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NAS WHITING FIELD
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FINAL FEASIBILITY STUDY ADDENDUM FOR SITE 3 NAS WHITING FIELD FL
8/31/2004
TETRA TECH NUS



TETRA TECH NUS, INC.

800 Oak Ridge Turnpike, A-600 ■ Oak Ridge, Tennessee 37830
(865) 483-9900 ■ FAX: (865) 483-2014 ■ www.tetrattech.com

0804-A090

August 31, 2004

Commander, Southern Division
Naval Facilities Engineering Command
ATTN: Ms. Linda Martin, Code ES31
P.O. Box 190010
2155 Eagle Drive
North Charleston, SC 29419-9010

Reference: CLEAN Contract No. N62467-94-D-0888
Contract Task Order No. 0028

Subject: Final Feasibility Study Addendum, Site 3 (Revision 2)
Naval Air Station, Whiting Field, Milton, Florida

Dear Ms. Martin:

Tetra Tech NUS, Inc. is pleased to submit the final Feasibility Study Addendum (FSA) for Site 3 Surface and Subsurface Soil (Revision 2) in hardcopy format. An electronic copy is being forwarded to you and the individuals indicated below. One hardcopy will be placed in the Administrative Record in the TtNUS Oak Ridge office. Electronic copies of the final FSAs, Proposed Plans, and RODs for Sites 3, 6, 30, 32, and 33 will be placed on one CD and submitted under separate cover.

If you have any questions, please contact me at (850) 385-9899.

Sincerely,

Terry Hansen
Task Order Manager

TH:ckf

Enclosure

c: Mr. Craig Benedikt, USEPA Region 4 (electronic copy and hardcopy)
Mr. Jim Cason, FDEP (electronic copy and 2 hardcopies)
Ms. Lisa Campbell, Tetra Tech NUS (electronic copy and hardcopy)
Mr. Ron Joyner, NAS Whiting Field (electronic copy and 2 hardcopies)
Mr. Larry Smith, Tetra Tech NUS (cover letter only)
Ms. Amy Twitty, CH2M Hill (electronic copy)
Mr. Mark Perry, Tetra Tech NUS (electronic copy and hardcopy)
Ms. Debra M. Humbert, Tetra Tech NUS (cover letter only)
File/db

Feasibility Study Addendum
for
**Site 3, Underground Waste Solvent
Storage Area
Surface and Subsurface Soil**

Naval Air Station Whiting Field
Milton, Florida
USEPA ID No. FL2170023244



Southern Division
Naval Facilities Engineering Command
Contract Number N62467-94-D-0888
Contract Task Order 0028

August 2004

**FEASIBILITY STUDY ADDENDUM
FOR
SITE 3, UNDERGROUND WASTE SOLVENT STORAGE AREA
SURFACE AND SUBSURFACE SOIL**

**NAVAL AIR STATION WHITING FIELD
MILTON, FLORIDA**

USEPA ID No. FL2170023244

Submitted to:

**Southern Division
Naval Facilities Engineering Command
2155 Eagle Drive
North Charleston, South Carolina 29406**

Submitted by:

**Tetra Tech NUS, Inc.
661 Andersen Drive
Foster Plaza 7
Pittsburgh, Pennsylvania 15220**

**CONTRACT NO. N62467-94-D-0888
CONTRACT TASK ORDER 0028**

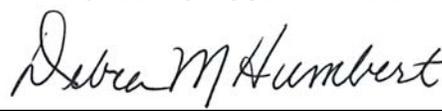
AUGUST 2004

PREPARED UNDER THE SUPERVISION OF:



**TERRY HANSEN
TASK ORDER MANAGER
TETRA TECH NUS, INC.
TALLAHASSEE, FLORIDA**

APPROVED FOR SUBMITTAL BY:



**DEBRA M. HUMBERT
PROGRAM MANAGER
TETRA TECH NUS, INC.
PITTSBURGH, PENNSYLVANIA**

PROFESSIONAL ENGINEER CERTIFICATION

I hereby certify this document, *Feasibility Study Addendum for Site 6, South Transformer Oil Disposal Area, Surface and Subsurface Soil, Naval Air Station Whiting Field, Milton, Florida*, was prepared under my direct supervision in accordance with acceptable standards of engineering practice.

Tetra Tech NUS, Inc.
800 Oak Ridge Turnpike, Suite A-600
Oak Ridge, TN 37830
Certificate of Authorization No. 7988

Lisa (Lisa) R. Campbell
8/20/04

Lisa Campbell, P.E.
Professional Engineer
State of Florida License No. 43887

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ACRONYMS

ABB-ES	ABB Environmental Services, Inc.
AF	adherence factor
bls	below land surface
cm ²	centimeter squared
COC	chemical of concern
COPCs	chemicals of potential concern
ELCR	excess lifetime cancer risk
EPC	exposure point concentration
F.A.C.	Florida Administrative Code
FDEP	Florida Department of Environmental Protection
FS	Feasibility Study
GIR	General Information Report
HHRA	Human Health Risk Assessment
HI	Hazard Index
HQ	Hazard Quotient
IRIS	Integrated Risk Information System
mg/cm ²	milligrams per centimeter squared
mg/kg	milligrams per kilogram
NAS	Naval Air Station
PCB	polychlorinated biphenyls
PRG	Preliminary Remediation Goal
RAGS	Risk Assessment Guidance for Superfund
RBC	Risk-Based Concentration
RI	Remedial Investigation
RME	Reasonable Maximum Exposure
SA	surface area
SCTL	soil cleanup target level
SVOC	semi-volatile organic compound
TiNUS	Tetra Tech NUS, Inc.
TRPH	total recoverable petroleum hydrocarbons
USEPA	United States Environmental Protection Agency
VOC	volatile organic compound

