ecological risk assessment were also conducted to assess the potential risks to human and ecological receptors.

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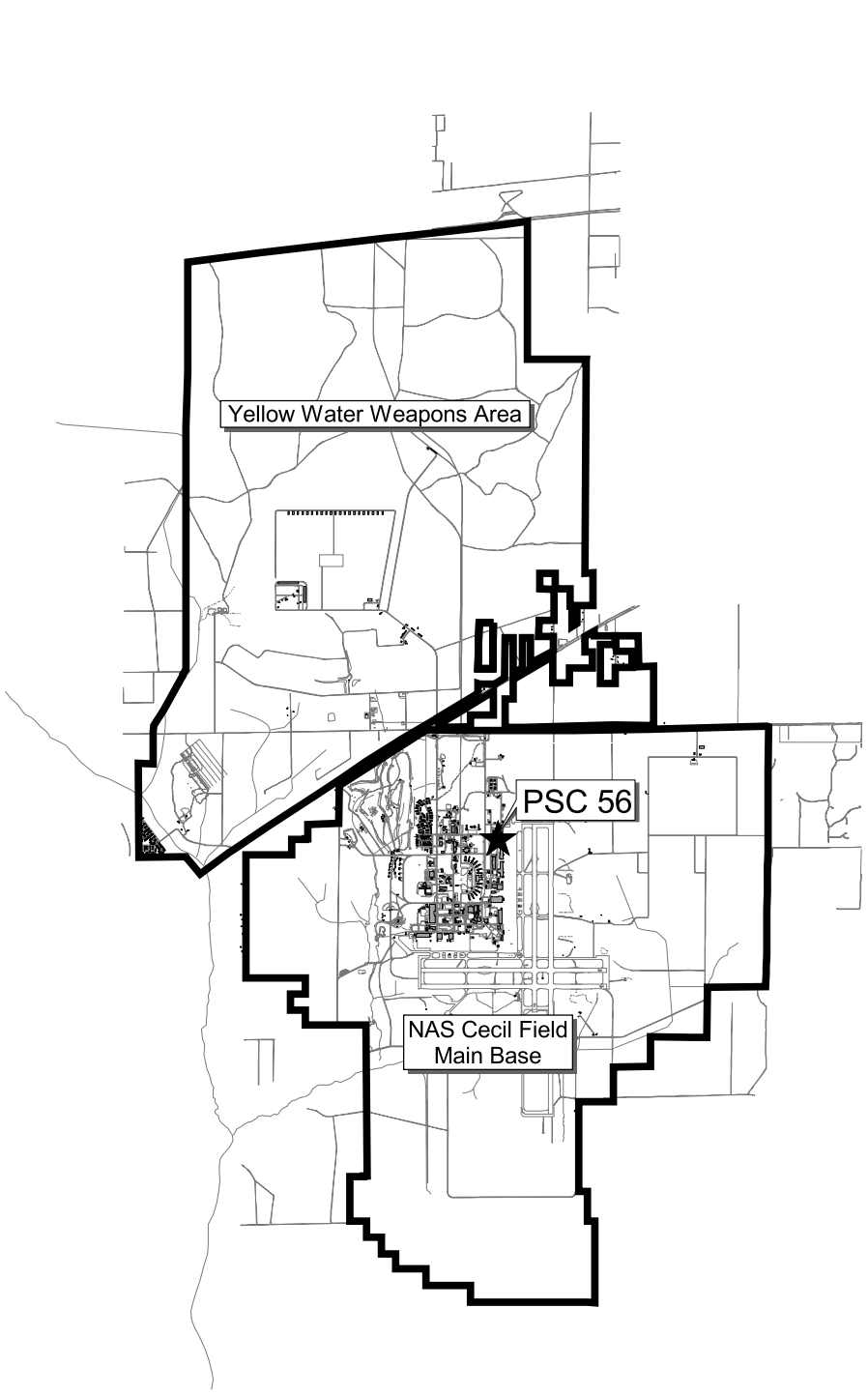

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CHECKED BY	DATE		APPROVED BY DATE
COST/SCHEDULE-AREA			APPROVED BY DATE
SCALE AS NOTED			DRAWING NO. FIGURE 2-1 / REV 0

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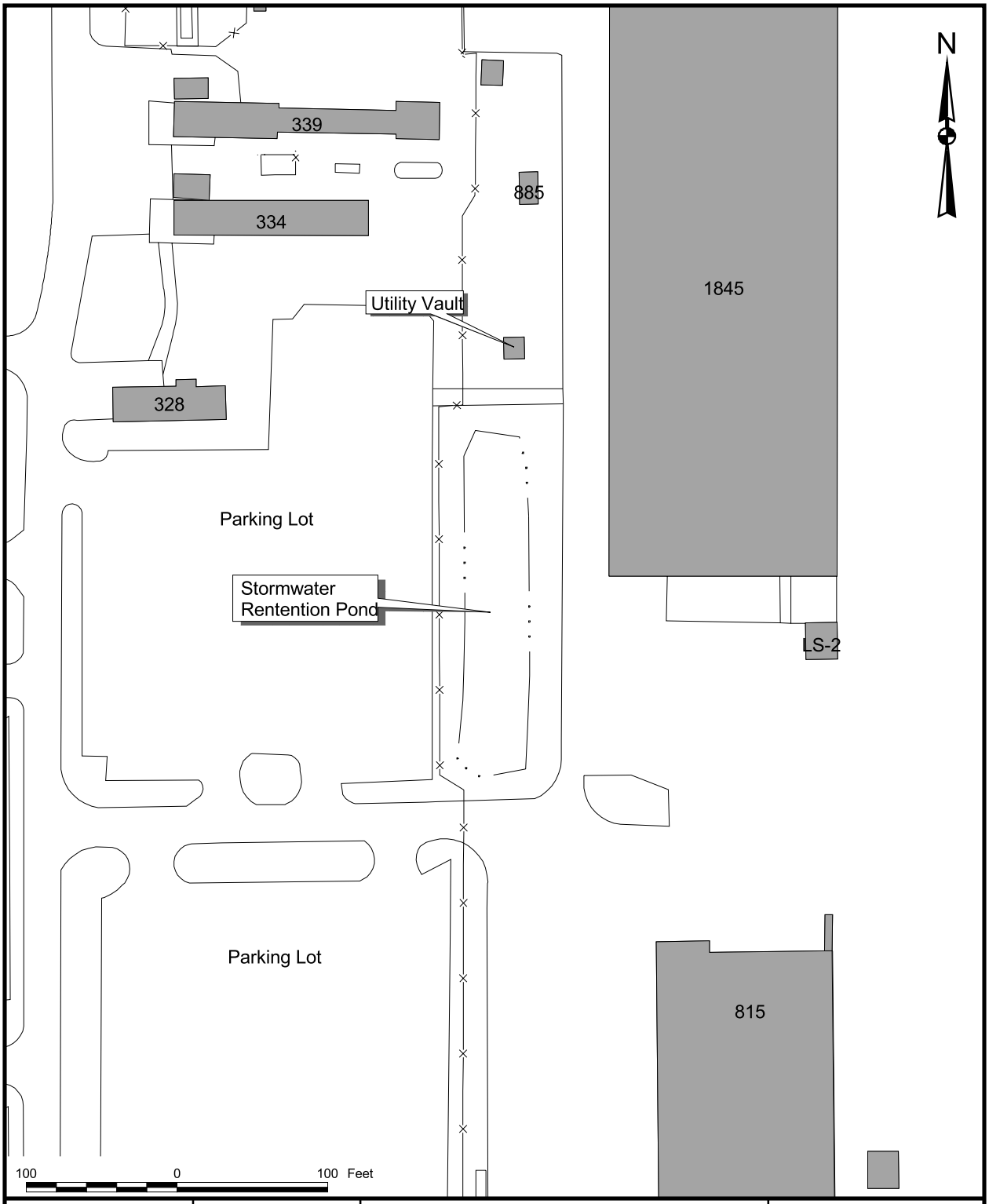

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COST/SCHEDULE-AREA			APPROVED BY DATE
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3.0 PREVIOUS INVESTIGATIONS

Environmental investigations at PSC 56 began in 1998. The results of the investigation that was conducted prior to the TtNUS investigation at the site are described in the Environmental Due Diligence Investigation, Flight Line Facilities (Golder Associates, Inc., 1998).

Golder collected two surface water and two sediment samples from the stormwater retention pond, and soil samples were collected from the vicinity of Building 1845 in June 1998 (as shown on Figure 3-1). In the investigation, VOCs including carbon disulfide and methylene chloride were detected in sediment samples. Bis(2-ethylhexyl) phthalate was also detected in one of the sediment samples. Several inorganics were detected in the sediment samples and many were elevated above background concentrations. Methylene chloride and trichloroethene (TCE) were detected in a surface soil sample from the southern end of Building 1845 (Golder Associates, 1998).

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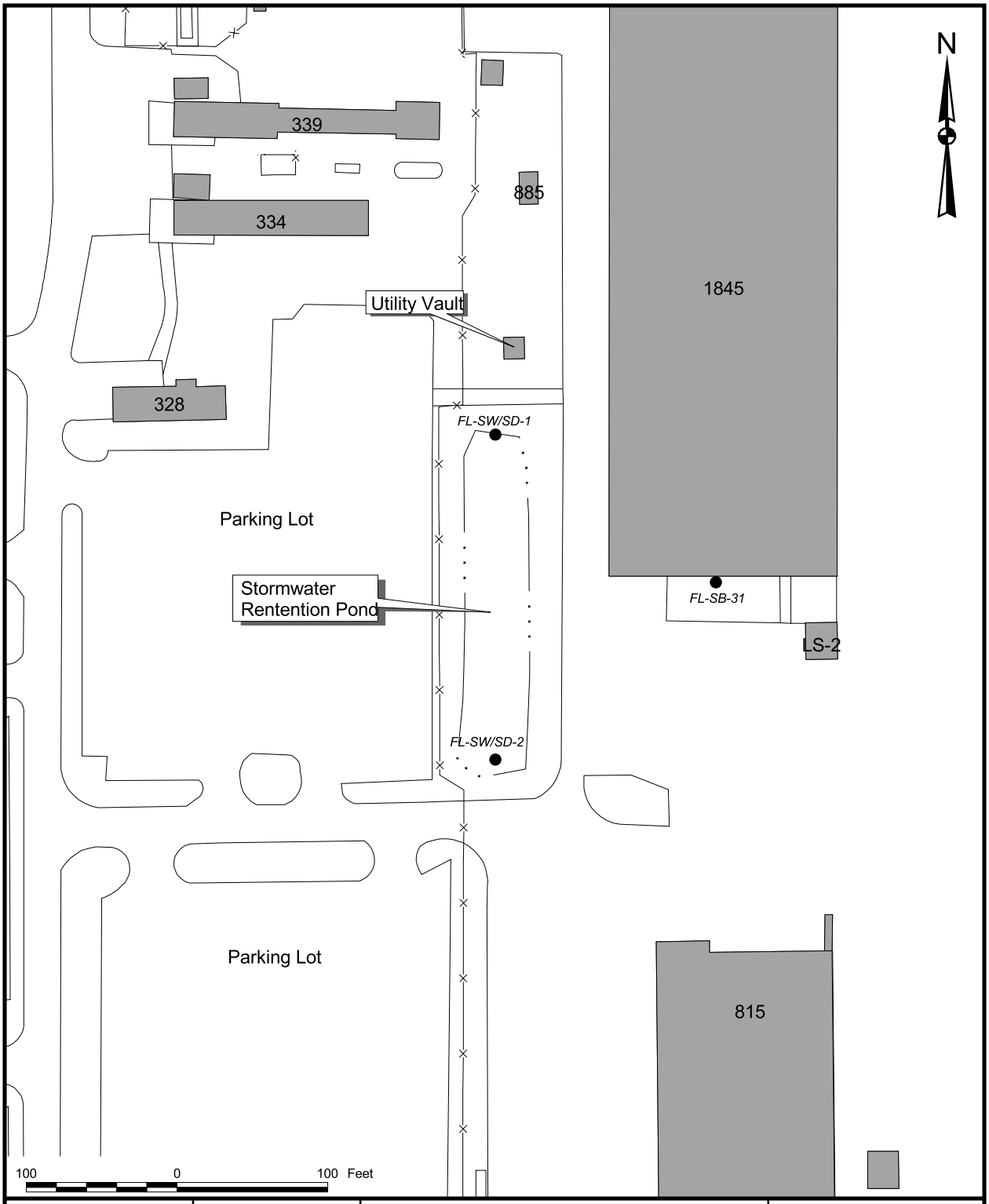

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COST/SCHEDULE-AREA			APPROVED BY DATE
SCALE AS NOTED			DRAWING NO. FIGURE 3-1 / REV 0

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4.0 FIELD INVESTIGATION

TtNUS collected samples from the pond and soil on the southern side of Building 1845 to confirm and delineate the results of the Golder investigation. TtNUS collected seven sediment samples and one surface water sample from the pond. The pond was nearly empty at the time of sampling. Four soil samples were collected from the southern side of Building 1845 in the vicinity of the Golder sample location. The Golder report did not provide a precise location of the soil sample (FL-SB-31) on the southern side of Building 1845 and the location was estimated from a figure in the Golder report. The sample locations were intended to be at and around the Golder sample location. The locations of these samples are shown on Figure 4-1.

Sediment, soil, and surface water samples were collected as grab samples. The sediment and soil samples were collected using plastic, disposable trowels. The surface water samples were collected by dipping the sample bottle into the water. Sampling activities were performed in accordance with the procedures described in the U.S. Environmental Protection Agency (U.S. EPA) Region 4 Environmental Investigations Standard Operating Procedures and Quality Assurance Manual (U.S. EPA Region 4, 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. A total of four quality assurance/quality control (QA/QC) samples were collected, including four field duplicates and one laboratory matrix spike.

The samples were analyzed for VOCs by U.S. EPA Method SW-846 8021B, SVOCs by U.S. EPA Method SW-846 82708, and inorganics by U.S. EPA Method SW-846 6010B. The soil samples were analyzed for VOCs. ACCUTEST SouthEast, in Orlando, Florida, performed the analysis.

