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CERTIFICATION AND CLOSURE REPORT
POTENTIAL SOURCE OF CONTAMINATION 43

NAVAL AIR STATION JACKSONVILLE
JACKSONVILLE, FLORIDA

Unit Identification Code: N00207

Contract No.: N62467-89-D-0317/076

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Prepared for:

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Anthony Robinson, Code 18511, Engineer-in-Charge

August 1997

CERTIFICATION OF TECHNICAL
DATA CONFORMITY (MAY 1987)

The Contractor, ABB Environmental Services, Inc., hereby certifies that, to the best of its knowledge and belief, the technical data delivered herewith under Contract No. N62467-89-D-0317/076 are complete and accurate and comply with all requirements of this contract.

DATE: August 25, 1997

NAME AND TITLE OF CERTIFYING OFFICIAL: Phylissa S. Miller
Task Order Manager

NAME AND TITLE OF CERTIFYING OFFICIAL: Don Haumann, P.E.
Chief Engineer

(DFAR 252.227-7036)

This Certification and Closure Report for Potential Source of Contamination (PSC) 43, Naval Air Station Jacksonville, Jacksonville, Florida, has been prepared under the direction of a Florida-registered professional engineer to document that remedial activities at PSC 43 have been performed in accordance with the Interim Remediation Work Plan (including approved changes; Bechtel Environmental, Inc., 1994), as approved by the Florida Department of Environmental Protection. The work and professional opinions rendered in this report were conducted or developed in accordance with commonly accepted procedures consistent with applicable standards of practice. The documented remediation activities at PSC 43, as presented in this report, are based on site observations by ABB Environmental Services, Inc., personnel and various items of supporting documentation provided in the subject report.

Willard A. Murray, P.E.
Senior Consulting Engineer
Professional Engineer No. 0039866
Expires February 28, 1998

5/23/97

FOREWORD

In accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended by the 1986 Superfund Amendments and Reauthorization Act (SARA), and as directed in Executive Order 12580 of January 1987, the Department of Defense (DOD) is conducting an Installation Restoration (IR) program for evaluating and remediating problems related to releases and disposal of toxic and hazardous materials at DOD facilities. The Naval Assessment and Control of Installation Pollutants (NACIP) program was developed by the Navy to implement the IR program for all Navy and Marine Corps facilities.

The NACIP program was originally conducted in three phases: (1) Phase I, Initial Assessment Study; (2) Phase II, Confirmation Study (including a Verification Step and a Characterization Step); and (3) Phase III, Planning and Implementation of Remedial Measures. The three-phase IR program was modified in 1987-88 to be congruent with CERCLA and SARA. The updated nomenclature for the Remedial Investigation/Feasibility Study process is as follows:

- preliminary assessment and site inspection,
- remedial investigation,
- feasibility study, and
- planning and implementation of remedial design.

In addition to these programs, military installations are subject to regulations promulgated by the 1976 Resource Conservation and Recovery Act and the 1984 Hazardous and Solid Waste Amendments. Southern Division, Naval Facilities Engineering Command (SOUTHNAVFACENGCOM) has the responsibility for enforcement of the IR program at Navy and Marine Corps facilities in the southeastern United States.

Questions regarding this report should be addressed to the SOUTHNAVFACENGCOM Engineer-in-Charge, Anthony Robinson, Code 18511, at (803) 820-7339.

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GLOSSARY

ABB-ES	ABB Environmental Services, Inc.
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	contaminant of concern
FAC	Florida Administrative Code
FDEP	Florida Department of Environmental Protection
FDER	Florida Department of Environmental Regulation
FRE	focused risk evaluation
FRI	focused remedial investigation
FRI/FFS	focused remedial investigation and focused feasibility study
FFS	focused feasibility study
FS	feasibility study
HDPE	high density polyethylene
IRA	interim remedial action
IROD	Interim Record of Decision
mg/kg	milligram per kilogram
NAS	Naval Air Station
OU	Operable Unit
PSC	Potential Source of Contamination
RAC	remedial action contractor
RAO	remedial action objective
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
SOUTHNAV-FACENGCOM	Southern Division, Naval Facilities Engineering Command
TCLP	toxicity characteristic leaching procedure
USEPA	U.S. Environmental Protection Agency
yd^3	cubic yards

1.0 INTRODUCTION

This report summarizes remedial activities implemented to certify closure of Potential Source of Contamination (PSC) 43 at Naval Air Station (NAS) Jacksonville in Jacksonville, Florida. The industrial sludge drying beds that comprise PSC 43 were used between 1980 and 1988 as a holding area to allow for evaporation and percolation of moisture from sludge generated at the station's industrial wastewater treatment facility. Closure of PSC 43 was performed under the Resource Conservation and Recovery Act (RCRA) closure requirements of hazardous waste facilities, according to Title 40, Code of Federal Regulations (CFR) Part 264 (40 CFR 264), Subpart G.

In 1988, the Florida Department of Environmental Regulation (FDER), currently incorporated within the Florida Department of Environmental Protection (FDEP), issued a Consent Order requiring a corrective action plan to mitigate hazardous constituents detected in materials still contained within the industrial sludge drying beds at PSC 43. The FDER issued the Consent Order (Appendix A) after their review of groundwater data collected in the vicinity of PSC 43. In response to the Consent Order, NAS Jacksonville prepared a Closure Plan (Appendix B) and applied for closure of both domestic and industrial sludge drying beds (PSCs 41 and 43, respectively), as well as PSC 42, the wastewater treatment plant polishing pond. In September 1991, FDER issued NAS Jacksonville a permit for closure and postclosure activities at PSCs 41, 42, and 43 (Appendix C).

In 1995, an interim remedial action (IRA) was performed at PSC 43 in accordance with

- ongoing Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) activities at NAS Jacksonville, which includes the PSC 43 area, and

- the above-mentioned FDER closure permit.

Contaminants of concern (COCs) for PSC 43 were identified as chromium, lead, and nickel. IRA activities included excavation and onsite treatment of industrial sludge drying bed materials, using a stabilization and solidification process, followed by temporary storage at PSC 41 (domestic sludge drying beds); nonhazardous waste materials and debris were disposed of off-site at a solid waste landfill (Subtitle D). Identical remedial actions were implemented at both PSCs 43 and 41, almost simultaneously, due to similar waste sources, COCs, and media to be treated. After excavation of both PSCs 41 and 43, contaminated materials from each were stored separately, adjacent to the excavation area at PSC 41. After a brief storage period, during which the treatment system was mobilized, PSC 43 media were stabilized and deposited in the PSC 41 excavation. Subsequent to verification testing of the stabilized PSC 43 materials, the excavated materials from PSC 41 were treated in the same manner. During the recent (1996-97) remedial actions (*in situ* stabilization and solidification) at PSC 42 (wastewater polishing pond), the stabilized PSCs 41 and 43 materials were reexcavated from the PSC 41 area and added to the backfill materials covering the solidified portions of the stabilized mix at PSC 42 (completed in March 1997).

This closure report presents a site description, project description, and summary of closure activities conducted at PSC 43 between March and October 1995 to document the execution of activities described in Appendices F, G, and H. Groundwater in the postconstruction area (former industrial sludge drying bed location) at PSC 43 has been addressed under the CERCLA Installation Restoration program at NAS Jacksonville, within which the remedial investigation (RI) report for Operable Unit (OU) 2 is currently under final review.

2.0 PROJECT OVERVIEW AND BACKGROUND

Closure (i.e., completion of site field activities associated with remediation) of PSC 43 was performed under the provisions currently found in Florida Administrative Code (FAC), Chapter 62-730, Hazardous Waste, FDEP (previously in Chapter 17 of the FAC). As mentioned in Chapter 1.0, this report was prepared in accordance with 40 CFR 264 Subpart G Closure and Post-Closure, the RCRA Guidance Manual for Subpart G Closure and Post-Closure Care Standards (U.S. Environmental Protection Agency [USEPA], 1987), and guidance found in the USEPA Remedial Action Report (USEPA, 1992).

2.1 SITE DESCRIPTION AND BACKGROUND. NAS Jacksonville is located in south-central Duval County, Florida, on the western bank of the St. Johns River (Figure 2-1). NAS Jacksonville has been used for U.S. Navy operations since 1940. In December 1989, as a result of previous investigations, NAS Jacksonville was placed on the National Priorities List for Uncontrolled Hazardous Waste Sites, in accordance with 40 CFR 300. ABB Environmental Services, Inc. (ABB-ES), was contracted under the Comprehensive Long-Term Environmental Action, Navy contract (contract number N62467-89-D-0317) to prepare and implement remedial investigation and feasibility study (RI/FS) workplans, site-screening workplans, and associated documents for PSCs at NAS Jacksonville. PSC 43 is part of OU 2, which is located in the northern part of the installation (Figure 2-2). The industrial waste sludge drying beds (PSC 43) were constructed in 1980 to dewater sludge generated at the station's industrial wastewater treatment plant. The plant was primarily designed to treat liquid wastestreams from electroplating operations at the facility (Figure 2-3).