1.0 INTRODUCTION

Tetra Tech NUS, Inc. (TtNUS), under contract N62467-94-D-0888 to the Department of the Navy, Southern Division, Naval Facilities Engineering Command, is submitting this Feasibility Study (FS) Addendum to address changes at Site 3, Underground Waste Solvent Storage Area, since the original FS was submitted in March 2001 (TtNUS, 2001). The original FS included six sites at Naval Air Station (NAS) Whiting Field: Sites 3, 4, 6, 30, 32 and 33. Surface and subsurface soil at Site 3 was addressed in Section 2.0 of the FS.

The changed conditions at Site 3 addressed in this FS Addendum include:

- Arsenic originally identified as a chemical of concern (COC) at Site 3 was determined to be naturally occurring at Site 3 - Based on additional review of inorganic data from the facility and surrounding area in April 2001, the observed arsenic values were determined to represent naturally occurring levels [Florida Department of Environmental Protection (FDEP), 2001]. Because the identified human health risks associated with arsenic are now considered to be due to naturally occurring levels, arsenic will not be retained as a COC and remediation of arsenic in surface and subsurface soil is not required at Site 3.
- United States Environmental Protection Agency (USEPA) Region IX Preliminary Remediation Goals (PRGs) used as Screening Criteria - Over the course of the investigations at this site, USEPA Region IV changed its screening criteria for evaluation of hazardous waste-related sites from USEPA Region III Risk-Based Concentrations (RBCs) to USEPA Region IX PRGs (USEPA, 2002). Therefore, analytical results are now compared to the USEPA Region IX PRGs and FDEP Soil Cleanup Target Levels (SCTLs) (FDEP, 1999).
- The individual metal constituents, aluminum, iron, manganese and vanadium, have no direct evidence of site-related use at Site 3 and the process and procedures at this site did not likely contribute to the presence of these inorganic analytes in surface or subsurface soil. Additionally, the site-specific values for these inorganics are within the range of levels found at NAS Whiting Field and of naturally occurring levels throughout the southeastern United States. The Remedial Investigation (RI) for NAS Whiting Field Site 40, Basewide Groundwater, contains the appendix "Inorganics in Soil at NAS Whiting Field" presenting the technical basis for this determination. Considering the information presented above, aluminum, iron, manganese and vanadium are not considered chemicals of potential concern (COPCs) for Site 3 surface and subsurface soils.

1.1 PURPOSE

The purpose of this FS Addendum is to present a revised Human Health Risk Assessment (HHRA) for surface and subsurface soil at Site 3 after considering the above changed conditions. The specific items to be evaluated include:

- Soil screening criteria changed to USEPA Region IX PRGs
- Revised HHRA and COPC selection

1.2 REPORT ORGANIZATION

This FS Addendum is organized into three chapters. Chapter 1.0 presents the purpose of the FS Addendum. Chapter 2.0 discusses environmental conditions at the site including the revised HHRA and Chapter 3.0 presents conclusions and recommendations.

2.0 ENVIRONMENTAL CONDITIONS

Site 3, Underground Waste Solvent Storage Area, is composed of two discontinuous areas at the north and south ends of Building 2941 and extends south toward Building 2987 in the North Field Industrial Area of NAS Whiting Field, Milton, Florida (Figure 2-1). The site includes an area where two 500-gallon metal USTs were used from 1980 to April of 1984 for the storage of waste solvents and residue generated from paint-stripping operations conducted at Building 2941. The two tanks were removed in 1984. Site 3 also includes the area where a waste oil UST was located near the southwestern corner of Building 2941. This tank was used for storage of airframe, power plant, and ground support equipment liquid waste from 1968, and possibly earlier, to 1986. This tank was reportedly removed in 1986.