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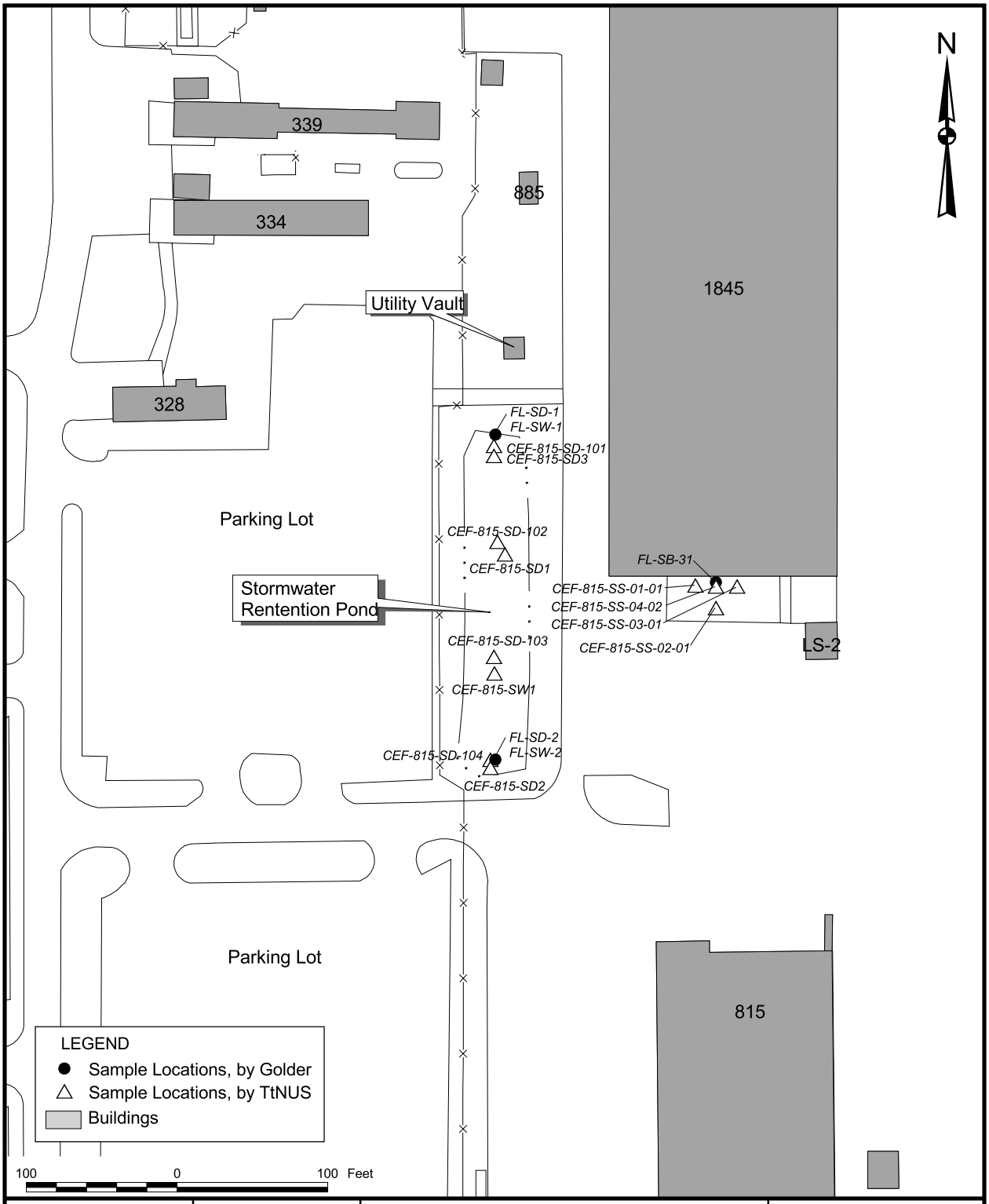

DRAWN BY MJJ	DATE 28Jan00	SAMPLE LOCATIONS MAP PSC 56, STORM WATER RETENTION POND NAVAL AIR STATION CECIL FIELD JACKSONVILLE, FLORIDA	CONTRACT NUMBER 0039
CHECKED BY	DATE		APPROVED BY DATE
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5.0 NATURE AND EXTENT OF CONTAMINATION

Several sources of potential contamination exist for the stormwater retention pond. These include Building 1845 (a large hangar used for aircraft storage and maintenance), and nearby parking lots and other paved areas associated with aircraft maintenance. The pond receives runoff from these parking lots and has occasionally received discharges from the floor drains of Building 1845.

Golder Associates analyzed two sediment samples from the pond for VOCs, SVOCs, and inorganics. No VOCs or SVOCs were detected above the Florida Department of Environmental Protection (FDEP) Soil Cleanup Target Levels (SCTLs) (FDEP, 1999). Seven inorganics were detected at concentrations greater than the NAS Cecil Field Inorganic Background Data Set (IBDS) (HLA, 1998) values, and three inorganics (cadmium, chromium, and copper) exceeded both IBDS and FDEP SCTL values (Golder Associates, 1998).

Golder Associates analyzed two surface water samples for VOCs, SVOCs, and inorganics. Carbon disulfide, a common laboratory contaminant, was detected above FDEP Surface Water Cleanup Target Levels (SWCTLs) (Golder Associates, 1998).

Golder Associates analyzed soil samples south of Building 1845. Methylene chloride and TCE were detected above the FDEP SCTL criteria (Golder Associates, 1998).

TtNUS analyzed four sediment samples for inorganics and three sediment samples for VOCs due to the exceedances found by Golder Associates. Toluene was detected in the sediment samples but not above the criterion. No other VOCs were detected above FDEP criteria. Chromium and vanadium exceeded both FDEP SCTLs and IBDS values. Table 5-1 summarizes the sediment results. Laboratory data sheets are included in Appendix A.

TtNUS analyzed one surface water sample for VOCs. No analytes were detected. Table 5-2 shows the surface water results. Laboratory data sheets are included in Appendix A.

TtNUS analyzed four soil samples for VOCs. No analytes were detected. Table 5-3 shows the surface soil results. Laboratory data sheets are included in Appendix A.

Figure 5-1 summarizes the analytes in sediment surface water, and soil from the investigations that exceeded the criteria.

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TABLE 5-1

SEDIMENT ANALYTICAL RESULTS - SUMMARY OF POSITIVE DETECTIONS
PSC 56, STORMWATER RETENTION POND NEAR BUILDING 815
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

Analysis	FL-SD-1 6/18/98	FL-SD-2 6/18/98	CEF-815-SD-01 10/13/99	CEF-815-SD-02 10/13/99	CEF-815-SD-03 10/13/99	CEF-815-SD-101 2/2/00	CEF-815-SD-102 2/2/00	CEF-815-SD-103 2/2/00	CEF-815-SD-104 2/2/00	CEF-815-SD-DUP-01 2/2/00	IBDS (1)	FDEP (2) SCTL
Inorganics (mg/kg)												
Aluminum	4000	8100	ND	ND	ND	8920 J	18000 J	6020 J	11200 J	5420 J	10200	72000
Barium	5.9	55	ND	ND	ND	42	27.3	11.5	31.7	13.7	36.1	110
Cadmium	ND	30	ND	ND	ND	4.7	1 U	0.12 U	2.8	0.71 U	2.05	8
Chromium	3.9	73	ND	ND	ND	60 J	18 J	5.4 J	23.6 J	5.7 J	16	38
Cobalt	ND	2.9	ND	ND	ND	ND	ND	ND	ND	ND	3	4700
Copper	ND	110	ND	ND	ND	96.5 J	13.5 J	3.5 J	33.9 J	7.5 J	12.5	110
Lead	3.1	240	ND	ND	ND	59.7 J	19.8 J	15.4 J	42.3 J	8.5 J	44.6	400
Mercury	0.012	0.058	ND	ND	ND	ND	ND	ND	ND	ND	0.305	2.1
Nickel	ND	25	ND	ND	ND	15.8	10.3	2.6	9	3.9	7	110
Tin	ND	14	ND	ND	ND	ND	ND	ND	ND	ND	NC	44000
Vanadium	3.7	13	ND	ND	ND	34.4	17.6	5.7	24.4	6.4	15	15
Zinc	5.2	500	ND	ND	ND	308 J	133 J	29.6 J	164 J	71.3 J	92.1	6000
Volatile Organics (ug/kg)												
Carbon Disulfide	16	240	ND	ND	ND	ND	ND	ND	ND	ND	NC	5600
Methylene Chloride	16	18	ND	ND	ND	ND	ND	ND	ND	ND	NC	20
Toluene	ND	ND	1.9 U	11	140 U	ND	ND	ND	ND	ND	NC	500
Semivolatile Organics (mg/kg)												
Bis (2-Ethylhexyl) Phthalate	ND	14	ND	ND	ND	ND	ND	ND	ND	ND	NC	76

Notes:
NC - No Criteria
ND - Not Detected

1 Background - NAS Cecil Field Inorganic Background Data Set (HLA, 1998).
2 SCTL - Florida Soil Cleanup Target Level, FAC Chapters 62 - 777 (FDEP, 1999). The more restrictive of residential and leachability to groundwater is shown.
Shaded value indicates exceedance of IBDS value and FDEP value.

TABLE 5-2
SURFACE WATER ANALYTICAL RESULTS - SUMMARY OF POSITIVE DETECTIONS
PSC 56, STORMWATER RETENTION POND NEAR BUILDING 815
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

Analysis	FL-SW-1 6/18/98	FL-SW-2 6/24/98	CEF-815-SW1 10/14/99	IBDS (1)	FDEP (2) SWCTL
Inorganics (mg/L)					
Barium	0.019	0.074	ND	43.7	NC
Zinc	NA	0.058	ND	51.4	NC
Volatile Organics (ug/L)					
Acetone	NA	68	ND	NC	1692
Carbon Disulfide	NA	170	ND	NC	105
Trichloroethene	16	NA	ND	NC	80.7

Notes:
NA - Not Analyzed
NC - No Criteria
ND - Not Detected

1 Background - NAS Cecil Field Inorganic Background Data Set (HLA, 1998).
2 SWCTL - Florida Surface Water Cleanup Target Level, FAC Chapters 62 - 777 (FDEP, 1999).
Shaded value indicates an exceedance of the criteria.

TABLE 5-3

SURFACE SOIL ANALYTICAL RESULTS - SUMMARY OF POSITIVE DETECTIONS
PSC 56
STORMWATER RETENTION POND
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

Analysis	FL-SB-31 6/8/98	CEF-815-SS-01-01 10/13/99	CEF-815-SS-02-01 10/13/99	CEF-815-SS-03-01 10/13/99	CEF-815-SS-04-02 (2) 10/13/99	FDEP (1) SCTL
Volatile Organics (mg/kg)						
Acetone	200	ND	ND	ND	ND	2800
Methylene Chloride	170	ND	ND	ND	ND	20
1,2-Dichloropropane	ND	ND	ND	ND	ND	30
Ethylbenzene	ND	ND	ND	ND	ND	600
Tetrachloroethene	ND	ND	ND	ND	ND	30
Toluene	ND	ND	ND	ND	ND	500
1,1,1-Trichloroethane	ND	ND	ND	ND	ND	1900
Trichloroethene	64	ND	ND	ND	ND	30
Xylenes	ND	ND	ND	ND	ND	200

NA - Not Analyzed
ND - Not Detected
1 - SCTL - Florida Soil Cleanup Target Level, FAC Chapters 62-777 (FDEP, 1999).
The more restrictive of residential and leachability to groundwater is shown.
2 - TtNUS CEF-815-SS-04-02 sample at same location as Golder sample FL-SB-31.
Shaded value indicates exceedance of FDEP value.

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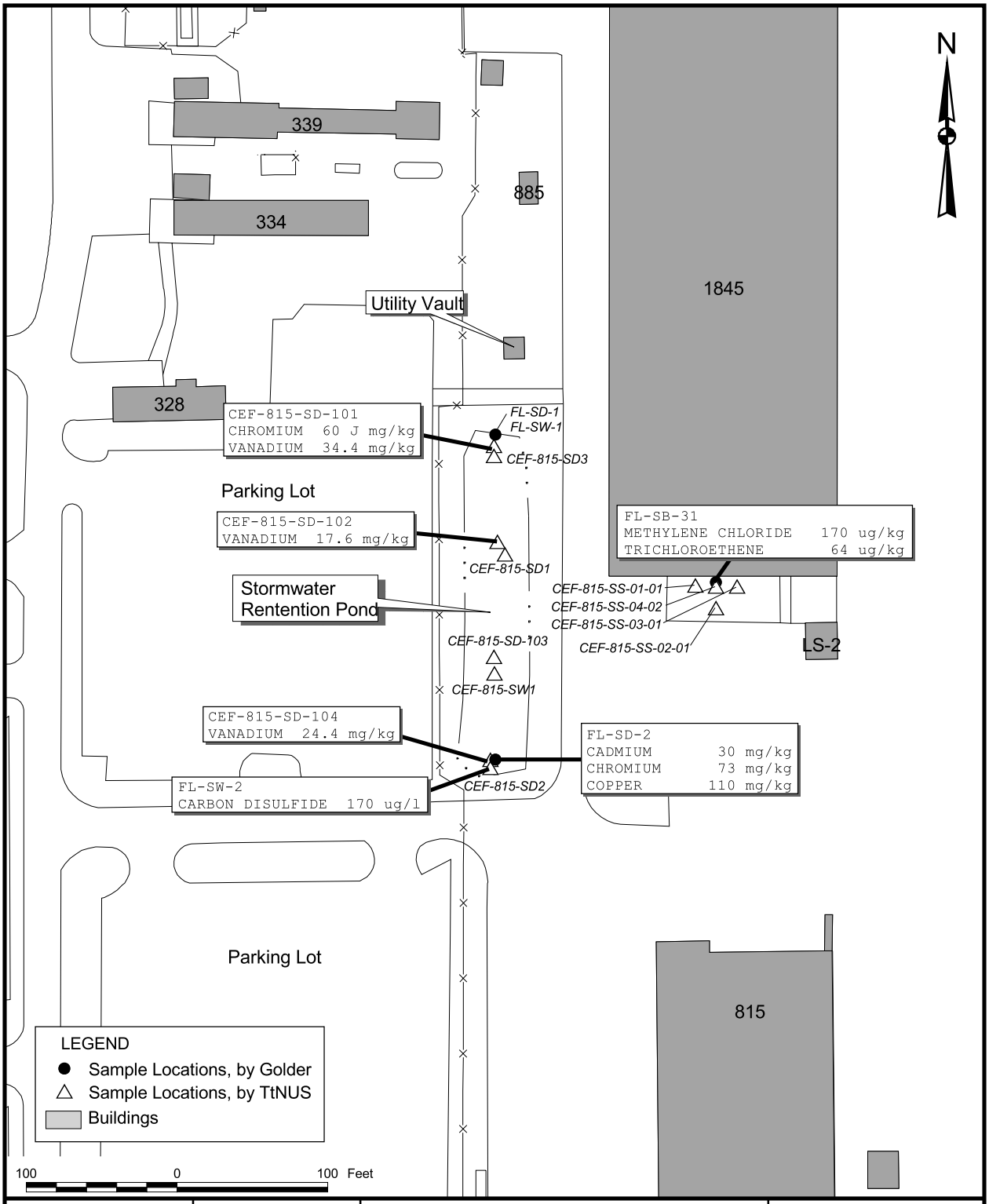

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6.0 RISK EVALUATIONS

6.1 HUMAN HEALTH RISKS

Exposure to surface water and sediments at PSC 56 would be infrequent relative to typical residential or industrial exposures to soil. Exposure to surface water and sediment would be of short duration, thereby rendering the dermal uptake of constituents negligible. Moreover, the presence of surface water reduces the adherence of sediments to the skin, further reducing the potential for constituent uptake. Overall, there would be no significant impact to human health as a result of exposure to surface water and sediment.