The industrial sludge drying beds consisted of four unlined beds, each approximately 15 feet wide and 18 feet long, enclosed with 8-inch-thick reinforced concrete retaining walls. From top downward, media within the beds consisted of 12 inches of sand, 4 inches of medium gravel (nominal diameter of 0.75 inch), and 6 to 15 inches (side of each bed to centerline, respectively) of coarse gravel (nominal diameter of 1.5 inches; see Figure 2-4). A synthetic filter material separated the two gravel layers. Each sludge bed was constructed on a natural base of silty fine sand, sloped to bed centerlines. Leachate was collected in 6-inch-diameter perforated plastic pipes, located along the bed centerlines. Collected leachate flowed by gravity, through a common header, to a small lift station located 10-20 feet west of the beds. Leachate from the domestic sludge beds (PSC 41) was also collected and mixed with the PSC 43 leachate in this lift station, prior to pumping the mixed liquids back to the industrial wastewater treatment plant headworks.

Between 1980 and 1988, approximately 41 cubic yards (yd^3) of dried sludge were excavated annually from the drying beds between 1980 and 1988 and disposed of by land spreading at PSC 3 and possibly PSC 4, both within OU 2. The industrial sludge drying beds were permanently removed from service in November 1988, with the remaining sludge removed and taken to an off-site USEPA-permitted landfill in 1991.

2.1.1 Focused Remedial Investigation (FRI) An FRI was conducted at PSC 43 between June and September 1993. This study included the collection and analysis

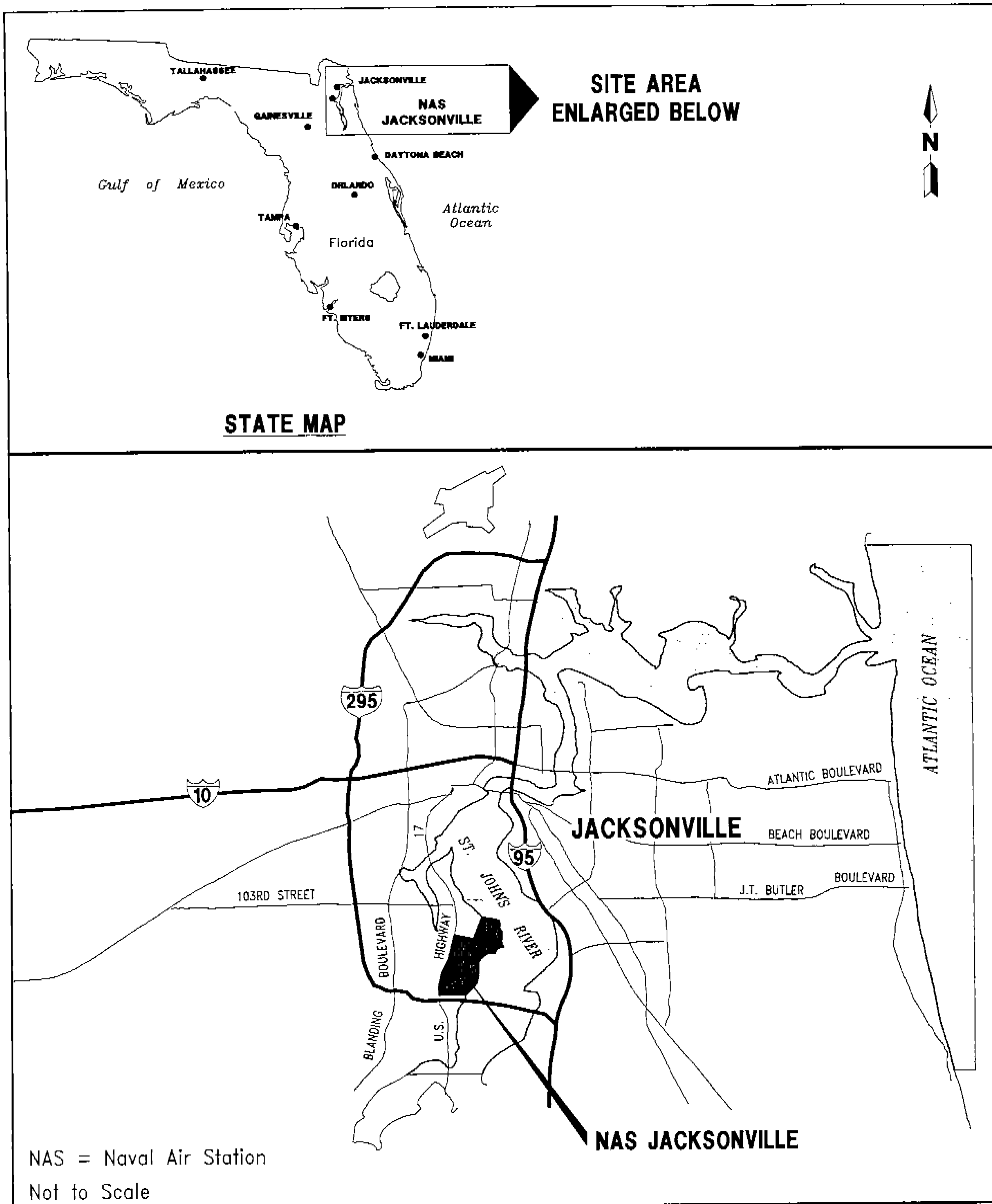

FIGURE 2-1
FACILITY LOCATION MAP

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CERTIFICATION AND CLOSURE REPORT FOR PSC 43