2.1 NATURE AND EXTENT OF CONTAMINATION

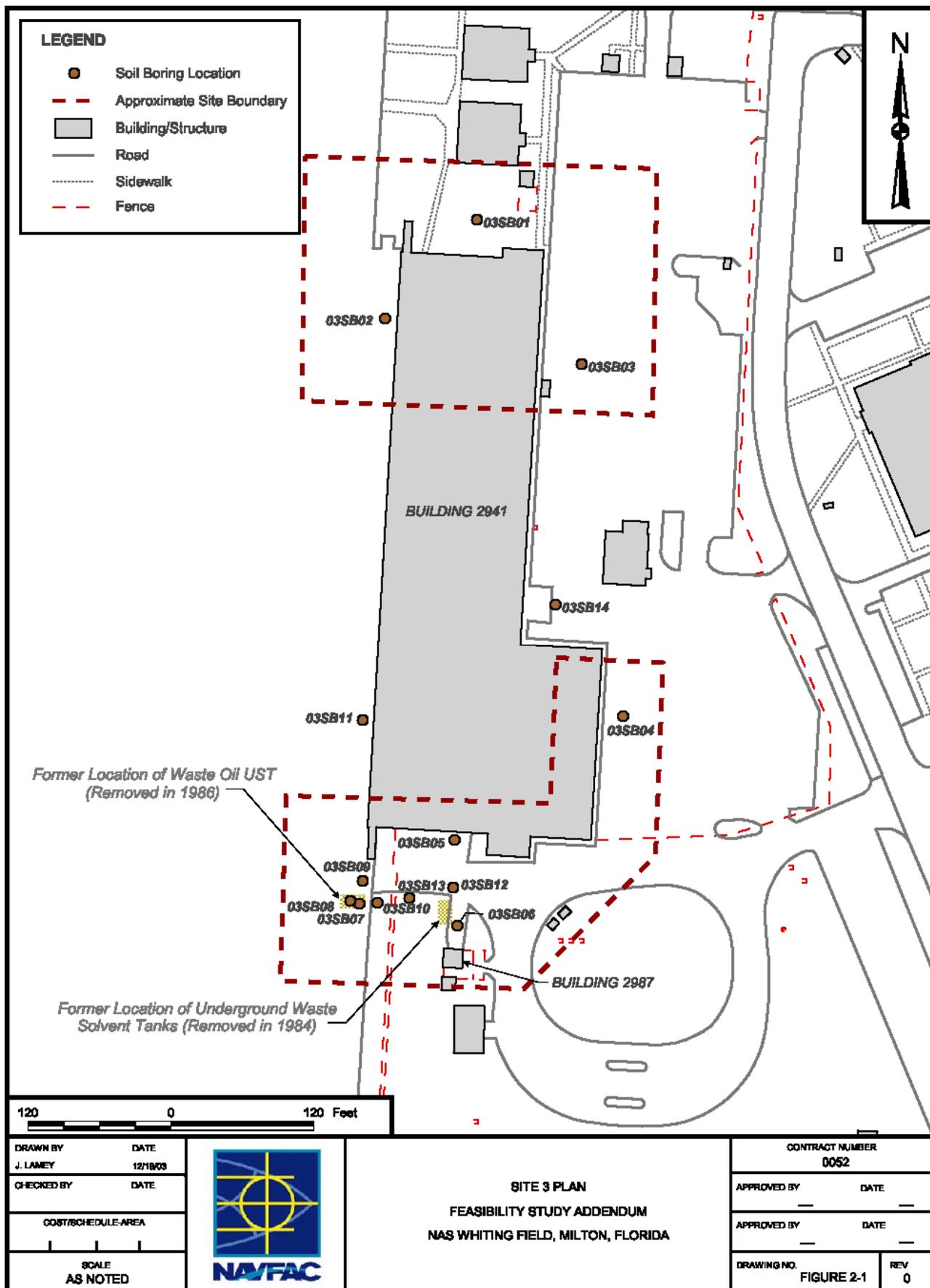
Environmental conditions at Site 3 are described in detail in the RI Report (TtNUS, 1999) and the FS (TtNUS, 2001). Section 2.1.1 of the original FS presents the nature and extent of contamination at Site 3. Chemicals detected in the surface and subsurface soils include volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), total recoverable petroleum hydrocarbons (TRPH), pesticides/polychlorinated biphenyls (PCBs), and inorganic constituents. Only the revised HHRA at Site 3 is discussed in the following sections.

2.2 REVISED HUMAN HEALTH RISK ASSESSMENT RESULTS

This section presents the revised HHRA results using analytical data from soils from 0 to 15 feet below land surface (bls). This revised HHRA includes the changed conditions discussed in Section 1.0. The original HHRA was included in the RI Report (TtNUS, 1999).

The first step of the re-evaluation was to determine a revised list of COPCs. The re-evaluation will consider exposure to surface and subsurface soil by hypothetical future residents. FDEP SCTLs and USEPA Region III RBCs were used to select COPCs in the original risk assessment. However, USEPA Region IV currently requires the use of USEPA Region IX PRGs to select COPCs, therefore, FDEP SCTLs and USEPA's Region IX PRGs were used in this analysis to select COPCs for this evaluation.

As discussed in Section 1.0, arsenic, aluminum, iron, manganese, and vanadium are not considered COPCs for Site 3 surface and subsurface soils; therefore, these inorganic constituents are not considered in this revised risk assessment. In addition, since the original risk assessment was prepared, the methodology for estimating risks resulting from dermal exposures to soil has changed. USEPA's Risk



Assessment Guidance for Superfund (RAGS), Part E dermal guidance was used for this risk evaluation (USEPA, 2001).

For this revised HHRA, the exposure point concentration (EPC) was considered to be the maximum detected concentration (worst case condition).

The revised HHRA consists of four steps:

- Selection of COPCs– Section 2.2.1
- Exposure assessment – Section 2.2.2
- Toxicity assessment – Section 2.2.3
- Risk characterization – Section 2.2.4

The risk screening for human health uses the FDEP SCTLs (FDEP, 1999) and the USEPA Region IX PRGs (USEPA, 2002) to conservatively assess exposure and toxicity. The steps for performing the risk screening are described in detail in the following sections.