Typically, a preliminary risk evaluation (PRE) entails a comparison of maximum detected concentrations to FDEP risk-based criteria to arrive at quantitative estimates of risk. At PSC 56, surface water and sediment were the only media evaluated. A qualitative assessment of potential risk to human health was conducted.

Because no contaminants were detected in the soil samples south of Building 1845, no risk evaluation was needed for the soil.

6.2 ECOLOGICAL RISKS

A screening-level ecological risk assessment was conducted to evaluate the potential risks to ecological receptors at PSC 56. The ecological assessment was conducted in accordance with the guidance described by U.S. EPA (U.S. EPA, 1997) and U.S. EPA Region 4 (U.S. EPA, 2000; U.S. EPA, 1999) and the Navy (Department of the Navy, 1999) for Steps 1 through 3a of ecological risk assessments. Steps 1 through 3a consist of the following:

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

6.2.1 Screening Level Problem Formulation and Ecological Effects Evaluation

PSC 56 consists of a stormwater retention pond that receives runoff from nearby parking lots and other paved areas. The retention pond has occasionally received discharge from floor drains of Building 1845.

The retention pond is located in a highly developed area of Cecil Field. Building 1845 (a large hangar used for aircraft storage and maintenance) is situated immediately east of the pond. A large-asphalt

covered parking lot is located west and southwest of the pond. Buildings, structures, and concrete-covered areas associated with aircraft maintenance operations lie north, south, and southeast of the pond. The retention pond is surrounded by a narrow strip (5 to 10 feet) of mowed grass and a chainlink fence.

The pond covers an area of approximately 200 feet by 40 feet. The water depth is variable, depending on recent rainfall, but is generally less than 1 foot. The depth is usually only a few inches, and the pond occasionally has no standing water. Cattail (*Typha latifolia*) is the dominant vegetation, and clumps of cattail are scattered throughout the pond. The retention pond presumably provides limited habitat for aquatic invertebrates, various reptiles and amphibians, wading birds, and semi-aquatic mammals such as the raccoon (*Procyon lotor*). A permanent fish population does not exist in the pond since it occasionally dries out.

The nature and extent of contamination were discussed in Section 5. Aquatic organisms in the retention pond, as well as wildlife that occasionally utilize the pond, 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.

The preliminary assessment endpoint for this ecological risk assessment was the protection of aquatic and semi-aquatic biota from adverse effects of chemicals on growth, survival, and reproduction. The preliminary measurement endpoints were chemical concentrations in sediment associated with adverse effects on growth, survival, and reproduction of sediment-dwelling organisms (sediment screening levels).

6.2.2 Screening-Level Preliminary Exposure Estimate and Risk Calculation

Maximum concentrations of inorganic analytes detected in sediment were compared to conservative ecological screening values (ESVs). Analytes whose maximum concentrations did not exceed ESVs were dropped from further consideration, and those that equaled or exceeded ESVs were retained as ecological chemicals of potential concern (COPCs). The sediment ESVs used for the initial screening were those established by U.S. EPA Region 4 (U.S. EPA, 2000; U.S. EPA, 1999) and consisted of threshold effects levels (TELs) (FDEP, 1994).

6.2.3 Screening Results

Maximum concentrations of cadmium, chromium, copper, lead, and zinc exceeded ESVs (Table 6-1). Region 4 ESVs were not available for aluminum, barium, and vanadium. The maximum screening hazard quotient (HQ) was 6.95 (cadmium). Sample CEF-815-SD-101 was the location of the maximum concentrations of all COPCs except aluminum.

TABLE 6-1

SELECTION OF ECOLOGICAL CHEMICALS OF POTENTIAL CONCERN
SEDIMENT
PSC 56
STORMWATER RETENTION POND
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

Analyte	Frequency of Detection	Range of Detected Values		Location of Maximum	IBDS	Ecological Screening Values	Maximum Hazard Quotient	Selected as COPC (Yes/No?)
		Minimum	Maximum					
Inorganics (mg/kg)								
Aluminum	4/4	5420	11,710	CEF-815-SD-102 avg	10,200	NA	NA	Yes
Barium	4/4	11.5	42	CEF-815-SD-101	36.1	NA	NA	Yes
Cadmium	2/4	2.8	4.7	CEF-815-SD-101	2.05	0.676	6.95	Yes
Chromium	4/4	5.4	60	CEF-815-SD-101	16.0	52.3	1.15	Yes
Copper	4/4	3.5	96.5	CEF-815-SD-101	12.5	18.7	5.16	Yes
Lead	4/4	8.5	59.7	CEF-815-SD-101	44.6	30.2	1.98	Yes
Nickel	4/4	2.6	15.8	CEF-815-SD-101	7.0	15.9	0.99	No
Vanadium	4/4	5.7	34.4	CEF-815-SD-101	15.0	NA	NA	Yes
Zinc	4/4	29.6	308	CEF-815-SD-101	92.1	124	2.48	Yes

NA = Ecological Screening Value not available
IBDS = NAS Cecil Field Background Data Set (HLA, 1998)
COPC = Chemicals of Potential Concern

6.2.4 Refinement of Preliminary Contaminants of Concern

Subsequent to the initial screening, other factors were considered to further refine COPCs. These factors included food chain modeling, habitat quality, area use factors, toxicological evaluation of COPCs, background concentrations, and comparisons of COPCs to alternate guidelines (U.S. EPA, 1997; Department of the Navy, 1999).

Food chain modeling was conducted to investigate potential risks to representative receptors from ingested doses of COPCs that are known to bioaccumulate or biomagnify (U.S. EPA, 2000). 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. The assessment endpoint associated with the food chain modeling was the protection of piscivorous birds and piscivorous mammals from adverse effects of COPCs on growth, survival, and reproduction. As noted in Section 6.2.1, a permanent fish population is not present in the retention pond since the pond occasionally dries out. However, populations of other aquatic organisms (e.g., crayfish, frogs, dragonfly and damsefly nymphs, caddisfly larvae, diptera larvae) occur in the pond, even when little or no water is present. Therefore, the term “piscivorous” is used here in a broad sense to describe birds and mammals that prey upon not only minnows but on a variety of aquatic organisms. The associated measurement endpoints were doses of COPCs associated with adverse effects on growth, survival, and reproduction of piscivorous birds and mammals.

An IBDS has been developed to represent facility-wide background concentrations of metals at NAS Cecil Field (HLA, 1998). Sediment concentrations of metals at PSC 56 were compared to these IBDS values in Step 3a. Sediment IBDS values for COPCs at PSC 56 are shown in Table 6-1.

Concentrations of COPCs were compared to alternate (usually less conservative) sediment guidelines in Step 3a of this assessment. The use of guidelines that are less conservative than Region 4 sediment ecological screening values provides balance to the conservative screening-level assessment. Alternative sediment guidelines include values established by various state and federal agencies and publications (Table 6-2).

6.2.5 Results of Food Chain Modeling

Cadmium, chromium, copper, lead, and zinc had at least one food chain HQ greater than 1.0 using maximum concentrations (Table 6-3). The maximum food chain HQ using maximum detected concentrations was 11.3 (chromium; heron). Based on mean concentrations, chromium, lead, and zinc

TABLE 6-2

ECOLOGICAL GUIDELINES FOR SEDIMENT COPCs
PSC 56
STORMWATER RETENTION POND
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

COPC	Maximum Conc.	Average Conc.	EPA Region IV ESV	ER-M	PEL	PEC	UET	Ontario MOE	Other
Inorganics (mg/kg)									
Aluminum	11,710	9462	NA	NA	NA	58030	NA	NA	NA
Barium	42	26.4	NA	NA	NA	NA	NA	NA	40[a], 48[b]
Cadmium	4.7	2.0	0.676	9.6	4.21	11.7	3.0	0.6/10	NA
Chromium	60	25.2	52.3	370	160	159	95	26/110	NA
Copper	96.5	36.1	18.7	270	108	77.7	86	16/110	NA
Lead	59.7	32.9	30.2	218	112	396	127	31/250	NA
Vanadium	34.4	19.1	NA	NA	NA	NA	NA	NA	57[b]
Zinc	308	151	124	410	271	1532	520	120/820	NA

NA Not Available
ER-M Effects Range Medium (Long et al., 1995)
ESV Ecological Screening Value
PEL Probable Effects Level (FDEP, 1994)
PEC Probable Effects Concentration, Assessment and Remediation of Contaminated Sediments Program (U.S., EPA 1996)
UET Upper Effects Threshold in freshwater sediment (Buchman, 1999)
MOE Ontario Ministry of the Environment: Lowest effect level / Severe effect level (Persaud, et al., 1993)
a. Baudo et al., (1990)
b. Apparent effects threshold in marine sediment (Buchman, 1999)

TABLE 6-3

RESULTS OF FOOD CHAIN MODELING
AQUATIC RECEPTORS
MAXIMUM CONCENTRATIONS
PSC 56
STORMWATER RETENTION POND
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

Ecological Chemical of Potential Concern	Raccoon		Heron	
	NOAEL HQ	LOAEL HQ	NOAEL HQ	LOAEL HQ
Inorganics				
CADMIUM	**1.01E+00**	1.01E-01	6.10E-01	4.42E-02
CHROMIUM	**3.92E+00**	3.92E-01	**1.13E+01**	**2.26E+00**
COPPER	**1.77E+00**	**1.37E+00**	3.86E-01	2.94E-01
LEAD	**1.60E+00**	1.60E-01	**9.94E+00**	9.94E-01
ZINC	4.13E-01	2.06E-01	**4.00E+00**	4.43E-01

HQ - Hazard quotient
LOAEL - Low observable adverse effects level
NOAEL - No observable adverse effects level
Bolded values - HQ > 1

had at least one food chain HQ greater than 1.0 (Table 6-4). The highest food chain HQ based on average concentrations was 4.75 (chromium; heron).

6.2.6 Discussion

Aluminum

Concentrations of aluminum exceeded aluminum's IBDS value (10,200 mg/kg) in sample CEF-815-SD-102 (11,710 mg/kg). Data on aluminum toxicity are sparse, but the concentrations at PSC 56 were less than the available sediment guideline (Table 6-2). Aluminum is the most commonly occurring metallic element and comprises eight percent of the earth's crust (Press and Siever, 1974). Aluminum toxicity via the food chain is negligible, because it does not bioaccumulate or biomagnify. For most terrestrial organisms (e.g., semi-aquatic mammals and birds), aluminum compounds are generally not harmful and are considered to be toxicologically inert, except in cases of high experimental doses or prolonged inhalation (Venugopal and Luckey, 1978).

Barium

Concentrations of barium exceeded barium's IBDS value (36.1 mg/kg) in sample CEF-15-SD-101 (42 mg/kg). Sediment guidelines for barium are sparse, but the concentrations at PSC 56 were less than the apparent effects threshold (Table 6-2). Barium is a common element in sediments and it is not generally associated with significant toxicity (ATSDR, 1997). Barium toxicity via the food chain is negligible, because it does not bioaccumulate or biomagnify.

Cadmium

Cadmium was detected in two of four samples, and concentrations in both samples exceeded cadmium's IBDS value and Region 4 ESV. The maximum concentration (4.7 mg/kg) exceeded some alternate sediment guidelines but was less than others (Table 6-2). Food chain HQs based on the maximum concentration exceeded 1.0 for the raccoon, but the exceedance was slight [No observable adverse effects level (NOAEL) HQ = 1.01]. The other food chain HQs for cadmium were less than 1.0 (Tables 6-3 and 6-4).

The retention pond at PSC 56 comprises a very small portion of the home range of piscivorous mammal and bird species represented by the raccoon and little blue heron. Therefore, the food chain HQs for cadmium in Tables 6-3 and 6-4 would be considerably lower if the sizes of home ranges were incorporated into the food chain model. Specifically, the area of the retention pond (approximately 200 feet x 40 feet) comprises approximately 8000 feet^2, or 0.184 acres. The smallest home range of the raccoon is 96 acres (U.S. EPA, 1993). Thus, aquatic habitat within the retention pond comprises

TABLE 6-4

RESULTS OF FOOD CHAIN MODELING
AQUATIC RECEPTORS
MEAN CONCENTRATIONS
PSC 56
STORMWATER RETENTION POND
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

Ecological Chemical of Potential Concern	Raccoon		Heron	
	NOAEL HQ	LOAEL HQ	NOAEL HQ	LOAEL HQ
Inorganics				
CADMIUM	4.28E-01	4.28E-02	2.59E-01	1.88E-02
CHROMIUM	**1.65E+00**	1.65E-01	**4.75E+00**	9.49E-01
COPPER	6.62E-01	5.12E-01	1.45E-01	1.10E-01
LEAD	8.82E-01	8.82E-02	**5.48E+00**	5.48E-01
ZINC	2.02E-01	1.01E-01	**1.96E+00**	2.17E-01

HQ - Hazard quotient
LOAEL - Low observable adverse effects level
NOAEL - No observable adverse effects level
Bolded values - HQ > 1

approximately 0.2 percent (0.184 acres ÷ 96 acres = 0.002) of a raccoon's total foraging area. This value, when multiplied by the maximum food chain HQ for cadmium (1.01), results in an HQ of 0.002. HQs for the heron were less than 1.0 even under the conservative assumption that the heron forages exclusively in the retention pond. With these considerations in mind, potential risks to upper level receptors from ingestion of cadmium in prey items at PSC 56 are negligible. Potential risks to sediment dwelling invertebrates are negligible, or minor (at worst), and exist only in the vicinity of one sample.