NAS JACKSONVILLE
JACKSONVILLE, FLORIDA

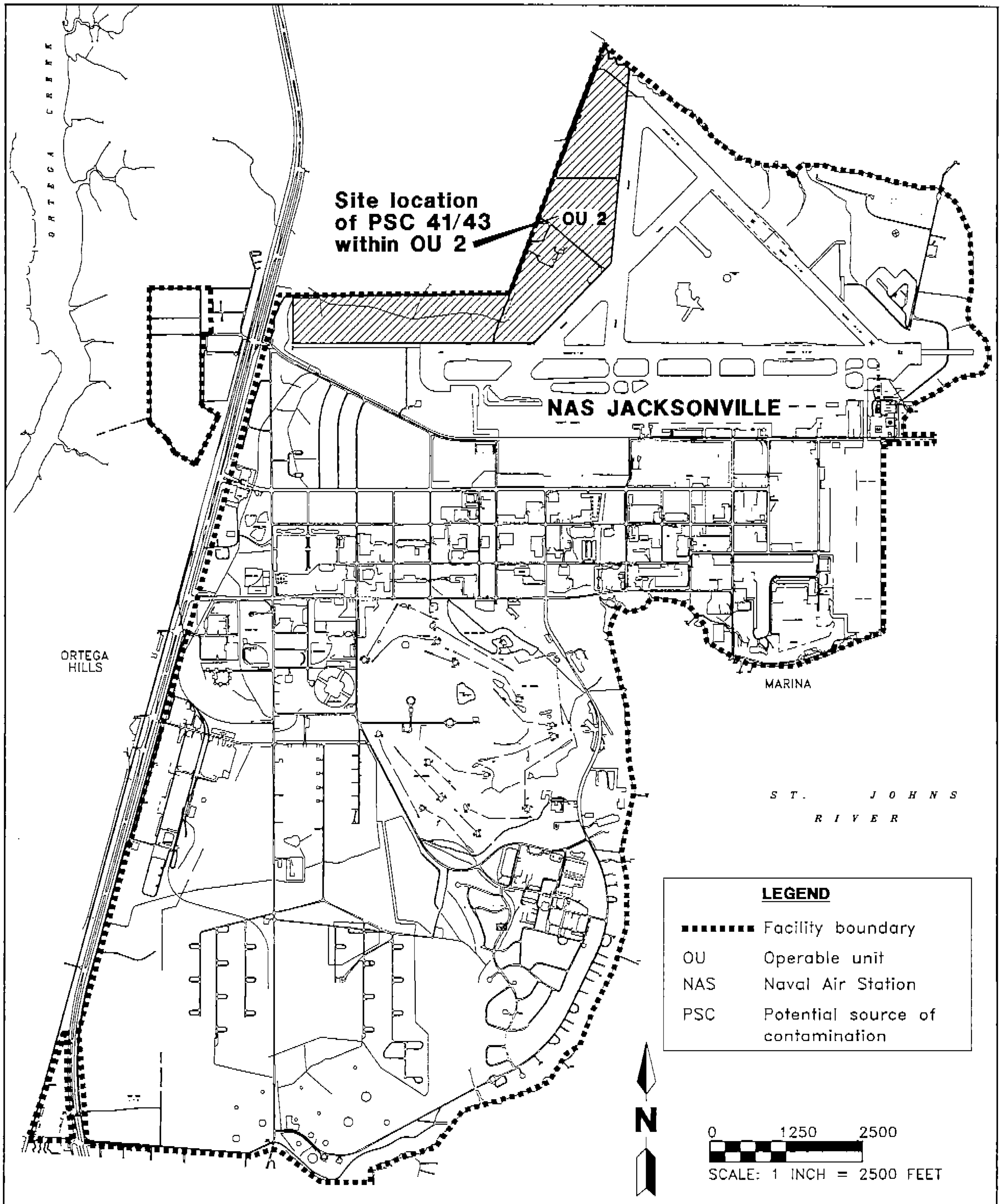

FIGURE 2-2
FACILITY MAP AND LOCATION OF OPERABLE UNIT 2 AND PSC 41 AND 43 PROJECT LOCATION

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CERTIFICATION AND CLOSURE REPORT FOR PSC 43

NAS JACKSONVILLE
JACKSONVILLE, FLORIDA

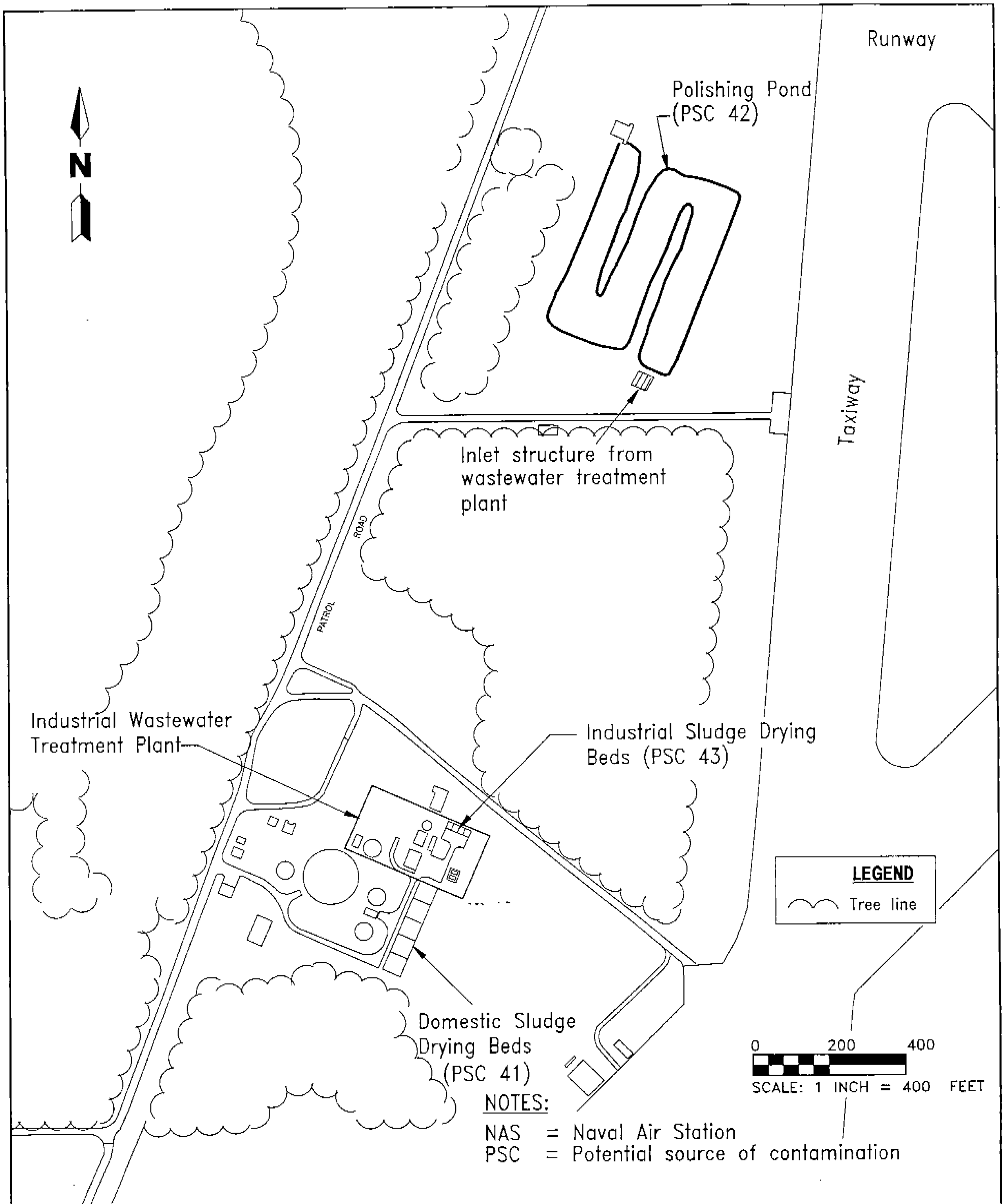

FIGURE 2-3
LOCATION OF PSCs 41, 42, AND 43 AT OPERABLE UNIT 2

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CERTIFICATION AND CLOSURE REPORT FOR PSC 43

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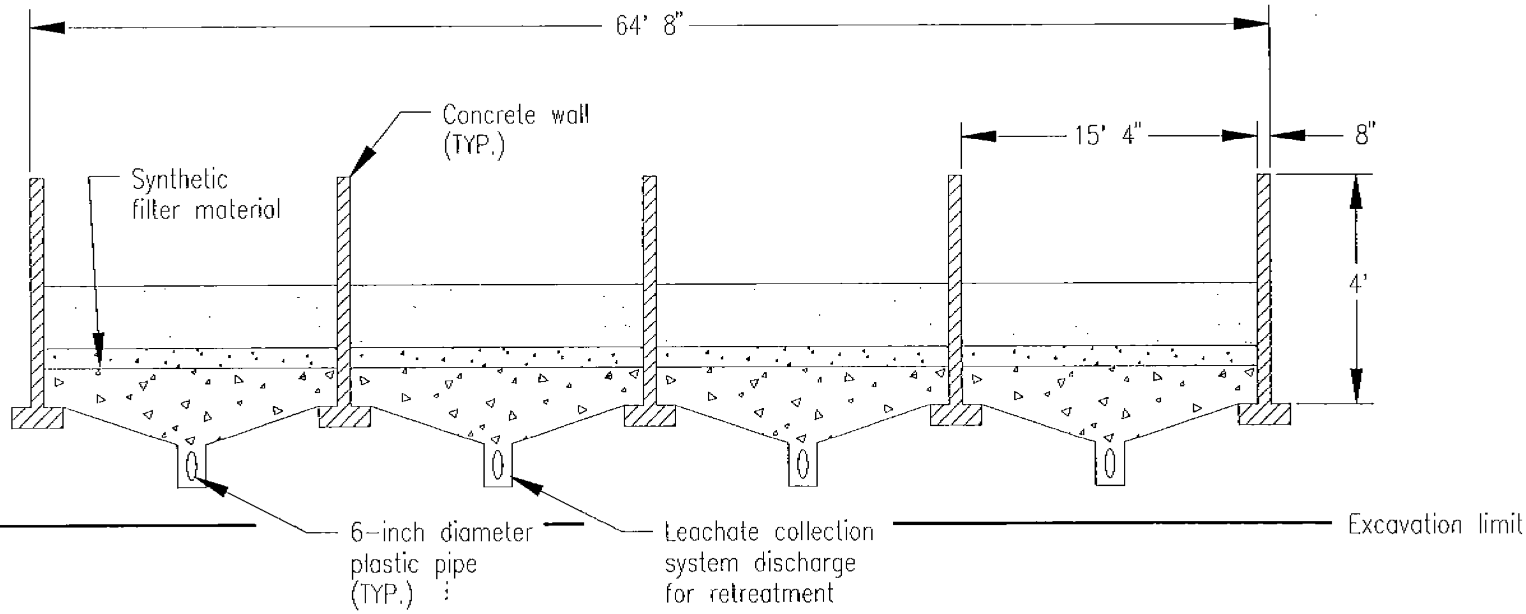