2.2.1 Selection of Human Health COPCs

The following factors are considered in the selection of COPCs for human receptors:

- 1) Occurrence and distribution of chemicals in the environmental media
- 2) Individual chemical toxicity
- 3) Adjustment for multiple chemical exposures
- 4) Comparisons of site-specific concentrations with corresponding background concentrations

All soil samples collected from 0 to 15 feet bls at Site 3 were evaluated for COPC selection. COPC selection results for surface and subsurface soil are shown in Tables 2-1 and 2-2, respectively. Only those chemicals detected in at least one sample were screened against the lesser of the USEPA Region IX residential PRG or the FDEP SCTL for direct residential exposure.

The USEPA Region IX PRGs are screening levels corresponding to fixed levels of risk, either an excess lifetime cancer risk (ELCR) of one in a million (1.0E-06) or a noncancer hazard quotient (HQ) of 1 or more. The USEPA Region IX PRGs consider the most sensitive receptor, a residential child, for chemicals associated with noncancer toxicity. For carcinogenic chemicals, exposure is based upon the

TABLE 2-1
SELECTION OF CHEMICALS OF POTENTIAL CONCERN IN SURFACE SOIL
SITE 3
NAS WHITING FIELD, MILTON, FLORIDA

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Scenario Time Frame: Current/Future
Medium: Surface Soil
Exposure Medium: Soil (0 to 2 feet)
Exposure Point: Site 3

CAS Number	Chemical	Minimum Detected Concentration	Maximum Concentration	Units	Detection Frequency	Concentration Used for Screening	Background Value ⁽¹⁾	Screening Toxicity Value			COPC Flag	Rationale for ⁽⁴⁾ Contaminant Deletion or Selection
								Region IX ⁽²⁾ Residential	Soil ⁽⁵⁾ Basis	Florida ⁽³⁾ Residential		
Volatiles												
78933	2-Butanone	0.006	0.006	mg/kg	1/7	0.006	NA	730	N	310	No	BSL
67641	Acetone	0.016	0.1	mg/kg	2/8	0.1	NA	160	N	110	No	BSL
127184	Tetrachloroethene	0.003	0.003	mg/kg	1/8	0.003	NA	1.5	C	8.9	No	BSL
Semivolatiles												
56553	Benzo(a)anthracene	0.098	0.098	mg/kg	1/7	0.098	NA	0.62	C	1.4	No	BSL
50328	Benzo(a)pyrene	0.02	0.04	mg/kg	2/7	0.04	NA	0.62	C	0.1	No	BSL
205992	Benzo(b)fluoranthene	0.084	0.084	mg/kg	1/7	0.084	NA	0.62	C	1.4	No	BSL
207089	Benzo(k)fluoranthene	0.081	0.081	mg/kg	1/7	0.081	NA	6.2	C	15	No	BSL
117817	Bis(2-ethylhexyl)phthalate	0.037	0.037	mg/kg	1/7	0.037	0.08	35	C	76	No	BSL
218019	Chrysene	0.13	0.13	mg/kg	1/7	0.13	NA	62.1	C	140	No	BSL
53703	Dibenzo(a,h)anthracene	0.006	0.006	mg/kg	1/7	0.006	NA	0.62	C	0.1	No	BSL
206440	Fluoranthene	0.22	0.22	mg/kg	1/7	0.22	NA	230	N	290	No	BSL
85018	Phenanthrene	0.048	0.048	mg/kg	1/7	0.048	NA	56 ^(b)	N	1900	No	BSL
129000	Pyrene	0.18	0.18	mg/kg	1/7	0.18	NA	230	N	220	No	BSL
Pesticides/PCBs												
72548	4,4'-DDD	0.0042	0.005	mg/kg	1/8	0.005	NA	2.4	C	4.6	No	BSL
72559	4,4'-DDE	0.0005	0.0034	mg/kg	3/8	0.0034	NA	1.7	C	3.3	No	BSL
50293	4,4'-DDT	0.0009	0.00099	mg/kg	2/8	0.00099	NA	1.7	C	3.3	No	BSL
5103742	Alpha-Chlordane	0.01	0.01	mg/kg	1/8	0.01	NA	1.6 ⁽⁷⁾	C	3.1 ⁽⁷⁾	No	BSL
60571	Dieldrin	0.0009	0.044	mg/kg	4/8	0.044	NA	0.03	C	0.07	Yes	ASL
5103719	Gamma-Chlordane	0.017	0.017	mg/kg	1/8	0.017	NA	1.6 ⁽⁷⁾	C	3.1 ⁽⁷⁾	No	BSL
1024573	Heptachlor Epoxide	0.026	0.026	mg/kg	1/8	0.026	NA	0.05	C	0.1	No	BSL