Chromium

The maximum concentration of chromium (60 mg/kg) exceeded chromium's IBDS value (16.0 mg/kg) but slightly exceeded chromium's ESV (HQ = 1.15). The maximum concentration was well below the probable effects level (PEL), the effects range-medium (ER-M), and most other alternate sediment guidelines (Table 6-2). Some food chain HQs exceeded 1.0, with a maximum food chain HQ of 11.3 (heron) based on the maximum concentration (Tables 6-3 and 6-4). Chromium toxicity is due primarily to hexavalent chromium, and other forms of chromium are much less toxic (Eisler, 1986). It is unlikely that chromium in the retention pond sediments is completely hexavalent chromium and also unlikely that all the chromium in sediments is bioavailable. Furthermore, the food chain HQs would be much less than 1.0 if area-use factors were incorporated into the food chain model. As explained in the previous paragraph (cadmium discussion), aquatic habitat within the retention pond comprises approximately 0.2 percent of a raccoon's total foraging area. Applying an area use factor of 0.002 to the maximum raccoon food chain HQ for chromium in Table 6-3 results in an HQ of 0.008 (0.002 x 3.92 = 0.008). The estimated total foraging area for a little blue heron is 469 acres (Appendix B). Therefore, the retention pond, which is 0.184 acres in size, would comprise approximately 0.04 percent of a little blue heron's total foraging area (0.184 acres ÷ 469 acres = 0.0004). An area use factor of 0.0004, multiplied by the maximum heron food chain HQ of 11.3 (Table 6-3) results in an HQ of 0.005. With these considerations in mind, chromium concentrations at PSC 56 pose negligible potential risks to ecological receptors.

Copper

Copper concentrations exceeded the ESV and IBDS value in two samples, with a maximum screening HQ of 5.16. The maximum concentration was well below the PEL and ER-M but exceeded some alternate guidelines (Table 6-2). Food chain HQs based on the maximum concentration exceeded 1.0 only for the raccoon, but the exceedance was slight (NOAEL HQ = 1.77). The food chain HQ based on the lowest adverse effect level (LOAEL) was 1.37. All other food chain HQs were less than 1.0 (Tables 6-3 and 6-4). The maximum food chain HQ (1.77) would be much less than 1.0 when the 0.002 area use factor for the raccoon is applied. Specifically, 0.002 x 1.77 = HQ of 0.004. With these considerations in mind, copper at PSC 56 poses negligible risks to upper-level receptors. Potential risks to sediment dwelling invertebrates are negligible or minor (at worst).

Lead

Lead concentrations exceeded the ESV and IBDS value in sample CEF-815-SD-101, with a maximum screening HQ of 1.98. The maximum concentration was well below the PEL, ER-M, and most other sediment guidelines (Table 6-2). The maximum food chain HQ was 9.94 (Tables 6-3 and 6-4). At least three conservative assumptions used in the food chain modeling for lead probably result in considerable overestimates of risk. First, dietary lead is administered as lead acetate in most laboratory studies of lead toxicity. Lead acetate is considered to be 100 percent bioavailable (Wixon and Davies, 1993). The bioavailability (i.e., the portion that is absorbed) of environmental lead after ingestion depends upon a variety of factors but is usually considerably less than 100 percent (Eisler, 1988). Thus, the toxicity reference values used in the food chain model overestimate the potential risks of lead ingestion under field conditions. A second factor that contributes to the overestimation of risk via the food chain is the assumption that concentrations of lead in prey items are equal to sediment concentrations. Although the ratio of lead concentrations in aquatic prey items to concentrations in sediment is variable, available data indicate that such ratios are usually much less than 1.0 (Eisler, 1988). Therefore, the assumption that concentrations of lead in prey items are equal to the maximum sediment concentration (59.7 mg/kg) is probably overly conservative. The extent to which the HQs are overestimated, however, is uncertain. A third conservative factor in the food chain model is that the receptors are assumed to forage exclusively on the site. As mentioned above, this would not be true for piscivorous birds or piscivorous mammals at PSC 56. Applying the area use factors previously discussed (0.002 for the raccoon and 0.0004 for the little blue heron) would result in a maximum food chain HQ of 0.003 for the raccoon (0.002 x 1.6 = 0.003) and 0.004 for the heron (0.0004 x 9.96 = 0.004). With the above considerations in mind, lead concentrations at PSC 56 are considered to pose negligible potential risks to ecological receptors.

Vanadium

Concentrations of vanadium exceeded vanadium's IBDS value (15.0 mg/kg) in two samples. Region 4 has not established an ESV for vanadium, but the concentrations were less than the available sediment guideline (Table 6-2). Vanadium toxicity via the food chain is negligible, because it does not bioaccumulate or biomagnify. Vanadium is a common element found in many types of substrates (ATSDR, 1997) and in many types of organisms (Klaassen et al., 1986). For these reasons, vanadium does not appear to pose potential ecological risks at PSC 56.

Zinc

Zinc concentrations exceeded the ESV and its IBDS value in three samples, but the screening HQ was relatively low (HQ = 2.48). The maximum concentration (308 mg/kg) exceeded some alternate sediment

guidelines but was less than others (Table 6-2). Food chain HQs were greater than 1.0 only for the heron (Tables 6-3 and 6-4), but the maximum HQ was relatively low (NOAEL HQ = 4.0). Applying the area use factor previously discussed for the heron (0.0004) in the food chain model would result in a maximum food chain HQ of 0.002 (0.0004 x 4.0 = 0.002). Furthermore, an absorption fraction of 100 percent was assumed for the food chain modeling (i.e., 100 percent of the ingested contaminant was absorbed). However, available data indicate that gastrointestinal absorption of zinc varies from 20 to 80 percent and depends on the chemical compound as well as on zinc levels in the body and on concentrations of other nutrients (U.S. EPA, 1984). With these considerations in mind, zinc at PSC 56 poses negligible risks to upper-level receptors. Potential risks to sediment-dwelling invertebrates are negligible or minor (at worst).

6.2.7 Ecological Risk Summary and Conclusions

Four sediment samples were collected from the 200 feet by 40 feet retention pond that comprises PSC 56 (Figure 2-2). The retention pond is located in a highly developed area and is surrounded by buildings, parking lots, and other paved areas. No permanent fish population exists in the pond, and the pond is not bordered by any shrubs or trees that would serve as cover for receptors that could forage in the pond. Overall, the pond provides minimal habitat for ecological receptors. Nevertheless, wading birds and mammals that prey on aquatic organisms are assumed to occasionally forage in the pond. Results of the food chain modeling indicate that potential risks to these upper-level receptors via the food chain are negligible.

Concentrations of metals tended to be highest in the northernmost sample (CEF-815-SD-101), which is where the intake structure is located. Concentrations in other samples were generally not elevated, indicating that potential ecological risks to sediment-dwelling invertebrates are limited to a small portion of the pond. However, screening HQs were relatively low, with a maximum HQ of 6.95, and sediment concentrations tended to be less than alternate guidelines. Therefore, potential risks to sediment-dwelling invertebrates are negligible or minor at worst.

7.0 CONCLUSIONS AND RECOMMENDATIONS

Concentrations of five metals exceeded the ecological screening values, and concentrations of nine metals exceeded the IBDS values. The concentrations were generally not elevated in comparison to alternate ecological screening values. Results of the food chain modeling indicate that potential risks to upper-level receptors are negligible. Therefore, potential risks to sediment-dwelling invertebrates are negligible or minor.

No contaminants were detected in the soil samples collected at and in the vicinity of the Golder sample where TCE was reported. Because the presence of the TCE could not be verified, no further action at this location is recommended. No contaminants were detected in the soil on the southern side of Building 1845, so no ecological or human health risk assessment was necessary.

Risks to human and ecological receptors are negligible. It is also recommended that the color classification of PSC 56 be changed from Yellow to Light Green to denote that releases of hazardous substances have occurred, but at concentrations that do not require a removal or remedial response. Therefore, the final recommendation for PSC 56, the stormwater retention pond and soil south of Building 1845, is no further action.

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APPENDIX A

ANALYTICAL LABORATORY RESULTS

A.1 SEDIMENT

Report of Analysis

Client Sample ID:	CEF-815-SD01		
Lab Sample ID:	F5074-11	Date Sampled:	10/13/99
Matrix:	SO - Soil	Date Received:	10/14/99
Method:	SW846 8260B	Percent Solids:	n/a
Project:	NAS Cecil Field N7895		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1 [a]	K004545.D	1	10/26/99	RAW	n/a	n/a	VK114
Run #2							

VOA 8021 List

CAS No.	Compound	Result	RL	Units	Q
71-43-2	Benzene	ND	1.9	ug/kg	
75-27-4	Bromodichloromethane	ND	1.9	ug/kg	
75-25-2	Bromoform	ND	1.9	ug/kg	
108-90-7	Chlorobenzene	ND	1.9	ug/kg	
75-00-3	Chloroethane	ND	4.8	ug/kg	
67-66-3	Chloroform	ND	1.9	ug/kg	
110-75-8	2-Chloroethyl vinyl ether	ND	4.8	ug/kg	
56-23-5	Carbon tetrachloride	ND	1.9	ug/kg	
75-34-3	1,1-Dichloroethane	ND	1.9	ug/kg	
75-35-4	1,1-Dichloroethylene	ND	1.9	ug/kg	
106-93-4	1,2-Dibromoethane	ND	1.9	ug/kg	
107-06-2	1,2-Dichloroethane	ND	1.9	ug/kg	
78-87-5	1,2-Dichloropropane	ND	1.9	ug/kg	
124-48-1	Dibromochloromethane	ND	1.9	ug/kg	
75-71-8	Dichlorodifluoromethane	ND	4.8	ug/kg	
156-59-2	cis-1,2-Dichloroethylene	ND	1.9	ug/kg	
10061-01-5	cis-1,3-Dichloropropene	ND	1.9	ug/kg	
541-73-1	m-Dichlorobenzene	ND	1.9	ug/kg	
95-50-1	o-Dichlorobenzene	ND	1.9	ug/kg	
106-46-7	p-Dichlorobenzene	ND	1.9	ug/kg	
156-60-5	trans-1,2-Dichloroethylene	ND	1.9	ug/kg	
10061-02-6	trans-1,3-Dichloropropene	ND	1.9	ug/kg	
100-41-4	Ethylbenzene	ND	1.9	ug/kg	
74-83-9	Methyl bromide	ND	4.8	ug/kg	
74-87-3	Methyl chloride	ND	4.8	ug/kg	
75-09-2	Methylene chloride	ND	9.5	ug/kg	
1634-04-4	Methyl Tert Butyl Ether	ND	1.9	ug/kg	
71-55-6	1,1,1-Trichloroethane	ND	1.9	ug/kg	
79-34-5	1,1,2,2-Tetrachloroethane	ND	1.9	ug/kg	
79-00-5	1,1,2-Trichloroethane	ND	1.9	ug/kg	
127-18-4	Tetrachloroethylene	ND	1.9	ug/kg	
108-88-3	Toluene	ND	1.9	ug/kg	
79-01-6	Trichloroethylene	ND	1.9	ug/kg	
75-69-4	Trichlorofluoromethane	ND	4.8	ug/kg	
75-01-4	Vinyl chloride	ND	4.8	ug/kg	
1330-20-7	Xylene (total)	ND	5.7	ug/kg	

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-815-SD01		
Lab Sample ID:	F5074-11	Date Sampled:	10/13/99
Matrix:	SO - Soil	Date Received:	10/14/99
Method:	SW846 8260B	Percent Solids:	n/a
Project:	NAS Cecil Field N7895		

VOA 8021 List

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
1868-53-7	Dibromofluoromethane	86%		71-122%
2037-26-5	Toluene-D8	101%		73-128%
460-00-4	4-Bromofluorobenzene	102%		53-158%
17060-07-0	1,2-Dichloroethane-D4	99%		71-122%

(a) Results reported on a wet weight basis.