LEGEND

	12-inch sand layer
	4-inch medium gravel layer
	6-inch to 15-inch coarse gravel layer
PSC	Potential source of contamination
NAS	Naval Air Station

INDUSTRIAL SLUDGE DRYING BEDS

(Typical cross section)

0 5 10

SCALE: 1 INCH = 10 FEET
(APPROX.)
VERTICAL EXAGGERATION: 3:1

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FIGURE 2-4
CROSS SECTION OF
INDUSTRIAL SLUDGE DRYING BEDS

CERTIFICATION AND CLOSURE REPORT FOR PSC 43

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of sludge drying bed media and soil from beneath the beds. Soil samples immediately surrounding the drying beds were also collected and analyzed during the FRI. Laboratory analysis identified acetone at a concentration of 44 micrograms per kilogram in one sample collected from the sludge drying bed filter media. Metals, particularly arsenic, cadmium, chromium, lead, and nickel, were also detected in the sludge bed filter media at concentrations higher than natural background levels found in local area soil. Onsite screening identified cadmium, chromium, lead, and nickel in the soil immediately below the filter media at concentrations higher than those for subsurface soil collected in areas immediately surrounding the drying beds. Concentrations of metals in the soil immediately surrounding the sludge drying beds were within the range of natural background concentrations found in local area soils (Appendix D, Section 3.0).

2.1.2 Focused Risk Evaluation (FRE) As part of the FRI, an FRE of the sludge drying beds and subsurface soils at PSC 43 was performed using laboratory data collected during the FRI. The FRE was completed as a means to characterize potential risks to humans and the environment that could be caused by exposure to the chemicals present at PSC 43. The FRE indicated that unacceptable risks to human health may be associated with exposure to the observed levels of chromium, nickel, and lead detected in the filter media and underlying soils at PSC 43 (Appendix D, Section 4.0).

In addition, these three metals were potentially acting as a continuing source of soil and groundwater contamination at PSC 43 due to the presence of residual contamination in the drying bed media and the potential for additional leaching of the contaminants into the soil and groundwater.

2.1.3 Focused Feasibility Study (FFS) Remedial action objectives (RAOs) were identified and remedial alternatives were developed as part of the FFS. The RAOs provided the basis for identification of remedial technologies and alternatives. The alternatives were analyzed and compared (Appendix D, Sections 5.0 through 8.0) prior to selection of the preferred alternative, as noted in the Technical Memorandum (Appendix E, Section 2.3).

2.1.4 IRA and Supporting Documentation After review of the FRI/FFS, Southern Division, Naval Facilities Engineering Command (SOUTHNAVFACENGCOM) and NAS Jacksonville proposed an IRA to provide source reduction at PSC 43. The proposed IRA for PSCs 41 and 43 was identified in the Technical Memorandum (Appendix E) and consisted of excavation and onsite solidification of the remaining sludge bed media and contaminated soil, followed by site restoration. The IRA objective was to reduce potential risks to human health and the environment from inorganic analytes and to comply with RCRA closure requirements (40 CFR 264 Subpart G).

A Proposed Plan for IRA was made available to the public in July 1994; the plan identified the potential risks and proposed remedy at PSC 43, as well as PSCs 2 and 41 (ABB-ES, 1994). After review of the FRI/FFS, FRE, and Proposed Plan, the FDEP and USEPA approved the IRA. An Interim Record of Decision (IROD), which identified the selected remedy for the three PSCs (Appendix F), was signed on September 30, 1994. An IRA workplan was issued in January 1995, providing necessary information for the remedial action contractor (RAC) (Bechtel Environmental, Inc.) to implement the IRA at PSC 43 (Appendix G). A Record of Decision encompassing all PSCs within OU 2 (consisting of PSCs 2, 3, 4, 41, 42, and 43), is forthcoming.

2.2 PROJECT DESCRIPTION. The IROD for PSC 43 identified the following preferred alternative for treatment of the contaminated material.

- Remove and dispose of nonhazardous material off-site.
- Excavate and treat hazardous materials onsite.
- Backfill the excavated area to existing area grade and revegetate the area.

Preliminary tests performed during the FRI/FFS determined that metal concentrations in the sludge drying bed filter media (sand and gravels) were above levels identified in the RCRA Land Disposal Restrictions standards (40 CFR 268) and thus required treatment prior to disposal. In accordance with 40 CFR 268, which describes approved treatment technologies for debris contaminated with metals, onsite stabilization was the treatment technology chosen for use. Metal contaminants were not destroyed by this treatment process, but rather became physically and chemically entrapped in the matrix residual stabilized material. Stabilized material consistency may range from a semisolid to a solid, depending upon the design mix employed.

Contaminated sludge bed materials and soil from PSC 43 were treated, stabilized, and solidified in this manner. The stabilized material was temporarily stored at PSC 41 until the final phase of disposal could be completed. Between January and March 1997, the treated material stored at PSC 41 (combined residual materials from PSCs 41 and 43 treatment) was disposed of at PSC 42 by incorporating the previously stabilized materials into the backfill used to cover the fully cured and stabilized areas of pond sediments at PSC 42, thus completing the final phase of disposal.

The following is a summary of IRA events that occurred at PSC 43. A high density polyethylene (HDPE) covered earthen pad was constructed adjacent to the sludge drying beds to temporarily stockpile the sludge bed media and underlying soils. Prior to stabilization, the excavated filter media and subsurface soil was screened through a 4-inch sieve to separate oversized material. Metal items (pipes, etc.) were separated from the oversized objects, and the remaining oversized materials were then crushed and added to the finer material stream. The contaminated material stream entered a chamber of the stabilization mixing unit via a conveyor belt, was mixed with kiln dust and water, and was ultimately discharged to the excavated PSC 41 area for completion of the stabilization process (solidification). Following stabilization, the treated material was sampled and analyzed using toxicity characteristic leaching procedures (TCLP) as specified in the workplan. The mobile stabilization equipment and HDPE-lined storage area were decontaminated and removed when this stage of the IRA was completed.

The interior concrete walls and other concrete appurtenances exposed to the sludge were decontaminated using an abrasive technique consistent with 40 CFR 268.45. The decontaminated concrete was then crushed and stored separately from other excavated materials. Debris generated during concrete decontamination was later added to the wastestream.

3.0 CLOSURE ACTIVITIES

Chapter 3.0 presents a summary of the PSC 43 IRA. Preconstruction activities, excavation, stabilization, confirmatory sampling, and site restoration are described.

3.1 PRECONSTRUCTION ACTIVITIES. Onsite activities began with personnel and equipment mobilization on March 13, 1995. Bechtel Environmental, Inc., the RAC for implementation of the IRA at PSC 43, secured applicable permits for installation of the onsite treatment system. Site preparation at PSC 43 included clearing of vegetation and debris and construction of a 75-foot by 125-foot HDPE-covered, earthen pad. The pad provided containment for the stockpiled soils and sieve equipment. A trench lined with HDPE was then constructed around the perimeter of the pad and sloped toward a sump for collection of leachate and runoff from stockpiled material. Liquid wastes collected in this manner were later disposed of at Industrial Water Services, Inc. (Jacksonville, Florida; USEPA ID# FLD981928484), an off-site industrial wastewater treatment facility.

Prior to excavation, a utility clearance survey was performed. Utility clearance included review of available As-Built or Record Drawings and use of standard field utility detection devices.

3.2 EXCAVATION AND DECONTAMINATION. Excavation at PSC 43 included removal of the filter media and subsurface soils immediately below the drying beds. Excavated material was then stockpiled at the HDPE-lined storage area, as described above. Excavation was done with a backhoe, shovel, and excavator. Sludge drying bed appurtenances encountered during the excavation process were removed. Appurtenances included plastic and steel pipe from the underdrain leachate collection system. Plastic pipe was crushed and mixed with filter media and soil for stabilization. Steel pipe was decontaminated by pressure washing inside and out. Rinsate samples were taken from the interior and exterior pipe surface to confirm decontamination. Deionized water was poured on and in the piping during rinsate water sample collection. Following receipt of analytical results from the rinsate samples and confirmation of acceptability, the steel pipe was disposed of in a Subtitle D landfill. A summary of laboratory results from the steel pipe rinsate samples can be found in Appendix C of the RAC *Completion Report for PSC 43 Sludge Drying Beds* (Appendix H-1). Clarification of reported data is found in Appendix H-2, Response to Comments. Wastewater generated during decontamination activities (equipment and steel pipe decontamination) was containerized in a storage tank and later disposed of at Industrial Water Services, Inc., of Jacksonville, Florida.