TABLE 2-1
SELECTION OF CHEMICALS OF POTENTIAL CONCERN IN SURFACE SOIL
SITE 3
NAS WHITING FIELD, MILTON, FLORIDA

Page 2 of 2

CAS Number	Chemical	Minimum Detected Concentration	Maximum Concentration	Units	Detection Frequency	Concentration Used for Screening	Background Value ⁽¹⁾	Screening Toxicity Value			COPC Flag	Rationale for ⁽⁴⁾ Contaminant Deletion or Selection
								Region IX ⁽²⁾	Soil ⁽⁵⁾	Florida ⁽³⁾		
								Residential	Soil Basis	Residential		
Inorganics												
7429005	Aluminum	4380	21500	mg/kg	8/8	21500	15848	7600	N	7200	No	NOIC
7440382	Arsenic	0.58	5.5	mg/kg	8/8	5.5	3.2	0.39	C	0.8	No	NOIC
7440393	Barium	6.4	16.2	mg/kg	8/8	16.2	23.2	540	N	110	No	BSL
7440417	Beryllium	0.06	0.09	mg/kg	2/8	0.09	0.36	15	N	12	No	BSL
7440439	Cadmium	0.36	0.72	mg/kg	3/8	0.72	0.58	3.7	N	75	No	BSL
7440702	Calcium	261	1380	mg/kg	8/8	1380	396	NA	--	--	No	NUT
7440473	Chromium	3.2	42.7	mg/kg	8/8	42.7	11	210 ⁽⁸⁾	C	210 ⁽⁸⁾	No	BSL
7440484	Cobalt	1	1.7	mg/kg	5/8	1.7	3	140	N	470	No	BSL
7440508	Copper	1.4	9.6	mg/kg	8/8	9.6	9.4	310	N	110	No	BSL
57125	Cyanide	0.41	0.51	mg/kg	3/7	0.51	0.28	120	N	30	No	BSL
7439896	Iron	2590	12900	mg/kg	8/8	12900	8832	2300	N	2300	No	NOIC
7439921	Lead	1.5	14.5	mg/kg	8/8	14.5	11.4	400 ⁽¹⁰⁾	--	400	No	BSL
7439954	Magnesium	61.3	226	mg/kg	8/8	226	268	NA	--	NA	No	NUT
7439965	Manganese	25	151	mg/kg	8/8	151	392	160	N	160	No	BSL
7439976	Mercury	0.02	0.06	mg/kg	5/8	0.06	0.12	2.3 ⁽¹¹⁾	N	0.34	No	BSL
7440020	Nickel	1.7	15.7	mg/kg	5/8	15.7	7.2	160	N	110	No	BSL
7440097	Potassium	93	175	mg/kg	5/8	175	177	NA	--	NA	No	NUT
7782492	Selenium	0.41	2.7	mg/kg	4/8	2.7	0.46	39	N	39	No	BSL
7440224	Silver	0.57	1	mg/kg	2/8	1	0.7	39	N	39	No	BSL
7440235	Sodium	165	212	mg/kg	4/8	212	406	NA	--	NA	No	NUT
7440280	Thallium	0.15	0.15	mg/kg	1/8	0.15	1.16	0.52	N	NA	No	BSL
7440622	Vanadium	5.9	34	mg/kg	8/8	34	21.8	55	N	15	No	NOIC
7440666	Zinc	1.5	12.2	mg/kg	8/8	12.2	15.4	2300	N	2300	No	BSL

Notes:

(1) Troup Loamy Soil (Table 39), General Information Report (GIR), Remedial Investigation and Feasibility Study, ABB, January, 1998. Background screening value for inorganics is two times the mean detected concentration.

(2) USEPA Region IX PRG Table, 2002 (note: 1/10th PRG value used for non-carcinogens)

(3) Table 2-1, Soil Cleanup Target Levels, Technical Report: Development of Soil Cleanup Target Levels (SCTLs) for Chapter 62-777, F.A.C. (Florida Administrative Code), May 1999. (note: 1/10th SCTL value used for non-carcinogens. Values for vanadium are based on acute toxicity. Therefore, vanadium screening values are not multiplied by 1/10th)

(4) Rationale codes:

- Above Screening Level (ASL)
- Essential Nutrient (NUT)
- Below Screening Level (BSL)
- Naturally Occurring Inorganic Chemical (NOIC)

(5) Soil basis codes:

- N - noncarcinogen
- C - carcinogen

(6) Value is for naphthalene.

(7) Value is for chloridane

(8) Value is for total chromium. Hexavalent chromium is not known to have been used at NAS Whiting Field

(9) Value is for hexavalent chromium, only SCTL given for chromium.

(10) Screening level for lead, "Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities", OSWER Directive #9355.412.

(11) Value is for mercuric chloride.

Chemicals exceeding criteria are bolded.

The average of a sample and its duplicate is used for all calculations.

COPC Chemical of Potential Concern

mg/kg milligram per kilogram

NA not applicable

TABLE 2-2
SELECTION OF CHEMICALS OF POTENTIAL CONCERN IN SUBSURFACE SOIL
SITE 3
NAS WHITING FIELD, MILTON, FLORIDA

Scenario Time Frame: Current/Future
Medium: Subsurface Soil
Exposure Medium: Soil (2 to 15 feet)
Exposure Point: Site 3