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-815-SD02		
Lab Sample ID:	F5074-12	Date Sampled:	10/13/99
Matrix:	SO - Soil	Date Received:	10/14/99
Method:	SW846 8260B	Percent Solids:	n/a
Project:	NAS Cecil Field N7895		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1 [a]	K004546.D	1	10/26/99	RAW	n/a	n/a	VK114
Run #2							

VOA 8021 List

CAS No.	Compound	Result	RL	Units	Q
71-43-2	Benzene	ND	1.9	ug/kg	
75-27-4	Bromodichloromethane	ND	1.9	ug/kg	
75-25-2	Bromoform	ND	1.9	ug/kg	
108-90-7	Chlorobenzene	ND	1.9	ug/kg	
75-00-3	Chloroethane	ND	4.8	ug/kg	
67-66-3	Chloroform	ND	1.9	ug/kg	
110-75-8	2-Chloroethyl vinyl ether	ND	4.8	ug/kg	
56-23-5	Carbon tetrachloride	ND	1.9	ug/kg	
75-34-3	1,1-Dichloroethane	ND	1.9	ug/kg	
75-35-4	1,1-Dichloroethylene	ND	1.9	ug/kg	
106-93-4	1,2-Dibromoethane	ND	1.9	ug/kg	
107-06-2	1,2-Dichloroethane	ND	1.9	ug/kg	
78-87-5	1,2-Dichloropropane	ND	1.9	ug/kg	
124-48-1	Dibromochloromethane	ND	1.9	ug/kg	
75-71-8	Dichlorodifluoromethane	ND	4.8	ug/kg	
156-59-2	cis-1,2-Dichloroethylene	ND	1.9	ug/kg	
10061-01-5	cis-1,3-Dichloropropene	ND	1.9	ug/kg	
541-73-1	m-Dichlorobenzene	ND	1.9	ug/kg	
95-50-1	o-Dichlorobenzene	ND	1.9	ug/kg	
106-46-7	p-Dichlorobenzene	ND	1.9	ug/kg	
156-60-5	trans-1,2-Dichloroethylene	ND	1.9	ug/kg	
10061-02-6	trans-1,3-Dichloropropene	ND	1.9	ug/kg	
100-41-4	Ethylbenzene	ND	1.9	ug/kg	
74-83-9	Methyl bromide	ND	4.8	ug/kg	
74-87-3	Methyl chloride	ND	4.8	ug/kg	
75-09-2	Methylene chloride	ND	9.6	ug/kg	
1634-04-4	Methyl Tert Butyl Ether	ND	1.9	ug/kg	
71-55-6	1,1,1-Trichloroethane	ND	1.9	ug/kg	
79-34-5	1,1,2,2-Tetrachloroethane	ND	1.9	ug/kg	
79-00-5	1,1,2-Trichloroethane	ND	1.9	ug/kg	
127-18-4	Tetrachloroethylene	ND	1.9	ug/kg	
108-88-3	Toluene	11.0	1.9	ug/kg	
79-01-6	Trichloroethylene	ND	1.9	ug/kg	
75-69-4	Trichlorofluoromethane	ND	4.8	ug/kg	
75-01-4	Vinyl chloride	ND	4.8	ug/kg	
1330-20-7	Xylene (total)	ND	5.8	ug/kg	

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-815-SD02		
Lab Sample ID:	F5074-12	Date Sampled:	10/13/99
Matrix:	SO - Soil	Date Received:	10/14/99
Method:	SW846 8260B	Percent Solids:	n/a
Project:	NAS Cecil Field N7895		

VOA 8021 List

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
1868-53-7	Dibromofluoromethane	92%		71-122%
2037-26-5	Toluene-D8	100%		73-128%
460-00-4	4-Bromofluorobenzene	124%		53-158%
17060-07-0	1,2-Dichloroethane-D4	101%		71-122%

(a) Results reported on a wet weight basis.

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-815-SD03		
Lab Sample ID:	F5074-13	Date Sampled:	10/13/99
Matrix:	SO - Soil	Date Received:	10/14/99
Method:	SW846 8260B	Percent Solids:	n/a
Project:	NAS Cecil Field N7895		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1 [a]	K004557.D	1	10/27/99	RAW	n/a	n/a	VK114
Run #2 [b]	K004560.D	50	10/27/99	RAW	n/a	n/a	VK114

VOA 8021 List

CAS No.	Compound	Result	RL	Units	Q
71-43-2	Benzene	ND [c]	140	ug/kg	
75-27-4	Bromodichloromethane	ND [c]	140	ug/kg	
75-25-2	Bromoform	ND [c]	140	ug/kg	
108-90-7	Chlorobenzene	ND [c]	140	ug/kg	
75-00-3	Chloroethane	ND [c]	340	ug/kg	
67-66-3	Chloroform	ND [c]	140	ug/kg	
110-75-8	2-Chloroethyl vinyl ether	ND [c]	340	ug/kg	
56-23-5	Carbon tetrachloride	ND [c]	140	ug/kg	
75-34-3	1,1-Dichloroethane	ND [c]	140	ug/kg	
75-35-4	1,1-Dichloroethylene	ND [c]	140	ug/kg	
106-93-4	1,2-Dibromoethane	ND [c]	140	ug/kg	
107-06-2	1,2-Dichloroethane	ND [c]	140	ug/kg	
78-87-5	1,2-Dichloropropane	ND [c]	140	ug/kg	
124-48-1	Dibromochloromethane	ND [c]	140	ug/kg	
75-71-8	Dichlorodifluoromethane	ND [c]	340	ug/kg	
156-59-2	cis-1,2-Dichloroethylene	ND [c]	140	ug/kg	
10061-01-5	cis-1,3-Dichloropropene	ND [c]	140	ug/kg	
541-73-1	m-Dichlorobenzene	ND [c]	140	ug/kg	
95-50-1	o-Dichlorobenzene	ND [c]	140	ug/kg	
106-46-7	p-Dichlorobenzene	ND [c]	140	ug/kg	
156-60-5	trans-1,2-Dichloroethylene	ND [c]	140	ug/kg	
10061-02-6	trans-1,3-Dichloropropene	ND [c]	140	ug/kg	
100-41-4	Ethylbenzene	ND [c]	140	ug/kg	
74-83-9	Methyl bromide	ND [c]	340	ug/kg	
74-87-3	Methyl chloride	ND [c]	340	ug/kg	
75-09-2	Methylene chloride	ND	14	ug/kg	
1634-04-4	Methyl Tert Butyl Ether	ND [c]	140	ug/kg	
71-55-6	1,1,1-Trichloroethane	ND [c]	140	ug/kg	
79-34-5	1,1,2,2-Tetrachloroethane	ND [c]	140	ug/kg	
79-00-5	1,1,2-Trichloroethane	ND [c]	140	ug/kg	
127-18-4	Tetrachloroethylene	ND [c]	140	ug/kg	
108-88-3	Toluene	ND [c]	140	ug/kg	
79-01-6	Trichloroethylene	ND [c]	140	ug/kg	
75-69-4	Trichlorofluoromethane	ND [c]	340	ug/kg	
75-01-4	Vinyl chloride	ND [c]	340	ug/kg	
1330-20-7	Xylene (total)	ND [c]	410	ug/kg	

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-815-SD03		
Lab Sample ID:	F5074-13	Date Sampled:	10/13/99
Matrix:	SO - Soil	Date Received:	10/14/99
Method:	SW846 8260B	Percent Solids:	n/a
Project:	NAS Cecil Field N7895		

VOA 8021 List

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
1868-53-7	Dibromofluoromethane	101%	84%	71-122%
2037-26-5	Toluene-D8	107%	89%	73-128%
460-00-4	4-Bromofluorobenzene	121%	92%	53-158%
17060-07-0	1,2-Dichloroethane-D4	104%	88%	71-122%

(a) Results reported on a wet weight basis.
(b) Dilution required due to matrix interference.
(c) Result is from Run# 2

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

order	01	02	03
location	CEF-815-SD1	CEF-815-SD2	CEF-815-SD3
nsample	CEF-815-SD01	CEF-815-SD02	CEF-815-SD03
sample	CEF-815-SD01	CEF-815-SD02	CEF-815-SD03
sample_dat	10/13/99	10/13/99	10/13/99
sacode	NORMAL	NORMAL	NORMAL
matrix	SD	SD	SD
sort	**c_01**	**c_02**	**c_03**
Volatile Organics (ug/kg)			
1,1,1-TRICHLOROETHANE	1.9 U	1.9 U	140 U
1,1,2,2-TETRACHLOROETHANE	1.9 U	1.9 U	140 U
1,1,2-TRICHLOROETHANE	1.9 U	1.9 U	140 U
1,1-DICHLOROETHANE	1.9 U	1.9 U	140 U
1,1-DICHLOROETHENE	1.9 U	1.9 U	140 U
1,2 DICHLOROBENZENE	1.9 U	1.9 U	140 U
1,2-DIBROMOETHANE	1.9 U	1.9 U	140 U
1,2-DICHLOROETHANE	1.9 U	1.9 U	140 U
1,2-DICHLOROPROPANE	1.9 U	1.9 U	140 U
1,3-DICHLOROBENZENE	1.9 U	1.9 U	140 U
1,4 DICHLOROBENZENE	1.9 U	1.9 U	140 U
2-CHLOROETHYL VINYL ETHER	4.8 U	4.8 U	340 U
BENZENE	1.9 U	1.9 U	140 U
BROMODICHLOROMETHANE	1.9 U	1.9 U	140 U
BROMOFORM	1.9 U	1.9 U	140 U
BROMOMETHANE	4.8 U	4.8 U	340 U
CARBON TETRACHLORIDE	1.9 U	1.9 U	140 U
CHLOROBENZENE	1.9 U	1.9 U	140 U
CHLOROETHANE	4.8 U	4.8 U	340 U
CHLOROFORM	1.9 U	1.9 U	140 U
CHLOROMETHANE	4.8 U	4.8 U	340 U
CIS-1,2-DICHLOROETHENE	1.9 U	1.9 U	140 U
CIS-1,3-DICHLOROPROPENE	1.9 U	1.9 U	140 U
DIBROMOCHLOROMETHANE	1.9 U	1.9 U	140 U
DICHLORODIFLUOROMETHANE	4.8 U	4.8 U	340 U
ETHYLBENZENE	1.9 U	1.9 U	140 U
METHYL TERT-BUTYL ETHER	1.9 U	1.9 U	140 U
METHYLENE CHLORIDE	9.5 U	9.6 U	14 U
TETRACHLOROETHENE	1.9 U	1.9 U	140 U
TOLUENE	1.9 U	11	140 U
TRANS-1,2-DICHLOROETHENE	1.9 U	1.9 U	140 U
TRANS-1,3-DICHLOROPROPENE	1.9 U	1.9 U	140 U
TRICHLOROETHENE	1.9 U	1.9 U	140 U
TRICHLOROFLUOROMETHANE	4.8 U	4.8 U	340 U
VINYL CHLORIDE	4.8 U	4.8 U	340 U
XYLENES, TOTAL	5.7 U	5.8 U	410 U

Tetra Tech NUS

INTERNAL CORRESPONDENCE

TO:	**M. SPERANZA**	**DATE:**	**FEBRUARY 24, 2000**
FROM:	**GRETCHEN PHIPPS**	**COPIES:**	**DV FILE**
SUBJECT:	**INORGANIC DATA VALIDATION – SELECT METALS** **CTO 078 - CECIL FIELD** **SDGs – F5812**		
SAMPLES:	5/Soils/		

CEF-815-SD-101 CEF-815-SD-102
CEF-815-SD-103 CEF-815-SD-104
CEF-815-SD-DUP01

Overview

The sample set for CTO 078, Cecil Field, SDG F5812 consists of five (5) soil environmental samples. One (1) field duplicate pair (CEF-815-SD-102/ CEF-815-SD-DUP01) was included within this SDG.

The samples were analyzed for aluminum, barium, cadmium, chromium, copper, lead, nickel, vanadium and zinc. The samples were collected by Tetra Tech NUS on February 1, 2000 and analyzed by Accutest Laboratory under Naval Facilities Engineering Service Center (NFESC) Quality Assurance / Quality Control (QA / QC) criteria. All metals analyses were conducted using SW 846 method 6010B.

The data was evaluated based on the following parameters:

* • Data Completeness
* • Holding Times
* • Calibration Verifications
  • Laboratory Blank Analyses
  • Field Duplicate Precision
* • Detection Limits

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

Laboratory Blank Analyses

The following contaminants were present in a laboratory method / preparation blanks at the following maximum concentrations:

Affected samples: All

Analyte	Maximum Concentration	Action Level
Aluminum	47.5µg/L	23.75 mg/kg
Barium[1]	0.18 mg/kg	0.90 mg/kg
Cadmium	0.90µg/L	0.45 mg/kg
Chromium	1.2µg/L	0.60 mg/kg
Copper	1.0µg/L	0.50 mg/kg
Lead	2.9µg/L	1.45 mg/kg
Nickel	1.4µg/L	0.70 mg/kg
Vanadium	1.1µg/L	0.55 mg/kg
Zinc[1]	0.38 mg/kg	1.9 mg/kg

(1) Maximum concentration present in a preparation blank.

An action level of 5X the maximum concentration has been used to evaluate the sample data for blank contamination. Sample aliquot, percent solids and dilution factors were taken into consideration when determining blank contamination. Positive results less than the blank action levels for cadmium were qualified, "U", as a result of blank contamination.

Field Duplicate Precision

Field duplicate imprecision (>50% and >5X CRDL) was noted for aluminum, chromium, copper, lead and zinc. The positive results reported for aluminum, chromium, copper, lead and zinc were qualified as estimated, "J".

Executive Summary

Laboratory Performance: Several analytes were present in the laboratory blanks.

Other Factors Affecting Data Quality: Field duplicate imprecision was noted for aluminum, chromium, copper, lead and zinc.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic 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)."