Once the sludge drying bed media and subsurface soils were excavated, the concrete walls were decontaminated using an abrasive technique similar to that described in Section 4.6 of the Interim Remediation Work Plan (Appendix G). A rinsate sample was collected from the concrete to confirm decontamination. Laboratory results are presented in Appendix B of the RAC Construction Completion Report (Appendix H). Debris resulting from concrete decontamination (dust and pieces of concrete) were temporarily containerized in Department of Transportation-rated steel drums and later stabilized with the other excavated material.

After the concrete was decontaminated, it was crushed and disposed of off-site, at a solid waste landfill (Subtitle D). Concrete footers and apron drains (discharging to the leachate lift station) were left in place. Additional steel pipes, located between PSC 43 and the industrial wastewater treatment plant, were excavated, decontaminated, and disposed of with the other decontaminated steel pipes. Other pipes observed to be impacted by the excavation and treatment were capped in place using a bolted mechanical joint cap, as described in Section 2.5.2 of the RAC Construction Completion Report (Appendix H).

3.3 STABILIZATION. Stabilization of the PSC 43 drying bed materials, underlying soil, plastic pipe, and concrete debris proceeded as follows: (1) excavated material was screened through a sieve that retained oversized material (greater than 4 inches); (2) with the exception of steel pipe, the oversized material was crushed and added to the wastestream; and (3) the crushed material entered a pug mill and was mixed in a weight ratio of 15 percent cement kiln dust, 10 percent water, and 75 percent contaminated material. A detailed description of the stabilization process is provided in Section 4.8 of the RAC Work Plan (Appendix G). The volume of material removed from PSC 43 and stabilized was approximately 200 yd^3. The total volume of material stabilized from both PSCs 41 and 43 was approximately 2,795 yd^3.

Stabilized material was periodically sampled to maintain consistency with the quality control program. One of the quality criteria tests included geotechnical strength. The stabilized material was required to achieve a minimum unconfined compressive strength of 30 pounds per square inch, as specified in Part 4.11 of the RAC Work Plan (Appendix G). One sample was collected and met the comprehensive strength requirements.

Samples of the stabilized material were also collected and shipped off-site for analysis of TCLP metals at a rate of approximately 1 sample per 200 yd^3. Laboratory results are summarized in Table 3-1 of this report and detailed in Appendix E of the RAC Construction Completion Report (Appendix H). Analytical results presented in Table 3-1 indicate that stabilized materials, as tested, were consistent with, and met, the criteria specified in the RAC Work Plan (Appendix G, Table 4-2).

3.4 CONFIRMATORY SOIL SAMPLES. Confirmatory sampling was conducted at the former industrial waste sludge drying beds. To confirm the lateral limits of excavation, eight samples were collected from the excavation sidewalls for laboratory analysis. The RAC Work Plan specified collection of confirmatory soil samples from the proposed level at the excavation base, unless groundwater was encountered first. Because groundwater was encountered, no floor samples were collected from the excavation. Two of the eight were composite samples, each composed of materials from four sidewall areas, for a total of 12 locations around the excavation perimeter (see Figure 2 of Appendix H for sample point locations). Both composite samples were analyzed for F-listed wastes. The remaining six samples were analyzed for arsenic, cadmium, chromium, lead, and nickel. Cleanup criteria used in the IRA are identified in Table 3-2. A summary of analytical results for the soil samples is presented in Table 3-2 of this report and Appendix D of the RAC Construction Completion Report (Appendix H). An exceedance of the total chromium criteria (160 milligrams per kilogram [mg/kg]) was noted in one of the composite samples (176 mg/kg). However, when

Table 3-1
Summary of Stabilized Soil Analytical Results

Certification and Closure Report
Potential Source of Contamination 43
Naval Air Station Jacksonville
Jacksonville, Florida

Sample ID[1]	27801	27901	28001	28101	28201	28301	28401	28501	28601	Stabilization Standards[2]
Collection Date	6/1/95	6/2/95	6/2/95	6/2/95	6/2/95	6/2/95	6/2/95	6/2/95	6/6/96	
TCLP Metals (µg/ℓ)										
Arsenic	42.1 U	42.1 U	42.1 U	42.1 U	42.1 U	42.1 U	42.1 U	42.1 U	42.1	5,000
Cadmium	3.3 U	16.1	3.3 U	17.1	19.3	3.3 U	3.3 U	28.6	NA	190
Chromium	17.0 B	8.6 B	20.0 B	4.9 B	9.6 B	11.9 B	14.6 B	7.5 B	14.6 B	860
Nickel	70.3	85.4	86.5	94.3	103	72.9	68.4	120	64.5	5,000
Lead	36.4 U	36.4 U	36.4 U	36.4 U	36.4 U	36.4 U	36.4 U	36.4 U	36.4 U	370

See notes at end of table.

Table 3-1 (Continued)
Summary of Stabilized Soil Analytical Results

Certification and Closure Report
Potential Source of Contamination 43
Naval Air Station Jacksonville
Jacksonville, Florida

Sample ID[1]	28701	28801	28901	28001	29101	29201	29301	29401	29501	Stabilization Standards[2]
Collection Date	6/6/95	6/6/95	6/6/95	6/6/95	6/7/94	6/8/95	6/8/95	6/8/95	6/8/95	
TCLP Metals (µg/ℓ)										
Arsenic	42.1 U	42.1 U	42.1 U	42.1 U	42.1 U	42.1 U	42.1 U	42.1 U	42.1	5,000
Cadmium	30.8	19.0	39.6	26.9	22.5	10.8	5.4	3.3 U	9.1	190
Chromium	12.2 B	9.1 B	12.8 B	10.9 B	16.9 B	15.3 B	19.4 B	27.0 B	17.2 B	860
Nickel	130	105	156	136	121	87.3	72.3	87.2	81.3	5,000
Lead	36.4 U	36.4 U	36.4 U	36.4 U	36.4 U	36.4 U	36.4 U	36.4 U	36.4 U	370

[1] All sample IDs are preceded by JX00.
[2] Stabilization procedures are taken from the *Interim Remediation Work Plan for Potential Source of Contamination 41 and 43* (Bechtel Environmental, Inc., 1996).

Notes: ID = identification.
TCLP = toxicity characteristic leaching procedure.
µg/ℓ = micrograms per liter.
NA = not analyzed.
U = not detected at the reporting limit. The reporting limit is the value preceded by the "U" qualifier.
B = reported value is between the contract-required detection limit and the instrument detection limit.

Table 3-2
Confirmatory Soil Analytical Results

Certification and Closure Report
Potential Source of Contamination 43
Naval Air Station Jacksonville
Jacksonville, Florida

Sample	301	302	303	304	305	306	316[1]	317[1]	Cleanup Criteria
Inorganic Analytes (mg/kg)									
Arsenic	2.5 U	2.4 U	2.5 U	2.4 U	2.5 U	2.6 U	2.53 U	2.45 U	[2]NC
Cadmium	0.56 B	0.19 U	0.32 B	0.36 B	0.20 U	0.20 U	2.79	0.195 U	[2]NC
Total Chromium	19.0	4.8	17.8	8.4	0.52 B	4.7	176	4.21	[3]160
									[4]3,360
Nickel	2.4 B	0.93 B	0.81 B	1.2 B	0.47 U	0.55 B	4.29	1.14 B	[5]26,200
									[3]3.24
									[4]40,800
Lead	4.6 B	3.5 B	2.8 B	2.0 U	2.2 U	2.5 B	23.0	3.26 B	[5]100
Total Cyanide	NA	NA	NA	NA	NA	NA	0.265 B	0.125 B	[2]NC
									[4]1,000
Volatile Organics (mg/kg)									
Methylene Chloride	NA	NA	NA	NA	NA	NA	0.00402 J	0.00295 J	[2]NC
Acetone	NA	NA	NA	NA	NA	NA	0.0188 J	0.0158 J	[2]NC

[1] F-listed waste composite samples.
[2] Arsenic, cadmium, methylene chloride, acetone, and cyanide were not identified in Table 4-1 of the *Interim Remediation Work Plan for Potential Source of Contamination 41 and 43* (Bechtel Environmental, Inc., 1995) as contaminants of concern for Potential Source of Contamination 43; therefore, cleanup criteria are not given.
[3] Cleanup criteria source: *Focused Remedial Investigation and Feasibility Study, Potential Sources of Contamination (PSCs) 2, 41, and 43 at Operable Unit 2 Naval Air Station Jacksonville, Jacksonville, Florida* (ABB Environmental Services, Inc., August 1994, Tables D-13 and D-14, Florida General Worker State Target Levels).
[4] Cleanup criteria source: *Focused Remedial Investigation and Feasibility Study, Potential Sources of Contamination (PSCs) 2, 41, and 43 at Operable Unit 2, Naval Air Station Jacksonville, Jacksonville, Florida* (ABB Environmental Services, Inc., August 1994, Tables D-13 and D-14, Industrial Preliminary Remedial Goals.)
[5] Cleanup criteria source: Florida Department of Environmental Protection Memorandum, *Cleanup Goals for the Military Sites in Florida*, dated July 5, 1994 (unless noted otherwise).