CAS Number	Chemical	Minimum Detected Concentration	Maximum Concentration	Units	Detection Frequency	Concentration Used for Screening	Background Value ⁽¹⁾	Screening Toxicity Value			Rationale for ⁽⁴⁾ Contaminant Deletion or Selection	
								Soil Residential	Soil ⁽⁵⁾ Basis	Florida ⁽⁶⁾ Soil Residential		
Volatiles												
67641	Acetone	0.002	0.09	mg/kg	9/20	0.09	NA	160	N	110	No	BSL
75092	Methylene chloride	0.0097	0.0104	mg/kg	3/20	0.0104	NA	9.1	C	16	No	BSL
127184	Tetrachloroethene	0.003	0.003	mg/kg	1/20	0.003	NA	1.5	C	8.9	No	BSL
Pesticides/PCBs												
72548	4,4'-DDD	0.005	0.005	mg/kg	1/15	0.005	NA	2.4	C	4.6	No	BSL
50293	4,4'-DDT	0.005	0.005	mg/kg	1/15	0.005	NA	1.7	C	3.3	No	BSL
60571	Dieldrin	0.026	0.026	mg/kg	1/15	0.026	NA	0.03	C	0.07	No	BSL
Inorganics												
7429905	Aluminum	1955	59600	mg/kg	16/16	59600	15848	7600	N	7200	No	NOIC
7440382	Arsenic	0.4275	16	mg/kg	15/15	16	3.2	0.39	C	0.8	No	NOIC
7440393	Barium	1.35	16.4	mg/kg	15/15	16.4	23.2	540	N	110	No	BSL
7440417	Beryllium	0.07	0.13	mg/kg	3/15	0.13	0.36	15	N	12	No	BSL
7440439	Cadmium	0.31	0.79	mg/kg	6/15	0.79	0.58	3.7	N	75	No	BSL
7440702	Calcium	12.2	429	mg/kg	13/15	429	396	NA	--	--	No	NUT
7440473	Chromium	3.95	37.9	mg/kg	15/15	37.9	11	210 ⁽⁸⁾	C	210 ⁽⁹⁾	No	BSL
7440484	Cobalt	0.73	3.2	mg/kg	6/16	3.2	3	140	N	470	No	BSL
7440508	Copper	1	8.6	mg/kg	15/16	8.6	9.4	310	N	110	No	BSL
57125	Cyanide	0.19	0.59	mg/kg	11/22	0.59	0.28	120	N	30	No	BSL
7439896	Iron	4895	32600	mg/kg	15/15	32600	8832	2300	N	2300	No	NOIC
7439921	Lead	1.02	6.6	mg/kg	14/15	6.6	11.4	400 ⁽¹⁰⁾	--	400	No	BSL
7439954	Magnesium	18.9	265	mg/kg	15/15	265	268	NA	--	NA	No	NUT
7439965	Manganese	4.2	39.4	mg/kg	16/16	39.4	392	180	N	160	No	BSL
7439976	Mercury	0.02	0.1	mg/kg	10/15	0.1	0.12	2.3 ⁽¹¹⁾	N	0.34	No	BSL
7440020	Nickel	2.1	5	mg/kg	8/15	5	7.2	160	N	110	No	BSL
7440097	Potassium	53.2	190	mg/kg	13/15	190	177	NA	--	NA	No	NUT
7782492	Selenium	0.13	4.9	mg/kg	9/15	4.9	0.46	39	N	39	No	BSL
7440224	Silver	0.765	2.1	mg/kg	3/15	2.1	0.7	39	N	39	No	BSL
7440235	Sodium	12.7	217	mg/kg	10/15	217	406	NA	--	NA	No	NUT
7440622	Vanadium	14.95	77.2	mg/kg	15/15	77.2	21.8	55	N	15	No	NOIC
7440666	Zinc	1.8	11.1	mg/kg	12/15	11.1	15.4	2300	N	2300	No	BSL

Notes:

- (1) Troup Loamy Soil (PRG 39), General Information Report (GIR), Remedial Investigation and Feasibility Study, ABB, January, 1998. Background screening value for inorganics is two times the mean detected concentration.
- (2) USEPA Region IX PRG Table, 2002 (note: 1/10th PRG value used for non-carcinogens).
- (3) Table 2-1, Soil Cleanup Target Levels, Technical Report: Development of Soil Cleanup Target Levels (SCTLs) for Chapter 62-777, F.A.C., May 1999. (note: 1/10th SCTL value used for non-carcinogens. Values for vanadium are based on acute toxicity. Therefore, vanadium screening values are not multiplied by 1/10th)
- (4) Rationale codes:
Selection or Deletion Reason:
Above Screening Level (ASL)
Essential Nutrient (NUT)
Below Screening Level (BSL)
Naturally Occurring Inorganic Chemical (NOIC)
Chemicals exceeding criteria are bolded.
The average of a sample and its duplicate is used for all calculations.
COPC Chemical of Potential Concern
mg/kg milligram per kilogram
NA not applicable
- (5) Soil basis codes:
N - noncarcinogen
C - carcinogen
- (6) Value is for naphthalene.
- (7) Value is for chloroethane
- (8) Value is for total chromium. Hexavalent chromium is not known to have been used at NAS Whiting Field
- (9) Value is for hexavalent chromium, only SCTL given for chromium.
- (10) Screening level for lead, "Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities", OSWER Directive #8355.412.
- (11) Value is for mercuric chloride.

assumption of cumulative exposure for a residential child and a residential adult. The Florida residential SCTLs are risk-based screening levels based on either cancer risk or noncancer toxicity, using the lower of values protective against ELCR of 1.0E-06 or a noncancer HQ of 1. Like the Region IX PRGs, the Florida SCTLs account for exposure to chemicals in soil via incidental ingestion, dermal contact, inhalation of volatiles, and inhalation of particulate dusts. To account for possible additivity of noncarcinogenic effects, screening levels for noncarcinogenic chemicals were divided by 10.

As described in the RI, some chemicals did not have PRGs or RBCs and, therefore, surrogate screening values were selected. Essential nutrients (calcium, magnesium, potassium, and sodium) were not considered COPCs. Inorganic analytes were screened against background concentrations but all chemicals selected as COPCs had maximum concentrations above background values.