Gretchen A Phipps

Tetra Tech NUS
Gretchen A. Phipps

Tetra Tech NUS
Joseph A. Samchuck
Quality Control Officer

Attachments:

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

CTO078 - NAS CECIL FIELD
SOIL DATA
Accutest, NJ
SDG: F5812

SAMPLE NUMBER:	CEF-815-SD-101			CEF-815-SD-102			CEF-815-SD-103			CEF-815-SD-104		
SAMPLE DATE:	02/01/00			02/01/00			02/01/00			02/01/00		
LABORATORY ID:	F5812-1			F5812-2			F5812-3			F5812-4		
QC_TYPE:	NORMAL			NORMAL			NORMAL			NORMAL		
% SOLIDS:	50.7 %			34.1 %			66.8 %			45.0 %		
UNITS:	MG/KG			MG/KG			MG/KG			MG/KG		
FIELD DUPLICATE OF:												
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
INORGANICS												
ALUMINUM	8920	J	G	18000	J	G	6020	J	G	11200	J	G
BARIUM	42.0			27.3			11.5			31.7		
CADMIUM	4.7			1.0	U	A	0.12	U	A	2.8		
CHROMIUM	60.0	J	G	18.0	J	G	5.4	J	G	23.6	J	G
COPPER	96.5	J	G	13.5	J	G	3.5	J	G	33.9	J	G
LEAD	59.7	J	G	19.8	J	G	15.4	J	G	42.3	J	G
NICKEL	15.8			10.3			2.6			9.0		
VANADIUM	34.4			17.6			5.7			24.4		
ZINC	308	J	G	133	J	G	29.6	J	G	164	J	G

CTO078 - NAS CECIL FIELD
SOIL DATA
Accutest, NJ
SDG: F5812

SAMPLE NUMBER:	CEF-815-SD-DUP01											
SAMPLE DATE:	02/01/00			/ /			/ /			/ /		
LABORATORY ID:	F5812-5											
QC_TYPE:	NORMAL											
% SOLIDS:	34.0 %			100.0 %			100.0 %			100.0 %		
UNITS:	MG/KG											
FIELD DUPLICATE OF:												
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
INORGANICS												
ALUMINUM	5420	J	G									
BARIUM	13.7											
CADMIUM	0.71	U	A									
CHROMIUM	5.7	J	G									
COPPER	7.5	J	G									
LEAD	8.5	J	G									
NICKEL	3.9											
VANADIUM	6.4											
ZINC	71.3	J	G									

ACCUTEST

Report of Analysis

Client Sample ID:	CEF-815-SD-101		
Lab Sample ID:	F5812-1	**Date Sampled:**	02/01/00
Matrix:	SO - Soil	**Date Received:**	02/03/00
		Percent Solids:	50.7
Project:	NAS Cecil Field PO#N0039-P98655A-01		

Metals Analysis

Analyte	Result	RL	Units	DF	Prep	Analyzed	By	Method
Aluminum	8920	36.9	mg/kg	1	02/09/00	02/11/00	JK	SW846 6010A
Barium	42.0	36.9	mg/kg	1	02/09/00	02/11/00	JK	SW846 6010A
Cadmium	4.7	0.74	mg/kg	1	02/09/00	02/11/00	JK	SW846 6010A
Chromium	60.0	1.8	mg/kg	1	02/09/00	02/11/00	JK	SW846 6010A
Copper	96.5	4.6	mg/kg	1	02/09/00	02/11/00	JK	SW846 6010A
Lead	59.7	18.4	mg/kg	1	02/09/00	02/11/00	JK	SW846 6010A
Nickel	15.8	7.4	mg/kg	1	02/09/00	02/11/00	JK	SW846 6010A
Vanadium	34.4	9.2	mg/kg	1	02/09/00	02/11/00	JK	SW846 6010A
Zinc	308	3.7	mg/kg	1	02/09/00	02/11/00	JK	SW846 6010A

RL = Reporting Limit

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Report of Analysis

Client Sample ID:	CEF-815-SD-102		
Lab Sample ID:	F5812-2	**Date Sampled:**	02/01/00
Matrix:	SO - Soil	**Date Received:**	02/03/00
		Percent Solids:	34.1
Project:	NAS Cecil Field PO#N0039-P98655A-01		

Metals Analysis

Analyte	Result	RL	Units	DF	Prep	Analyzed	By	Method
Aluminum	18000	55.3	mg/kg	1	02/09/00	02/11/00	JK	SW846 6010A
Barium	27.3 B	55.3	mg/kg	1	02/09/00	02/11/00	JK	SW846 6010A
Cadmium	1.0 B	1.1	mg/kg	1	02/09/00	02/11/00	JK	SW846 6010A
Chromium	18.0	2.8	mg/kg	1	02/09/00	02/11/00	JK	SW846 6010A
Copper	13.5	6.9	mg/kg	1	02/09/00	02/11/00	JK	SW846 6010A
Lead	19.8 B	27.7	mg/kg	1	02/09/00	02/11/00	JK	SW846 6010A
Nickel	10.3 B	11.1	mg/kg	1	02/09/00	02/11/00	JK	SW846 6010A
Vanadium	17.6	13.8	mg/kg	1	02/09/00	02/11/00	JK	SW846 6010A
Zinc	133	5.5	mg/kg	1	02/09/00	02/11/00	JK	SW846 6010A

RL = Reporting Limit

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Report of Analysis

Client Sample ID:	CEF-815-SD-103		
Lab Sample ID:	F5812-3	**Date Sampled:**	02/01/00
Matrix:	SO - Soil	**Date Received:**	02/03/00
		Percent Solids:	66.8
Project:	NAS Cecil Field PO#N0039-P98655A-01		

Metals Analysis

Analyte	Result	RL	Units	DF	Prep	Analyzed	By	Method
Aluminum	6020	31.2	mg/kg	1	02/09/00	02/11/00	JK	SW846 6010A
Barium	11.5 B	31.2	mg/kg	1	02/09/00	02/11/00	JK	SW846 6010A
Cadmium	0.12 B	0.62	mg/kg	1	02/09/00	02/11/00	JK	SW846 6010A
Chromium	5.4	1.6	mg/kg	1	02/09/00	02/11/00	JK	SW846 6010A
Copper	3.5 B	3.9	mg/kg	1	02/09/00	02/11/00	JK	SW846 6010A
Lead	15.4 B	15.6	mg/kg	1	02/09/00	02/11/00	JK	SW846 6010A
Nickel	2.6 B	6.2	mg/kg	1	02/09/00	02/11/00	JK	SW846 6010A
Vanadium	5.7 B	7.8	mg/kg	1	02/09/00	02/11/00	JK	SW846 6010A
Zinc	29.6	3.1	mg/kg	1	02/09/00	02/11/00	JK	SW846 6010A

RL = Reporting Limit

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ACCUTEST

Report of Analysis

Client Sample ID:	CEF-815-SD-104		
Lab Sample ID:	F5812-4	**Date Sampled:**	02/01/00
Matrix:	SO - Soil	**Date Received:**	02/03/00
		Percent Solids:	45.0
Project:	NAS Cecil Field PO#N0039-P98655A-01		

Metals Analysis

Analyte	Result	RL	Units	DF	Prep	Analyzed	By	Method
Aluminum	11200	45.4	mg/kg	1	02/09/00	02/11/00	JK	SW846 6010A
Barium	31.7 B	45.4	mg/kg	1	02/09/00	02/11/00	JK	SW846 6010A
Cadmium	2.8	0.91	mg/kg	1	02/09/00	02/11/00	JK	SW846 6010A
Chromium	23.6	2.3	mg/kg	1	02/09/00	02/11/00	JK	SW846 6010A
Copper	33.9	5.7	mg/kg	1	02/09/00	02/11/00	JK	SW846 6010A
Lead	42.3	22.7	mg/kg	1	02/09/00	02/11/00	JK	SW846 6010A
Nickel	9.0 B	9.1	mg/kg	1	02/09/00	02/11/00	JK	SW846 6010A
Vanadium	24.4	11.3	mg/kg	1	02/09/00	02/11/00	JK	SW846 6010A
Zinc	164	4.5	mg/kg	1	02/09/00	02/11/00	JK	SW846 6010A

RL = Reporting Limit

ACCUTEST

Report of Analysis

Client Sample ID:	CEF-815-SD-DUP01		
Lab Sample ID:	F5812-5	**Date Sampled:**	02/01/00
Matrix:	SO - Soil	**Date Received:**	02/03/00
		Percent Solids:	34.0
Project:	NAS Cecil Field PO#N0039-P98655A-01		

Metals Analysis

Analyte	Result	RL	Units	DF	Prep	Analyzed	By	Method
Aluminum	5420	60.0	mg/kg	1	02/09/00	02/11/00	JK	SW846 6010A
Barium	13.7 B	60.0	mg/kg	1	02/09/00	02/11/00	JK	SW846 6010A
Cadmium	0.71 B	1.2	mg/kg	1	02/09/00	02/11/00	JK	SW846 6010A
Chromium	5.7	3.0	mg/kg	1	02/09/00	02/11/00	JK	SW846 6010A
Copper	7.5 B	7.5	mg/kg	1	02/09/00	02/11/00	JK	SW846 6010A
Lead	8.5 B	30.0	mg/kg	1	02/09/00	02/11/00	JK	SW846 6010A
Nickel	3.9 B	12.0	mg/kg	1	02/09/00	02/11/00	JK	SW846 6010A
Vanadium	6.4 B	15.0	mg/kg	1	02/09/00	02/11/00	JK	SW846 6010A
Zinc	71.3	6.0	mg/kg	1	02/09/00	02/11/00	JK	SW846 6010A

RL = Reporting Limit

00 007

order	04	05	08	06	07
location	CEF-815-SD-101	CEF-815-SD-102	CEF-815-SD-102	CEF-815-SD-103	CEF-815-SD-104
nsample	CEF-815-SD-101	CEF-815-SD-102	CEF-815-SD-102-D	CEF-815-SD-103	CEF-815-SD-104
sample	CEF-815-SD-101	CEF-815-SD-102	CEF-815-SD-DUP01	CEF-815-SD-103	CEF-815-SD-104
sample_dat	02/02/00	02/02/00	02/02/00	02/02/00	02/02/00
sacode	NORMAL	DUP	DUP	NORMAL	NORMAL
matrix	SD	SD	SD	SD	SD
sort	**c_04**	**c_05**	**c_08**	**c_06**	**c_07**

Inorganics (mg/kg)

ALUMINUM	8920 J	18000 J	5420 J	6020 J	11200 J
BARIUM	42	27.3	13.7	11.5	31.7
CADMIUM	4.7	1 U	0.71 U	0.12 U	2.8
CHROMIUM	60 J	18 J	5.7 J	5.4 J	23.6 J
COPPER	96.5 J	13.5 J	7.5 J	3.5 J	33.9 J
LEAD	59.7 J	19.8 J	8.5 J	15.4 J	42.3 J
NICKEL	15.8	10.3	3.9	2.6	9
VANADIUM	34.4	17.6	6.4	5.7	24.4
ZINC	308 J	133 J	71.3 J	29.6 J	164 J

A.2 SURFACE WATER

Report of Analysis

Client Sample ID:	CEF-815-SW-01		
Lab Sample ID:	F5088-7	Date Sampled:	10/14/99
Matrix:	AQ - Ground Water	Date Received:	10/15/99
Method:	SW846 8021B	Percent Solids:	n/a
Project:	NAS Cecil Field N7895		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	QR001054.D	1	10/25/99	JG	n/a	n/a	GQR26
Run #2							

VOA 8021 List

CAS No.	Compound	Result	RL	Units	Q
71-43-2	Benzene	ND	1.0	ug/l	
75-27-4	Bromodichloromethane	ND	1.0	ug/l	
75-25-2	Bromoform	ND	1.0	ug/l	
74-83-9	Bromomethane	ND	1.0	ug/l	
56-23-5	Carbon tetrachloride	ND	1.0	ug/l	
108-90-7	Chlorobenzene	ND	1.0	ug/l	
124-48-1	Dibromochloromethane	ND	1.0	ug/l	
75-00-3	Chloroethane	ND	1.0	ug/l	
110-75-8	2-Chloroethylvinyl ether	ND	1.0	ug/l	
67-66-3	Chloroform	ND	1.0	ug/l	
74-87-3	Chloromethane	ND	1.0	ug/l	
106-93-4	1,2-Dibromoethane	ND	1.0	ug/l	
95-50-1	1,2-Dichlorobenzene	ND	1.0	ug/l	
541-73-1	1,3-Dichlorobenzene	ND	1.0	ug/l	
106-46-7	1,4-Dichlorobenzene	ND	1.0	ug/l	
75-71-8	Dichlorodifluoromethane	ND	1.0	ug/l	
75-34-3	1,1-Dichloroethane	ND	1.0	ug/l	
107-06-2	1,2-Dichloroethane	ND	1.0	ug/l	
75-35-4	1,1-Dichloroethene	ND	1.0	ug/l	
156-59-2	cis-1,2-Dichloroethene	ND	1.0	ug/l	
156-60-5	trans-1,2-Dichloroethene	ND	1.0	ug/l	
78-87-5	1,2-Dichloropropane	ND	1.0	ug/l	
10061-01-5	cis-1,3-Dichloropropene	ND	1.0	ug/l	
10061-02-6	trans-1,3-Dichloropropene	ND	1.0	ug/l	
100-41-4	Ethylbenzene	ND	1.0	ug/l	
75-09-2	Methylene chloride	ND	5.0	ug/l	
1634-04-4	Methyl Tert Butyl Ether	ND	1.0	ug/l	
79-34-5	1,1,2,2-Tetrachloroethane	ND	1.0	ug/l	
127-18-4	Tetrachloroethene	ND	1.0	ug/l	
108-88-3	Toluene	ND	1.0	ug/l	
71-55-6	1,1,1-Trichloroethane	ND	1.0	ug/l	
79-00-5	1,1,2-Trichloroethane	ND	1.0	ug/l	
79-01-6	Trichloroethene	ND	1.0	ug/l	
75-69-4	Trichlorofluoromethane	ND	1.0	ug/l	
75-01-4	Vinyl chloride	ND	1.0	ug/l	
1330-20-7	Xylenes (total)	ND	3.0	ug/l	

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-815-SW-01		
Lab Sample ID:	F5088-7	Date Sampled:	10/14/99
Matrix:	AQ - Ground Water	Date Received:	10/15/99
Method:	SW846 8021B	Percent Solids:	n/a
Project:	NAS Cecil Field N7895		

VOA 8021 List

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
75-29-6	2-Chloropropane	100%		75-125%
352-33-0	1-Chloro-4-fluorobenzene	100%		65-125%
352-33-0	1-Chloro-4-fluorobenzene	97%		65-125%
98-08-8	aaa-Trifluorotoluene	98%		72-125%

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

order	**1**
location	CEF-815-SW1
nsample	CEF-815-SW-01
sample	CEF-815-SW-01
sample_dat	10/14/99
matrix	SW

sort	**c_1**	**count**
Volatile Organics (ug/L)		
1,1,1-TRICHLOROETHANE	1 U	1
1,1,2,2-TETRACHLOROETHANE	1 U	1
1,1,2-TRICHLOROETHANE	1 U	1
1,1-DICHLOROETHANE	1 U	1
1,1-DICHLOROETHENE	1 U	1
1,2-DIBROMOETHANE	1 U	1
1,2-DICHLOROBENZENE	1 U	1
1,2-DICHLOROETHANE	1 U	1
1,2-DICHLOROPROPANE	1 U	1
1,3-DICHLOROBENZENE	1 U	1
1,4-DICHLOROBENZENE	1 U	1
2-CHLOROETHYL VINYL ETHER	1 U	1
BENZENE	1 U	1
BROMODICHLOROMETHANE	1 U	1
BROMOFORM	1 U	1
BROMOMETHANE	1 U	1
CARBON TETRACHLORIDE	1 U	1
CHLOROBENZENE	1 U	1
CHLOROETHANE	1 U	1
CHLOROFORM	1 U	1
CHLOROMETHANE	1 U	1
CIS-1,2-DICHLOROETHENE	1 U	1
CIS-1,3-DICHLOROPROPENE	1 U	1
DIBROMOCHLOROMETHANE	1 U	1
DICHLORODIFLUOROMETHANE	1 U	1
ETHYLBENZENE	1 U	1
METHYL TERT-BUTYL ETHER	1 U	1
METHYLENE CHLORIDE	5 U	1
TETRACHLOROETHENE	1 U	1
TOLUENE	1 U	1
TRANS-1,2-DICHLOROETHENE	1 U	1
TRANS-1,3-DICHLOROPROPENE	1 U	1
TRICHLOROETHENE	1 U	1
TRICHLOROFLUOROMETHANE	1 U	1
VINYL CHLORIDE	1 U	1
XYLENES, TOTAL	3 U	1

from angsw_sam.dbf
from angsw_res.dbf
from angsw_res.xls
from p:\sdiv

A.3 SOIL

Report of Analysis

Client Sample ID:	CEF-815-SS-01-01		
Lab Sample ID:	F5074-7	Date Sampled:	10/13/99
Matrix:	SO - Soil	Date Received:	10/14/99
Method:	SW846 8260B	Percent Solids:	n/a
Project:	NAS Cecil Field N7895		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1 [a]	K004541.D	1	10/26/99	RAW	n/a	n/a	VK114
Run #2							