Notes: All sample IDs are preceded by JX00.
Shaded entry indicates exceedance of criteria for chromium. Exceedance is considered to be a statistical outlier.

mg/kg = milligrams per kilogram.
U = not detected at the reporting limit. The reporting limit is the value preceded by the "U" qualifier.
NC = no criteria.
B = reported value is between the contract-required detection limit and the instrument detection limit.
NA = not analyzed.
J = reported value is an estimated quantity.

compared to results from the other seven samples, where the highest reported level was 19 mg/kg, the high value noted for the one composite sample was considered as a statistical outlier.

3.5 SITE RESTORATION. The excavated area was surveyed for preparation of site drawings to support the RCRA closure process. Backfilling the excavation at PSC 43 included placement of a sand layer on the excavation floor, followed by an impermeable plastic sheet and another sand layer. Additional backfill material, used to bring the excavated area to the prescribed grade, was thermally treated soil from the Kemen Test Cell Site - Building 873 at NAS Jacksonville (Bechtel Engineering, Inc., 1996). Site restoration and final grading included a slight mounding of the excavated area (surface runoff control), followed by hydroseeding.

3.6 SUMMARY. The following are several salient points related to the IRA undertaken at PSC 43.

- After completion of field activities at PSC 43, a final site inspection occurred on October 6, 1995.
- Bechtel Environmental, Inc., prepared and submitted a completion report (August 1996) summarizing the field implementation of remedial activities associated with PSC 43 (Appendix H-1). Clarification of analytical results reported in the appendices to that document are provided in Bechtel's Response to Comments, dated March 1997 (Appendix H-2).
- Daily construction status reports, prepared by the RAC during the IRA implementation period, are presently kept at the NAS Jacksonville Resident Officer-in-Charge of Construction office. They will eventually be transferred and stored at SOUTHNAVFACENGCOM.

ABB-ES has prepared this report and certified that the intent was met for both the Closure Plan as provided in Appendix B-1, and Closure Permit (Appendix C-1), in accordance with the approved Interim-Remediation Work Plan (Appendix G).

REFERENCES

ABB Environmental Services, Inc. 1994. *Proposed Plan for Interim Remedial Action, Potential Sources of Contamination (PSCs) 2, 41, and 43 at Operable Unit 2, Naval Air Station, Jacksonville, Florida.* Prepared for the Department of Navy, Southern Division, Naval Facilities Engineering Command (SOUTHNAVFACENGCOM), North Charleston, South Carolina (July).

Bechtel Engineering, Inc (BEI). 1995. *Interim Remediation Work Plan for Potential Source of Contamination 41 and 43.* Prepared for SOUTHNAVFACENGCOM, North Charleston, South Carolina.

BEI. 1996. *Kemen Test Cell - Building 873 at NAS Jacksonville.* Bechtel Job No. 2256. Prepared for SOUTHNAVFACENGCOM, North Charleston, South Carolina (June).

U.S. Environmental Protection Agency (USEPA). 1987. *RCRA Guidance Manual for Subpart G Closure and Post-Closure Care Standards, and Subpart H Cost Estimation Requirements.* Prepared by ICF Incorporated for USEPA, Office of Emergency and Remedial Response (OSWER) Policy Directive #9476.00-5. Washington, D.C. (January).

USEPA. 1992. *Remedial Action Report - Documentation for Operable Unit Completion.* OSWER Publication 9355.0-39FS. Washington, D.C. (June).

APPENDIX A

FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION vs. NAVAL AIR STATION JACKSONVILLE, CONSENT ORDER NO. 88-0280 (JUNE 1988)

Note: *A signed copy of Consent Order No. 88-0280 could not be located in FDEP record files. Therefore, a signed copy could not be included in this report.*

Craig Campbell

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

NORTHEAST DISTRICT
3426 BILLS ROAD
JACKSONVILLE, FLORIDA 32207
904/798-4200

BOB MARTINEZ
GOVERNOR
DALE TWACHTMANN
SECRETARY
ERNEST E. FREY
DISTRICT MANAGER
GARY L. SHAFFER
ASSISTANT DISTRICT MANAGER

June 3, 1988

CERTIFIED - RETURN RECEIPT

17

Capt. William J. Green, Jr., USN
Commanding Officer
U. S. Naval Air Station Jacksonville
Jacksonville, Florida 32212-5000

Dear Captain Green:

OGC Consent Order No. 88-0280
United States Naval Air Station Jacksonville

Enclosed is the revised Consent Order to resolve the above-referenced case. Please review the document and, if acceptable, sign and return it to this office for my execution within 14 days of receipt.

Should you have any questions concerning the Consent Order, please contact Elizabeth Merrill at the letterhead address or telephone number.

Your cooperation in this matter is appreciated.

Sincerely,

Ernest E. Frey

Ernest E. Frey
District Manager

EEF:eml

Enclosure

01390

CERTIFIED
P 771 966 378
MAIL

BEFORE THE STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

STATE OF FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION, Complainant, vs. UNITED STATES NAVAL AIR STATION JACKSONVILLE, Respondent.	IN THE OFFICE OF THE NORTHEAST DISTRICT OGC Case No.: 88-0280

CONSENT ORDER

This Consent Order is made and entered into between the State of Florida Department of Environmental Regulation ("Department") and United States Navy ("Respondent"), United States Naval Air Station Jacksonville, Jacksonville, Florida 32212-5000.

The Department finds and Respondent neither admits nor denies the following:

1. The Department is the State agency charged with the protection of the air and waters of the State of Florida, and is vested with the power and duty to implement and enforce the provisions of the Florida Air and Water Pollution Control Act, Chapter 403, Part I, Florida Statutes (FS), and the Florida Resource Recovery and Management Act, Chapter 403, Part IV, FS, and the Rules promulgated thereunder, Florida Administrative Code (FAC) Title 17. Pursuant to these provisions, the Department is authorized to control or prohibit activities which may reasonably be expected to be sources of pollution and which may discharge hazardous substances.

2. Respondent's Naval installation, located at the 6400 block of Roosevelt Boulevard, Jacksonville, Duval County, Florida, is a major operation base for patrol aircraft and has a large industrial complex, Naval Aviation Depot, for the repair and overhaul of airframes and engines of Naval aircraft. Respondent's property is further described as Section 23, Township 3 South, Range 27 East, latitude: 30°14'29" and longitude: 81°40'33".

3. Respondent is a person within the meaning of Sections 403.031 and 403.703, FS.

4. Respondent is a hazardous waste generator as defined in FAC Rule 17-30.020 and Title 40 Code of Federal Regulations (CFR) 260.10. Additionally, Respondent operates a hazardous waste storage facility and a hazardous waste treatment facility.

5. Respondent, as a generator, storer, and treater of hazardous waste, is required to comply with all applicable State and Federal hazardous waste regulations, and specifically FAC Chapter 17-30, which adopts and incorporates 40 CFR 260.10 and 40 CFR Parts 261 through 266.

6. On June 15, 1987, the Department issued Respondent Hazardous Waste Operation Permit No. HO16-119108 for the operation of sludge drying beds at the industrial wastewater treatment plant to dewater sludges, which are classified as a hazardous waste and generated by Respondent's electroplating operations. This permit expires on November 8, 1988.

7. On April 19, 1985, the Department issued Respondent Hazardous Waste Temporary Operation Permit No. HT16-68255 for operation of a container storage area at Building 144. This permit expired on April 20, 1988.

8. On July 28, 1987, Respondent submitted to the Department, a permit application for an operation permit for the container storage area referenced in paragraph 7 above. It is the intention of the Department to modify Operation Permit No. HO16-119108 to include provisions applicable to the container storage area provided Respondent submits complete and adequate information to the Department.

9. Specific Condition 46 of Operation Permit No. HO16-119108 required Respondent to establish a corrective action plan which meets the requirements of 40 CFR 264.100 within 45 days of receipt of documentation that hazardous constituents were measured in the groundwater. Hazardous constituents were detected at the industrial wastewater treatment plant prior to issuance of the permit; therefore, the plan was due on or before July 31, 1987. A plan has not been received by the Department to date.