Chemicals detected in soils were retained as COPCs if the maximum detected concentrations exceeded the adjusted screening levels and twice the mean of the background concentration. The development of the background concentrations for Whiting Field, Florida is presented in the General Information Report (GIR), NAS Whiting Field (ABB-ES, 1998). Additional information regarding site-specific background concentrations for arsenic, aluminum, iron, manganese and vanadium at NAS Whiting Field has been discussed previously in this FS addendum.

Only one constituent, dieldrin, was selected as a surface soil COPC. No other COPCs were identified in surface or subsurface soil.

2.2.2 Exposure Assessment

The exposure assessment methodology used in the risk re-evaluation was the same as used in the RI HHRA with the following exceptions:

- The maximum detected value (worst case) was selected as the EPC.
- Only a residential scenario (an adult and a child receptor) was considered.
- Dermal exposure was updated using RAGS Part E guidance. Specifically, the surface area (SA) available for contact was changed to 5,700 centimeters squared (cm²) for an adult and 2,800 cm² for a child and the adherence factor (AF) was changed to 0.07 milligrams per cm² (mg/cm²) for an adult and 0.2 mg/cm² for child.

Values used for the daily intake equations are shown in Table 2-3.

TABLE 2-3
VALUES USED FOR DAILY INTAKE CALCULATION
SITE 3
NAS WHITING FIELD, MILTON, FLORIDA

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Surface Soil
Exposure Point: Surface Soil
Receptor Population: Resident
Receptor Age: Adult/Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value (adult/child)	RME Rationale/Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	chemical specific		
	IR	Ingestion Rate	mg/day	100 / 200	USEPA, 1995	
	FI	Fraction Ingested	unitless	1	USEPA, 1992	
	EF	Exposure Frequency	days/year	350	USEPA, 1995	
	ED	Exposure Duration	years	24 / 6	USEPA, 1995	
	CF1	Conversion Factor	kg/mg	10 ⁻⁶		
	BW	Body Weight	kg	70 / 15	USEPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	USEPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8,760 / 2,190	USEPA, 1989	
	Dermal	CS	Chemical Concentration in Soil	mg/kg	chemical specific	
CF		Conversion Factor	kg/mg	10 ⁻⁶		
SA		Skin Surface Area Available for Contact (adult)	cm ²	5,700	USEPA, 2001	
SA soil/adj		Skin Surface Area Available for Contact (child)	cm ² -year/kg	2,800	USEPA, 2001	
AF		Adherence Factor	mg/cm ²	0.07 / 0.2	USEPA, 2001	
ABS		Absorption Factor	unitless	chemical specific	USEPA, 2001	
EF		Exposure Frequency	days/year	350	USEPA, 1995	
ED		Exposure Duration	years	24 / 6	USEPA, 1995	
BW		Body Weight	kg	70 / 15	USEPA, 1991	
AT-C		Averaging Time (Cancer)	days	25,550	USEPA, 1989	
AT-N	Averaging Time (Non-Cancer)	days	8,760 / 2,190	USEPA, 1989		

RME = Reasonable Maximum Exposure

References:

USEPA, 1989. Risk Assessment Guidance for Superfund Volume I Human Health Evaluation Manual (Part A), EPA/540/1-89/002.

USEPA, 1991. "Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Parameters".

USEPA, 1992. "Dermal Exposure Assessment: Principles and Applications". EPA/600/8-91/011B.

USEPA, 1995. "USEPA Region IV Guidance Bulletin No. 3, November".

USEPA, 2001. Risk Assessment Guidance for Superfund Volume I Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment)

2.2.3 Toxicity Assessment

The toxicity assessment methodology used in the risk re-evaluation was the same as used in the RI HHRA with the following exceptions:

- Dermal toxicity factors were updated using RAGS Part E guidance. Specifically, oral reference doses and cancer slope factors were adjusted by multiplying by the fraction of contaminant absorbed in gastrointestinal tract shown in Exhibit 4-1 of RAGS Part E. No adjustment was made to the toxicity factor for dieldrin.

Toxicity factors used were as follows:

COPC	Oral Reference Dose	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor	Dermal Reference Dose	Dermal Cancer Slope Factor	Source
Dieldrin	5.0E-05	16	1.0	5.0E-05	16	IRIS

IRIS = Integrated Risk Information System (USEPA, 2000)

2.2.4 Risk Characterization

The risk characterization methodology used in the risk re-evaluation was the same as used in the RI HHRA.

2.2.5 Evaluation of Results

No COPCs were identified for subsurface soil; therefore, no carcinogenic or non-carcinogenic human health risks have been identified for subsurface soil at Site 3.

The cancer risk associated with exposure to surface soil (ingestion and dermal contact) for a resident (adult and child) is 1.1E-06, slightly above the FDEP's target risk level of 1.0 E-06 and within the USEPA acceptable cancer risk range of 1.0E-04 to 1.0E-06. Dieldrin was the only carcinogenic COPC identified in surface soil at Site 3. The maximum detected dieldrin concentration of 0.044 mg/kg is less than the FDEP SCTL of 0.07 mg/kg and only slightly exceeds the USEPA Region IX PRG of 0.03 mg/kg. The remaining soil samples collected had dieldrin concentrations below all screening levels (3 of 8 total samples) or dieldrin was not detected (4 of 8 samples).