VOA 8021 List

CAS No.	Compound	Result	RL	Units	Q
71-43-2	Benzene	ND	2.1	ug/kg	
75-27-4	Bromodichloromethane	ND	2.1	ug/kg	
75-25-2	Bromoform	ND	2.1	ug/kg	
108-90-7	Chlorobenzene	ND	2.1	ug/kg	
75-00-3	Chloroethane	ND	5.3	ug/kg	
67-66-3	Chloroform	ND	2.1	ug/kg	
110-75-8	2-Chloroethyl vinyl ether	ND	5.3	ug/kg	
56-23-5	Carbon tetrachloride	ND	2.1	ug/kg	
75-34-3	1,1-Dichloroethane	ND	2.1	ug/kg	
75-35-4	1,1-Dichloroethylene	ND	2.1	ug/kg	
106-93-4	1,2-Dibromoethane	ND	2.1	ug/kg	
107-06-2	1,2-Dichloroethane	ND	2.1	ug/kg	
78-87-5	1,2-Dichloropropane	ND	2.1	ug/kg	
124-48-1	Dibromochloromethane	ND	2.1	ug/kg	
75-71-8	Dichlorodifluoromethane	ND	5.3	ug/kg	
156-59-2	cis-1,2-Dichloroethylene	ND	2.1	ug/kg	
10061-01-5	cis-1,3-Dichloropropene	ND	2.1	ug/kg	
541-73-1	m-Dichlorobenzene	ND	2.1	ug/kg	
95-50-1	o-Dichlorobenzene	ND	2.1	ug/kg	
106-46-7	p-Dichlorobenzene	ND	2.1	ug/kg	
156-60-5	trans-1,2-Dichloroethylene	ND	2.1	ug/kg	
10061-02-6	trans-1,3-Dichloropropene	ND	2.1	ug/kg	
100-41-4	Ethylbenzene	ND	2.1	ug/kg	
74-83-9	Methyl bromide	ND	5.3	ug/kg	
74-87-3	Methyl chloride	ND	5.3	ug/kg	
75-09-2	Methylene chloride	ND	11	ug/kg	
1634-04-4	Methyl Tert Butyl Ether	ND	2.1	ug/kg	
71-55-6	1,1,1-Trichloroethane	ND	2.1	ug/kg	
79-34-5	1,1,2,2-Tetrachloroethane	ND	2.1	ug/kg	
79-00-5	1,1,2-Trichloroethane	ND	2.1	ug/kg	
127-18-4	Tetrachloroethylene	ND	2.1	ug/kg	
108-88-3	Toluene	ND	2.1	ug/kg	
79-01-6	Trichloroethylene	ND	2.1	ug/kg	
75-69-4	Trichlorofluoromethane	ND	5.3	ug/kg	
75-01-4	Vinyl chloride	ND	5.3	ug/kg	
1330-20-7	Xylene (total)	ND	6.4	ug/kg	

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-815-SS-01-01		
Lab Sample ID:	F5074-7	Date Sampled:	10/13/99
Matrix:	SO - Soil	Date Received:	10/14/99
Method:	SW846 8260B	Percent Solids:	n/a
Project:	NAS Cecil Field N7895		

VOA 8021 List

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
1868-53-7	Dibromofluoromethane	89%		71-122%
2037-26-5	Toluene-D8	94%		73-128%
460-00-4	4-Bromofluorobenzene	90%		53-158%
17060-07-0	1,2-Dichloroethane-D4	93%		71-122%

(a) Results reported on a wet weight basis.

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-815-SS-02-01		
Lab Sample ID:	F5074-8	Date Sampled:	10/13/99
Matrix:	SO - Soil	Date Received:	10/14/99
Method:	SW846 8260B	Percent Solids:	n/a
Project:	NAS Cecil Field N7895		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1 [a]	K004542.D	1	10/26/99	RAW	n/a	n/a	VK114
Run #2							

VOA 8021 List

CAS No.	Compound	Result	RL	Units	Q
71-43-2	Benzene	ND	2.1	ug/kg	
75-27-4	Bromodichloromethane	ND	2.1	ug/kg	
75-25-2	Bromoform	ND	2.1	ug/kg	
108-90-7	Chlorobenzene	ND	2.1	ug/kg	
75-00-3	Chloroethane	ND	5.3	ug/kg	
67-66-3	Chloroform	ND	2.1	ug/kg	
110-75-8	2-Chloroethyl vinyl ether	ND	5.3	ug/kg	
56-23-5	Carbon tetrachloride	ND	2.1	ug/kg	
75-34-3	1,1-Dichloroethane	ND	2.1	ug/kg	
75-35-4	1,1-Dichloroethylene	ND	2.1	ug/kg	
106-93-4	1,2-Dibromoethane	ND	2.1	ug/kg	
107-06-2	1,2-Dichloroethane	ND	2.1	ug/kg	
78-87-5	1,2-Dichloropropane	ND	2.1	ug/kg	
124-48-1	Dibromochloromethane	ND	2.1	ug/kg	
75-71-8	Dichlorodifluoromethane	ND	5.3	ug/kg	
156-59-2	cis-1,2-Dichloroethylene	ND	2.1	ug/kg	
10061-01-5	cis-1,3-Dichloropropene	ND	2.1	ug/kg	
541-73-1	m-Dichlorobenzene	ND	2.1	ug/kg	
95-50-1	o-Dichlorobenzene	ND	2.1	ug/kg	
106-46-7	p-Dichlorobenzene	ND	2.1	ug/kg	
156-60-5	trans-1,2-Dichloroethylene	ND	2.1	ug/kg	
10061-02-6	trans-1,3-Dichloropropene	ND	2.1	ug/kg	
100-41-4	Ethylbenzene	ND	2.1	ug/kg	
74-83-9	Methyl bromide	ND	5.3	ug/kg	
74-87-3	Methyl chloride	ND	5.3	ug/kg	
75-09-2	Methylene chloride	ND	11	ug/kg	
1634-04-4	Methyl Tert Butyl Ether	ND	2.1	ug/kg	
71-55-6	1,1,1-Trichloroethane	ND	2.1	ug/kg	
79-34-5	1,1,2,2-Tetrachloroethane	ND	2.1	ug/kg	
79-00-5	1,1,2-Trichloroethane	ND	2.1	ug/kg	
127-18-4	Tetrachloroethylene	ND	2.1	ug/kg	
108-88-3	Toluene	ND	2.1	ug/kg	
79-01-6	Trichloroethylene	ND	2.1	ug/kg	
75-69-4	Trichlorofluoromethane	ND	5.3	ug/kg	
75-01-4	Vinyl chloride	ND	5.3	ug/kg	
1330-20-7	Xylene (total)	ND	6.4	ug/kg	

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-815-SS-02-01		
Lab Sample ID:	F5074-8	Date Sampled:	10/13/99
Matrix:	SO - Soil	Date Received:	10/14/99
Method:	SW846 8260B	Percent Solids:	n/a
Project:	NAS Cecil Field N7895		

VOA 8021 List

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
1868-53-7	Dibromofluoromethane	82%		71-122%
2037-26-5	Toluene-D8	97%		73-128%
460-00-4	4-Bromofluorobenzene	100%		53-158%
17060-07-0	1,2-Dichloroethane-D4	92%		71-122%

(a) Results reported on a wet weight basis.

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-815-SS-03-01		
Lab Sample ID:	F5074-9	Date Sampled:	10/13/99
Matrix:	SO - Soil	Date Received:	10/14/99
Method:	SW846 8260B	Percent Solids:	n/a
Project:	NAS Cecil Field N7895		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1 [a]	K004543.D	1	10/26/99	RAW	n/a	n/a	VK114
Run #2							

VOA 8021 List

CAS No.	Compound	Result	RL	Units	Q
71-43-2	Benzene	ND	2.1	ug/kg	
75-27-4	Bromodichloromethane	ND	2.1	ug/kg	
75-25-2	Bromoform	ND	2.1	ug/kg	
108-90-7	Chlorobenzene	ND	2.1	ug/kg	
75-00-3	Chloroethane	ND	5.2	ug/kg	
67-66-3	Chloroform	ND	2.1	ug/kg	
110-75-8	2-Chloroethyl vinyl ether	ND	5.2	ug/kg	
56-23-5	Carbon tetrachloride	ND	2.1	ug/kg	
75-34-3	1,1-Dichloroethane	ND	2.1	ug/kg	
75-35-4	1,1-Dichloroethylene	ND	2.1	ug/kg	
106-93-4	1,2-Dibromoethane	ND	2.1	ug/kg	
107-06-2	1,2-Dichloroethane	ND	2.1	ug/kg	
78-87-5	1,2-Dichloropropane	ND	2.1	ug/kg	
124-48-1	Dibromochloromethane	ND	2.1	ug/kg	
75-71-8	Dichlorodifluoromethane	ND	5.2	ug/kg	
156-59-2	cis-1,2-Dichloroethylene	ND	2.1	ug/kg	
10061-01-5	cis-1,3-Dichloropropene	ND	2.1	ug/kg	
541-73-1	m-Dichlorobenzene	ND	2.1	ug/kg	
95-50-1	o-Dichlorobenzene	ND	2.1	ug/kg	
106-46-7	p-Dichlorobenzene	ND	2.1	ug/kg	
156-60-5	trans-1,2-Dichloroethylene	ND	2.1	ug/kg	
10061-02-6	trans-1,3-Dichloropropene	ND	2.1	ug/kg	
100-41-4	Ethylbenzene	ND	2.1	ug/kg	
74-83-9	Methyl bromide	ND	5.2	ug/kg	
74-87-3	Methyl chloride	ND	5.2	ug/kg	
75-09-2	Methylene chloride	ND	10	ug/kg	
1634-04-4	Methyl Tert Butyl Ether	ND	2.1	ug/kg	
71-55-6	1,1,1-Trichloroethane	ND	2.1	ug/kg	
79-34-5	1,1,2,2-Tetrachloroethane	ND	2.1	ug/kg	
79-00-5	1,1,2-Trichloroethane	ND	2.1	ug/kg	
127-18-4	Tetrachloroethylene	ND	2.1	ug/kg	
108-88-3	Toluene	ND	2.1	ug/kg	
79-01-6	Trichloroethylene	ND	2.1	ug/kg	
75-69-4	Trichlorofluoromethane	ND	5.2	ug/kg	
75-01-4	Vinyl chloride	ND	5.2	ug/kg	
1330-20-7	Xylene (total)	ND	6.3	ug/kg	

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-815-SS-03-01		
Lab Sample ID:	F5074-9	Date Sampled:	10/13/99
Matrix:	SO - Soil	Date Received:	10/14/99
Method:	SW846 8260B	Percent Solids:	n/a
Project:	NAS Cecil Field N7895		

VOA 8021 List

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
1868-53-7	Dibromofluoromethane	91%		71-122%
2037-26-5	Toluene-D8	93%		73-128%
460-00-4	4-Bromofluorobenzene	93%		53-158%
17060-07-0	1,2-Dichloroethane-D4	93%		71-122%

(a) Results reported on a wet weight basis.

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-815-SS-04-02		
Lab Sample ID:	F5074-10	Date Sampled:	10/13/99
Matrix:	SO - Soil	Date Received:	10/14/99
Method:	SW846 8260B	Percent Solids:	n/a
Project:	NAS Cecil Field N7895		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1 [a]	K004544.D	1	10/26/99	RAW	n/a	n/a	VK114
Run #2							

VOA 8021 List

CAS No.	Compound	Result	RL	Units	Q
71-43-2	Benzene	ND	2.6	ug/kg	
75-27-4	Bromodichloromethane	ND	2.6	ug/kg	
75-25-2	Bromoform	ND	2.6	ug/kg	
108-90-7	Chlorobenzene	ND	2.6	ug/kg	
75-00-3	Chloroethane	ND	6.5	ug/kg	
67-66-3	Chloroform	ND	2.6	ug/kg	
110-75-8	2-Chloroethyl vinyl ether	ND	6.5	ug/kg	
56-23-5	Carbon tetrachloride	ND	2.6	ug/kg	
75-34-3	1,1-Dichloroethane	ND	2.6	ug/kg	
75-35-4	1,1-Dichloroethylene	ND	2.6	ug/kg	
106-93-4	1,2-Dibromoethane	ND	2.6	ug/kg	
107-06-2	1,2-Dichloroethane	ND	2.6	ug/kg	
78-87-5	1,2-Dichloropropane	ND	2.6	ug/kg	
124-48-1	Dibromochloromethane	ND	2.6	ug/kg	
75-71-8	Dichlorodifluoromethane	ND	6.5	ug/kg	
156-59-2	cis-1,2-Dichloroethylene	ND	2.6	ug/kg	
10061-01-5	cis-1,3-Dichloropropene	ND	2.6	ug/kg	
541-73-1	m-Dichlorobenzene	ND	2.6	ug/kg	
95-50-1	o-Dichlorobenzene	ND	2.6	ug/kg	
106-46-7	p-Dichlorobenzene	ND	2.6	ug/kg	
156-60-5	trans-1,2-Dichloroethylene	ND	2.6	ug/kg	
10061-02-6	trans-1,3-Dichloropropene	ND	2.6	ug/kg	
100-41-4	Ethylbenzene	ND	2.6	ug/kg	
74-83-9	Methyl bromide	ND	6.5	ug/kg	
74-87-3	Methyl chloride	ND	6.5	ug/kg	
75-09-2	Methylene chloride	ND	13	ug/kg	
1634-04-4	Methyl Tert Butyl Ether	ND	2.6	ug/kg	
71-55-6	1,1,1-Trichloroethane	ND	2.6	ug/kg	
79-34-5	1,1,2,2-Tetrachloroethane	ND	2.6	ug/kg	
79-00-5	1,1,2-Trichloroethane	ND	2.6	ug/kg	
127-18-4	Tetrachloroethylene	ND	2.6	ug/kg	
108-88-3	Toluene	ND	2.6	ug/kg	
79-01-6	Trichloroethylene	ND	2.6	ug/kg	
75-69-4	Trichlorofluoromethane	ND	6.5	ug/kg	
75-01-4	Vinyl chloride	ND	6.5	ug/kg	
1330-20-7	Xylene (total)	ND	7.8	ug/kg	

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-815-SS-04-02		
Lab Sample ID:	F5074-10	Date Sampled:	10/13/99
Matrix:	SO - Soil	Date Received:	10/14/99
Method:	SW846 8260B	Percent Solids:	n/a
Project:	NAS Cecil Field N7895		

VOA 8021 List

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
1868-53-7	Dibromofluoromethane	95%		71-122%
2037-26-5	Toluene-D8	94%		73-128%
460-00-4	4-Bromofluorobenzene	94%		53-158%
17060-07-0	1,2-Dichloroethane-D4	96%		71-122%

(a) Results reported on a wet weight basis.