10. On October 15, 1987, the Department issued Respondent Warning Notice No. NE-W-16-4441. The Warning Notice notified Respondent that it had failed to establish a corrective action plan pursuant to the requirements of Specific Condition 46 of Operation Permit No. HO16-119108.

11. On January 28, 1988, Respondent submitted to the Department a plan titled "Plan of Action, Delineation of Impacted Ground Water at the Industrial Wastewater Treatment Plant." This plan does not satisfy the requirements of Specific Condition 46 of Operation Permit No. HO16-119108.

12. The Department believes that Respondent's alleged failure to comply with Specific Condition 46 of Operation Permit No. HO16-119108 is a violation of Section 403.161(1)(b), which prohibits Respondent from failing to comply with any permit issued by the Department pursuant to its lawful authority.

13. The Department and Respondent have agreed to enter into this Consent Order in order to give Respondent the time necessary to come into compliance with the applicable State and Federal regulations allegedly violated so that the Department may modify Respondent's hazardous waste operation permit to include operation of the hazardous waste storage facility.

THEREFORE, having met and reached a resolution of this matter, pursuant to Florida Administrative Code Rule 17-103.110, the Department and Respondent mutually agree, and it is

ORDERED:

14. Within 30 days from the effective date of this Consent Order, Respondent shall make payment to the Department for costs and expenses of the State in the amount of $152.10. An accounting of the costs and expenses, which are recoverable pursuant to Section 403.141(1), Florida Statutes is attached and incorporated herein as Exhibit I. Payment shall be made by cashier's check or money order, payable to the "State of Florida Department of Environmental Regulation." Respondent shall render said payment by United States mail to the Department of Environmental Regulation, Northeast District, 3426 Bills Road, Jacksonville, Florida 32207.

15. Respondent shall immediately implement the plume delineation actions as set forth in the January, 1988 document titled "Plan of Action, Delineation of Impacted Ground Water at the Industrial Wastewater Treatment Plant."

16. Respondent shall submit to the Department the following documents within the indicated time frames or by the referenced date.

EM Survey Final Report	July 1, 1988
Conceptual Design Final Report	July 12, 1988
Plume Delineation Final Report	September 12, 1988
Corrective Action Plan 100% Report	October 11, 1988 Oct. 12, 1988
Corrective Action Final Report	45 days from receipt of Department comments on the 100% Report
Corrective Action Final Design	75 days from receipt of Department comments on the 100% Report

G Design Oct. 25 1989

The Conceptual Design Report shall evaluate treatment technologies to identify the most environmentally sound and effective corrective action to achieve cleanup of the groundwater contamination detected at the industrial wastewater treatment plant. The Plume Delineation Final Report shall summarize the results of the investigation conducted pursuant to paragraph 15 and shall include delineation of the horizontal and vertical extent of contamination for each constituent within the plume(s). The Corrective Action Plan Report shall meet the requirements of Operation Permit No. HO16-119108. If the corrective action plan recommends a treatment process, details of the treatment process, the recommended groundwater removal rate, and the treatment capacity shall be provided. The Corrective Action Plan Design shall be plans and specifications for the implementation of the Corrective Action Plan Report which meets the requirements of Operation Permit No. HO16-119108. The design plan shall include an implementation schedule which shall be subject to Department approval.

17. In the event that additional information is necessary for the Department to evaluate the reports and plans submitted pursuant to paragraph 14 above, the Department shall make a written request to Respondent for the information, and Respondent shall provide all requested information in writing to the Department within 20 days from receipt of said request unless the requested information requires additional field work in which case Respondent shall submit to the Department a written schedule acceptable to the Department for completing the field work needed to provide the requested information.

18. Once a report or plan has been approved by the Department, it shall become effective and made a part of this Consent Order. The plans shall be implemented upon receipt of the Department's notification to Respondent that the plan has been approved. The reports or plans shall incorporate all modifications required by the regulations and identified by the Department.

19. Six copies of all reports, plans, and data required by this Consent Order to be submitted to the Department shall be sent to the Hazardous Waste Supervisor, Department of Environmental Regulation, Northeast District, 3426 Bills Road, Jacksonville, Florida, 32207.

20. Respondent shall publish the following notice in a newspaper of general circulation in Duval County, Florida. The notice shall be published one time only within 14 days after execution of the Consent Order by the Department.

State of Florida Department of Environmental Regulation
Notice of Proposed Agency Action

The Department of Environmental Regulation gives notice of agency action of entering into a Consent Order with Naval Air Station Jacksonville pursuant to Rule 17-103.110(3), Florida Administrative Code (FAC). The Consent Order addresses the requirements of FAC Chapter 17-30 regarding this facility's management of hazardous waste including corrective action for groundwater contamination.

The Consent Order is available for public inspection during normal business hours, 8:00 a.m. to 5:00 p.m., Monday through Friday, except legal holidays, at the Department of Environmental Regulation, 3426 Bills Road, Jacksonville, Florida 32207.

Persons whose substantial interests are affected by the above proposed agency action have a right, pursuant to Section 120.57, Florida Statutes (F.S.), to petition for an administrative determination (hearing) on the proposed action. The Petition must conform to the requirements of Chapters 17-103 and 28-5, FAC, and must be filed (received) with the Department's Office of General Counsel, 2600 Blair Stone Road, Tallahassee, Florida, 32301, within 14 days of publication of this notice. Failure to file a petition within the 14 days constitutes a waiver of any right such person has to an administrative determinaiton (hearing) pursuant to Section 120.57, F.S.

If a petition is filed, the administrative hearing process is designed to formulate agency action. Accordingly, the Department's final action may be different from the proposed agency action. Persons whose substantial interests will be affected by any decision of the Department have the right to intervene in the proceeding. A petition for intervention must be filed pursuant to Model Rule 28-5.207, FAC, at least five days before the final hearing and be filed with the Hearing Officer if one has been assigned at the Division of Administrativo Hearings, Department of Administration, 2009 Apalachee Parkway, Tallahassee, Florida, 32301. If no Hearing Officer has been assigned, the petition is to be filed with the Department's Office of General Counsel, 2600 Blair Stone Road, Tallahassee, Florida 32399-2400. Failure to petition to intervene within the allowed time frame constitutes a waiver of any right such person has to an administrative determination (hearing) under Section 120.57, F.S.

Within 21 days of the effective date of this Consent Order, Respondent shall provide the Department with proof of publication.

21. With regard to any determination made by the Department regarding Respondent's responses to the Corrective Actions made pursuant to this Consent Order, Respondent may file a Petition for Formal or Informal Administrative Hearing Proceeding if Respondent objects to the Department's determination, pursuant to Section 120.57, FS, and FAC Chapters 17-103 and 28-5. Respondent shall have the burden to establish the inappropriateness of the Department's determination. The petition must conform with the requirements of FAC Rule 28-5.201, and must be received by the Department's Office of General Counsel, 2600 Blair Stone Road, Tallahassee, Florida 32399-2400, within 14 days after receipt of notice from the Department of any determination Respondent wishes to challenge. Failure to file a petition within this time period shall constitute a waiver by Respondent of its right to request an administrative proceeding under Section 120.57, FS. The Department's determination, upon expiration of the 14-day time period if no petition is filed, or the Department's Final Order as a result of the filing of a petition, shall be incorporated by reference into this Consent Order and made a part of it. All other aspects of this Consent Order shall remain in full force and effect at all times. If Respondent seeks an administrative proceeding pursuant to this paragraph, the Department may file suit against Respondent in lieu of or in addition to holding the administrative proceeding to obtain judicial resolution of all the issues unresolved at the time of the request for administrative proceeding.

22. Respondent shall allow all authorized representatives of the Department access to the property at reasonable times for the purpose of determining compliance with the terms of this Consent Order and the rules of the Department.

23. The Department hereby expressly reserves the right to initiate appropriate legal action to prevent or prohibit future violations of applicable statutes or the rules promulgated thereunder not covered by the terms of this Consent Order.

24. The Department, for and in consideration of the complete and timely performance by Respondent of the obligations agreed to in this Consent Order, hereby waives any rights it may have to seek judicial imposition of damages, or civil or criminal penalties for violations outlined in this Consent Order.

25. Entry of this Consent Order does not relieve Respondent of the need to comply with the applicable federal, state or local laws, regulations, or ordinances. The entry of this Consent order does not abrogate the rights of substantially affected persons who are not parties to this Order, pursuant to Chapter 120, FS.