The Hazard Index (HI) for exposure to surface soil by an adult (0.0013) is less than 1.0 indicating no unacceptable risks. The HI for exposure to surface soil by a child is 0.012, indicating no unacceptable risks.

Table 2-4 presents the results of the cancer risk evaluation and Tables 2-5 and 2-6 present the results of the non-cancer risk evaluation for an adult and child resident receptor, respectively.

TABLE 2-4
CALCULATION OF CANCER RISK HAZARDS
REASONABLE MAXIMUM EXPOSURE
SITE 3
NAS WHITING FIELD, MILTON, FLORIDA

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Surface Soil
Exposure Point: Site 3
Receptor Population: Resident
Receptor Age: Adult/Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Dieldrin	0.044	mg/kg		mg/kg	M	6.9E-08	mg/kg/day	1.60E+01	(mg/kg/day) ⁻¹	1.1E-06
Dermal	Dieldrin	0.044	mg/kg		mg/kg	M	2.2E-09	mg/kg/day	1.60E+01	(mg/kg/day) ⁻¹	3.5E-08
											1.1E-06

(1) Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

EPC - Exposure Point Concentrations
mg/kg - milligram per kilogram
mg/kg/day - milligram per kilogram per day

TABLE 2-5
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE (ADULT RESIDENT)
SITE 3
NAS WHITING FIELD, MILTON, FLORIDA

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Total Soil
Exposure Point: Site 3
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Target Organ	Hazard Quotient
Ingestion	Dieldrin	0.044	mg/kg		mg/kg	M	6.0E-08	mg/kg/day	5.0E-05	mg/kg/day	Liver	1.2E-03
Dermal	Dieldrin	0.044	mg/kg		mg/kg	M	2.4E-09	mg/kg/day	5.0E-05	mg/kg/day	Liver	4.8E-05
Total HI Across All Exposure Routes/Pathways												1.3E-03
Total HI Liver												1.3E-03

(1) Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

(2) Values are for chronic exposure.

EPC - Exposure Point Concentrations

mg/kg - milligram per kilogram

mg/kg/day - milligram per kilogram per day

TABLE 2-6
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE (CHILD RESIDENT)

SITE 3

NAS WHITING FIELD, MILTON, FLORIDA

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Surface Soil
Exposure Point: Site 3
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Target Organ	Hazard Quotient
Ingestion	Dieldrin	0.044	mg/kg		mg/kg	M	5.6E-07	mg/kg/day	5.0E-05	mg/kg/day	Liver	1.1E-02
Dermal	Dieldrin	0.044	mg/kg		mg/kg	M	1.6E-08	mg/kg/day	5.0E-05	mg/kg/day	Liver	3.2E-04
Total HI Across All Exposure Routes/Pathways												1.2E-02
Total HI Liver												1.2E-02

(1) Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

(2) Values are for chronic exposure.

EPC - Exposure Point Concentrations

mg/kg - milligram per kilogram

mg/kg/day - milligram per kilogram per day

3.0 CONCLUSIONS AND RECOMMENDATIONS

The preceding sections of this FS Addendum described the human health risk from exposure to surface and subsurface soil at Site 3, Underground Waste Solvent Storage Area. Conclusions and recommendations based on this HHRA information are presented in the following sections.

3.1 CONCLUSIONS

The conclusions of the FS Addendum are summarized below.

- No subsurface soil COPCs have been identified at Site 3.
- Dieldrin was the only carcinogenic COPC identified in surface soil at Site 3.
- The cancer risk associated with dieldrin is $1.1E-06$, slightly above FDEP's target risk level of $1.0E-06$ and within the USEPA acceptable cancer risk range of $1.0E-04$ to $1.0E-06$.
- The maximum detected dieldrin concentration of 0.044 mg/kg is less than the FDEP SCTL of 0.07 mg/kg and only slightly exceeds USEPA Region IX PRG of 0.03 mg/kg.
- The total HI for the adult resident is equal to 0.0013 . This indicates no adverse non-carcinogenic effects would be expected to occur for the adult resident exposed to surface soil at Site 3.
- The total HI for the child resident is equal to 0.012 . This indicates no adverse non-carcinogenic effects would be expected to occur for the child resident exposed to surface soil at Site 3.

3.2 RECOMMENDATIONS

No Action for surface and subsurface soil is recommended at Site 3 due to the following reasons.

- Dieldrin is not present at Site 3 above FDEP SCTL for direct residential exposure and the risk associated with it ($1.1E-06$) is within USEPA's target risk range.
- No adverse non-carcinogenic effects are predicted to occur for the adult and child resident due to exposure to surface and subsurface soil at Site 3.

REFERENCES

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Tetra Tech NUS (TtNUS), 1999. *Remedial Investigation for Surface and Subsurface Soil at Sites 3, 4, 6, 30, 32, and 33, Naval Air Station Whiting Field, Milton, Florida*. Prepared for Southern Division Naval Facilities Engineering Command, North Charleston, South Carolina. September.

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USEPA, 2001. *Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual- (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim Guidance*, Office of Emergency and Remedial Response, Washington, D.C.

USEPA, 2002. *Region IX PRGs Table 2002 Update*. USEPA Region IX, San Francisco, California. October 1.