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

APPENDIX B

ECOLOGICAL EFFECTS EVALUATION
FOOD CHAIN MODELING;
SEDIMENT SAMPLES ASSOCIATED WITH PSC 56

APPENDIX B

FOOD CHAIN MODELING

Food chain modeling was conducted as part of COPC refinement. The objective of the food chain modeling was to investigate potential risks to representative receptors from screening-level COPCs that are known to bioaccumulate or biomagnify (U.S. EPA, 2000a). 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 not available, toxicity data from laboratory species were extrapolated to receptor species. The TRVs were obtained from wildlife toxicity data that were summarized by Sample et al. (1996). TRVs used in this ecological risk assessment and their sources are presented in Table B-1.

Food chain modeling was limited to COPCs that are known to bioaccumulate or biomagnify (U.S. EPA, 2000a). U.S. EPA Region 4 considers chemicals in this category to consist of those so designated in U.S. EPA's (2000b) *Appendix to Bioaccumulation Testing and Interpretation for the Purpose of Sediment Quality Assessment, Status and Needs, Chemical-Specific Summary Tables* (Simon, 2000). COPCs at PSC 56 that are known to bioaccumulate or biomagnify consist of cadmium, chromium, copper, lead, and zinc. The remainder of the COPCs (aluminum, barium, and vanadium) are not known to bioaccumulate or biomagnify, and were not included in the food chain model.

Representative Receptors

Representative ecological receptors used in the food chain model for PSC 56 consisted of the raccoon (*Procyon lotor*) and little blue heron (*Egretta caerulea*), both of which are found at NAS Cecil Field and could forage at PSC 56. 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 (U.S. 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 (U.S. EPA, 1993). Raccoon home ranges on a Georgia coastal island were 160 acres for males and 96 acres for females (Lotze, 1979). The gate in the chain link fence surrounding the pond does not prevent access by small animals, and thus, raccoons could access the pond through openings between the gate panels. In addition, raccoons could probably pass underneath some portions of the chain link fence.

Little blue heron (*Egretta caerulea*)

The little blue heron was selected as a representative bird that preys on aquatic organisms. Due to the absence of fish in the pond, belted kingfishers (*Ceryle alcyon*) would probably not forage at PSC 56. Likewise, the green heron (*Butorides striatus*), which forages primarily along forested margins of water bodies, would also not be found at PSC 56. However, the little blue heron and other wading bird species would be expected to forage at the site.

The little blue heron is associated with freshwater ponds, lakes, marshes, and coastal wetlands of the Gulf Coast States. This species forages by wading in shallow waters, and its diet typically consists of fish, amphibians, crayfish, and aquatic insects (U.S. EPA, 1993). The little blue heron is classified as a Species of Special Concern by the Florida Fish and Wildlife Conservation Commission (1997). Breeding populations in Florida are non-migratory. Home range data for the

little blue heron was not available. Peters (1983) used data from several studies to develop the following formula for the relationship of body size to home range for birds that prey upon animals:

home range (km^2) = $8.3\ W^{1.37}$
where W = body mass (kg)

Using this formula and a body weight of 340 g (Dunning, 1993), the estimated home range for a little blue heron would be 1.9 km^2 (469 acres).

Exposure Estimate and Risk Calculation

The following equation was 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 B-2. Food ingestion rates shown in Table B-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)

- little blue heron: 64 g/day; calculated using equation for food ingestion rate for herons:
  log ingestion rate (g/day; wet weight) = 0.966 (log bw) – 0.64 (Kushlan, 1978)

Biota-sediment accumulation factors (BSAFs) for calculating sediment to biota chemical concentrations were assumed to equal 1.0. In other words, contaminant concentrations in food items of the raccoon and little blue heron (C_{food} in the equation shown above) were assumed to be equal to sediment concentrations. The U.S. EPA Environmental Response Team, which authored the primary guidance for ecological risk assessments (U.S. EPA, 1997) recommends this assumption in screening level ecological risk assessments.

Hazard quotients (HQs) are presented for each COPC for which risks via the food chain were investigated at PSC 56 (Tables B-3 through B-6) and are defined as the ratio of the modeled dose to the TRV.

References

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TABLE B-1

TOXICITY REFERENCE VALUES (TRVs)
PSC 56, STORMWATER RETENTION POND
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

Compound	Test Species	Endpoint	Study Duration	NOAEL (mg/kg/d)	LOAEL (mg/kg/d)	Reference[a]
Cadmium	Rat	Reproduction	6 weeks	1	10	Sutou et al., 1980
	Mallard duck	Reproduction	90 days	1.45	20	White and Finley, 1978
Chromium	Black duck	Reproduction	10 months	1	5	Haseltine et al., unpublished data
	Rat	Body weight, food comsumption	1 year	3.28	ND	MacKenzie et al., 1958
Copper	Mink	Reproduction	357 days	11.7	15.14	Aulerich et al., 1982
	One-day old chick	Growth, mortality	10 weeks	47	61.7	Mehring et al,. 1960
Lead	Rat	Reproduction	3 generations (>1 year)	8	80	Azar et al,. 1973
	Japanese quail	Reproduction	12 weeks	1.13	11.3	Edens et al., 1976
Zinc	Rat	Reproduction	Days 1-16 of gestation	160	320	Schlinker and Cox, 1968
	White leghorn hen	Reproduction	44 weeks	14.5	131	Stahl et al., 1990

a See Sample, et al. (1996) for full citations.
NOAEL = No observable effects level.
LOAEL = Lowest observable effects level.
ND = Not determined. Value of 32.8 (NOAEL x 10) assumed as LOAEL.

TABLE B-2

EXPOSURE PARAMETERS FOR REPRESENTATIVE ECOLOGICAL RECEPTORS
PSC 56, STORMWATER RETENTION
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIA

Receptor	Representative Group	Body Weight (grams)	Food Ingestion[1] (grams/day)	Assumed Diet for Exposure Assessment	Home Range (acres)
Raccoon (*Procyon lotor*)	Piscivorous Mammal	3990[2]	856[2]	90.6% aquatic invertebrates 9.4% sediment[2]	96 to 160[2]
Little blue heron (*Egretta caerulea*)	Piscivorous Bird	340[3]	64[4]	100% fish soil, sediment: none[5]	469[6]

1 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.

2 U.S. EPA, 1993.

3 Dunning, 1993.

4 Estimated using Kushlan's (1978) equation for food ingestion rate of herons.

5 Sample and Suter, 1994.

6 Estimated using allometric equation from Peters, 1983.

TABLE B-3

HAZARD QUOTIENT CALCULATIONS
MEAN CONCENTRATIONS
RACCOON
PSC 56, STORMWATER RETENTION POND
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

Body Weight	3.9900	kg		
Food Ingestion Rate	0.8560	kg/day	% prey	0.906
Water Ingestion Rate	0.3310	kg/day		
Sediment Ingestion Rate	0.8560	kg/day	% sediment	0.094

Ecological Contaminant of Potential Concern	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
Inorganics								
ALUMINUM	9462.50	0.0000	9462.50	2030.0501	1.93	19.3	1.05E+03	1.05E+02
BARIUM	26.43	0.0000	26.43	5.6691	5.1	19.8	1.11E+00	2.86E-01
CADMIUM	2.00	0.0000	2.00	0.4284	1	10	4.28E-01	4.28E-02
CHROMIUM	25.21	0.0000	25.21	5.4090	3.28	32.8	1.65E+00	1.65E-01
COPPER	36.10	0.0000	36.10	7.7448	11.7	15.14	6.62E-01	5.12E-01
LEAD	32.89	0.0000	32.89	7.0556	8	80	8.82E-01	8.82E-02
NICKEL	8.63	0.0000	8.63	1.8504	40	80	4.63E-02	2.31E-02
VANADIUM	19.13	0.0000	19.13	4.1030	0.21	2.1	1.95E+01	1.95E+00
ZINC	150.94	0.0000	150.94	32.3816	160	320	2.02E-01	1.01E-01

NOAEL = No observable effects level.
LOAEL = Lowest observable effects level.

TABLE B-4

HAZARD QUOTIENT CALCULATIONS
MAXIMUM CONCENTRATIONS
RACCOON
PSC 56, STORMWATER RETENTION POND
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

Body Weight	3.9900	kg		
Food Ingestion Rate	0.8560	kg/day	% prey	0.9060
Water Ingestion Rate	0.3310	kg/day		
Sediment Ingestion Rate	0.8560	kg/day	% prey	0.0940

Ecological Contaminant of Potential Concern	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
Inorganics								
ALUMINUM	11710.00	0.0000	11710.00	2512.2206	1.93	19.3	1.30E+03	1.30E+02
BARIUM	42.00	0.0000	42.00	9.0105	5.1	19.8	1.77E+00	4.55E-01
CADMIUM	4.70	0.0000	4.70	1.0083	1	10	1.01E+00	1.01E-01
CHROMIUM	60.00	0.0000	60.00	12.8722	3.28	32.8	3.92E+00	3.92E-01
COPPER	96.50	0.0000	96.50	20.7028	11.7	15.14	1.77E+00	1.37E+00
LEAD	59.70	0.0000	59.70	12.8078	8	80	1.60E+00	1.60E-01
NICKEL	15.80	0.0000	15.80	3.3897	40	80	8.47E-02	4.24E-02
VANADIUM	34.40	0.0000	34.40	7.3801	0.21	2.1	3.51E+01	3.51E+00
ZINC	308.00	0.0000	308.00	66.0772	160	320	4.13E-01	2.06E-01

NOAEL = No observable effects level.
LOAEL = Lowest observable effects level.

TABLE B-5

HAZARD QUOTIENT CALCULATIONS
MEAN CONCENTRATIONS
LITTLE BLUE HERON
PSC 56, STORMWATER RETENTION POND
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

Body Weight	0.3400000	kg	
Food Ingestion Rate	0.0640000	kg/day	100% fish
Water Ingestion Rate	0.0150000	kg/day	
Sediment Ingestion Rate	0.0000000	kg/day	

Ecological Contaminant of Potential Concern	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
Inorganics								
ALUMINUM	9462.50	0.0000	9462.50	1781.1765	109.7	1097	1.62E+01	1.62E+00
BARIUM	26.43	0.0000	26.43	4.9741	20.8	41.7	2.39E-01	1.19E-01
CADMIUM	2.00	0.0000	2.00	0.3759	1.45	20	2.59E-01	1.88E-02
CHROMIUM	25.21	0.0000	25.21	4.7459	1	5	4.75E+00	9.49E-01
COPPER	36.10	0.0000	36.10	6.7953	47	61.7	1.45E-01	1.10E-01
LEAD	32.89	0.0000	32.89	6.1906	1.13	11.3	5.48E+00	5.48E-01
NICKEL	8.63	0.0000	8.63	1.6235	77.4	107	2.10E-02	1.52E-02
VANADIUM	19.13	0.0000	19.13	3.6000	11.4	114	3.16E-01	3.16E-02
ZINC	150.94	0.0000	150.94	28.4118	14.5	131	1.96E+00	2.17E-01

NOAEL = No observable effects level.
LOAEL = Lowest observable effects level.

TABLE B-6

HAZARD QUOTIENT CALCULATIONS
MAXIMUM CONCENTRATIONS
LITTLE BLUE HERON
PSC 56, STORMWATER RETENTION POND
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

Body Weight	0.3400000	kg	
Food Ingestion Rate	0.0640000	kg/day	100% fish
Water Ingestion Rate	0.0150000	kg/day	
Sediment Ingestion Rate	0.0000000	kg/day	

Ecological Contaminant of Potential Concern	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
Inorganics								
ALUMINUM	11710.00	0.0000	11710.00	2204.2353	109.7	1097	2.01E+01	2.01E+00
BARIUM	42.00	0.0000	42.00	7.9059	20.8	41.7	3.80E-01	1.90E-01
CADMIUM	4.70	0.0000	4.70	0.8847	1.45	20	6.10E-01	4.42E-02
CHROMIUM	60.00	0.0000	60.00	11.2941	1	5	1.13E+01	2.26E+00
COPPER	96.50	0.0000	96.50	18.1647	47	61.7	3.86E-01	2.94E-01
LEAD	59.70	0.0000	59.70	11.2376	1.13	11.3	9.94E+00	9.94E-01
NICKEL	15.80	0.0000	15.80	2.9741	77.4	107	3.84E-02	2.78E-02
VANADIUM	34.40	0.0000	34.40	6.4753	11.4	114	5.68E-01	5.68E-02
ZINC	308.00	0.0000	308.00	57.9765	14.5	131	4.00E+00	4.43E-01

NOAEL = No observable effects level.
LOAEL = Lowest observable effects level.