26. The terms and conditions set forth in this Consent Order may be enforced in a court of competent jurisdiction pursuant to Sections 120.69 and 403.121, FS.

27. This Consent Order is final agency action of the Department pursuant to Section 120.69, FS, and FAC Rule 17-103.110(3), and it is final and effective on the date filed with the Clerk of the Department unless a Petition for Administrative Hearing is filed in accordance with Chapter 120, FS. Upon the timely filing of a petition this Consent Order will not be effective until further order of the Department.

28. No modification of the terms of this Consent Order shall be effective until reduced to writing and executed by both Respondent and the Department. This Consent Order shall terminate when all activities and projects agreed to herein have been determined by the Department to have been completed. Such determination shall not be unreasonably withheld.

29. Respondent's failure to comply with the deadlines established in this Consent Order shall be excused only for such period that such failure is caused by events beyond the control and without the fault of Respondent and/or an act of God, an act of war, strike, vandalism or act or omission of a party other than Respondent or its agents, which Respondent could not have, through diligent effort, prevented. Provided, however, that Respondent shall notify the Department in writing if such condition occurs, within 5 days of discovery thereof, and shall provide a statement

as to the specific causes and reasons for delaying the anticipated completion date.

FOR RESPONDENT:

Date

Captain William J. Green, Jr., USN
Commanding Officer
U. S. Naval Air Station Jacksonville
Jacksonville, Florida 32212-5000

DONE AND ORDERED this day of , 1988, in Jacksonville, Florida.

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL REGULATION

Ernest E. Frey
District Manager
Northeast District
3426 Bills Road
Jacksonville, Florida 32207
Telephone: 904/798-4200

Copies furnished to:

Stan Kupiszewski, Jr., Office of General Counsel, DER
United States Navy

EXHIBIT II

INVESTIGATIVE COSTS OF HAZARDOUS WASTE VIOLATIONS
NAVAL AIR STATION - JACKSONVILLE
STARTING DATE: OCTOBER 15, 1987

Man-hours

Assistant District Manager	1 hr @	18.49/hr	=	$18.49
Environmental Supv. I	6 hrs @	11.09/hr	=	66.54
Environmental Spec. II	4 hrs @	11.09/hr	=	44.36
Sr. Word Proc. Sys. Oper.	2 hrs @	6.23/hr	=	12.46

Miscellaneous

Copying costs:

132 pages @ $.05/page = 6.60

Mailing Costs:

1 package by certified mail = 2.40
2 packages by regular mail = 1.25

Total...$152.10

APPENDIX B

CLOSURE PLAN FOR POTENTIAL SOURCES OF CONTAMINATION 41, 42, AND 43 AT NAVAL AIR STATION JACKSONVILLE

Appendix B-1	1991 Closure Plan for Potential Sources of Contamination 41, 42, and 43 at Naval Air Station, Jacksonville
Appendix B-2	1996 Closure Plan for Potential Sources of Contamination 41, 42, and 43 at Naval Air Station, Jacksonville

APPENDIX B-1

1991 CLOSURE PLAN FOR POTENTIAL SOURCES OF CONTAMINATION 41, 42, AND 43 AT NAVAL AIR STATION JACKSONVILLE

1991(?) Closure Plan

Table of Contents

SECTION K - CLOSURE

Attachments

SECTION K - CLOSURE

K.1 Closure Plan

Sludge Drying Beds - The Industrial and Domestic Sludge Drying Beds will be closed as follows:

1. All structures , filter media, collection system materials, drain pipe, and subsoil to 6 inches below the lowest point of the collection system will be demolished. All demolished materials will be removed and disposed of at a permitted hazardous waste landfill.
2. The sludge drying beds will be backfilled with clean soil to a point within 21 inches of the final grade.
3. A 12 inch layer of 1 X 10^{-7} cm/sec permeability clay will be placed over the backfill area.
4. A final cap of 9 inches of concrete pavement will be placed over the clay cap.

Polishing Pond - The polishing pond will be closed as follows:

1. The polishing pond sludge will be dewatered and stabilized in-situ by the addition and blending of cement kiln dust.
2. The stabilized sludge will be compacted to 95 percent maximum density.
3. The polishing pond will then be backfilled with clean soil to within 3 feet of final grade.
4. Twelve inches of 1 x 10^{-7} cm/sec or less permeability

clay will be placed over the backfill area.

5. A synthetic liner will be placed on the clay cap.
6. Nine inches of clean construction sand will then be placed over the synthetic liner.
7. Fifteen inches of topsoil will be placed over the sand layer and seeded with bahia grass seed.

Inspection Activities - During the post-closure care period, the above caps will be informally inspected daily for any signs of deterioration. A thorough inspection will be performed monthly and a log will be maintained documenting the results of the monthly inspections. The inspection log will note the inspection date and time, inspector's name, any noted deficiencies, corrective action taken, and date corrective action is complete.

Maintenance Activities - During the post-closure care period, the above caps will be maintained as follows:

1. Any erosion of the polishing pond clay liner will be filled with like clay. Any deterioration of the top soil will be filled with like soil and reseeded.
2. Any barren areas of polishing pond cover will be reseeded and fertilized.
3. Any cracks in the sludge drying bed caps will be repaired and sealed.
4. Periodic maintenance of the polishing pond cover will

include mowing twice monthly and fertilizing twice yearly.

The point of contact during the post closure period will be:

Mr. Joseph P. Wallmeyer
Environmental Coordinator
NAS-Jacksonville
P. O. Box 5, Code 814
Jacksonville, Florida 322212-5000

K.2 Alternate Closure Plan

On October 23,1990, the U.S. Environmental Protection Agency, the Florida Department of Environmental Regulation, and the U. S. Department of the Navy entered into the Federal Facilities Agreement (FFA) for NAS Jacksonville. This agreement establishes the requirements for each of the three parties in assessing and remediating each of the 42 Potential Sources of Contamination (POCs) currently identified at NAS Jacksonville. The Domestic Sludge Drying Beds and polishing pond are identified in the FFA as POCs requiring a Remedial Investigation/Feasibility Study (RI/FS). The Industrial Sludge Drying Beds will be added to the FFA as an additional site requiring an RI/FS in accordance with Section IV.B of the FFA.

Section VII of the NAS Jacksonville FFA states that the parties intend to integrate the Navy's CERCLA response obligations and RCRA corrective action obligations. As such, the FFA establishes the mechanism whereby remediation of the POCs will occur under the provisions of CERCLA with RCRA considered an applicable or relevant and appropriate requirement (ARAR) with respect to releases of hazardous waste. Further, the FFA states that permits shall be modified to incorporate the provisions of the FFA and modified again after the CERCLA process has resulted in the final selection of a remedial action.

Based on the above provisions, the Navy will develop alternatives for closure of the Industrial Sludge Drying Beds, Domestic Sludge Drying Beds, and polishing pond other than that specified in K.1 above. Ultimately, the CERCLA process will result in a Record of Decision (ROD) which will specify the remediation alternative of choice for each of the units. The Navy will then submit a modified closure/post-closure permit application for the ISDBs, DSDBs, and polishing pond based on the ROD. See Attachment K-1 for a detailed description of the CERCLA process.

K.3 Schedule

The FFA requires that the Navy submit a Site Management Plan (SMP) which provides a schedule for performing the CERCLA activities at NAS Jacksonville. The Navy is to update and submit a revised schedule yearly. The schedule included in the SMP shall serve as the schedule required for the purposes of this permit. A copy of the current SMP is included as Attachment K-2.

ATTACHMENT K-1

CERCLA PROCESS

The Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Remedial Investigation (RI) and Feasibility Study (FS) process shall determine the appropriate response to identified contamination. The RI/FS process characterizes the nature and extent of risks posed by uncontrolled hazardous ~~waste site~~ contamination and for evaluating potential remedial options. The process is not a rigid step by step approach but a flexible methodology that is tailed to each site.

Although the RI/FS process is iterative and integrated, each component has specific functions. The RI serves as the mechanism to collect site characterization data, determine the nature of the waste, assess risk to human health and environment, and conduct treatability testing of possible remediations. The FS is the mechanism for identifying, developing and screening technologies and generating detailed analytical data supporting selection of final remediation alternatives.

The basic RI/FS process starts with scoping activities. Here previously developed and acquired data are assessed to identify potential technologies that might address site problems. Site specific applicable or relevant and appropriate regulations (ARARs) are gathered and data quality objectives assigned. With this information in hand, remedial objectives are developed, data acquisition needs are identified, and RI field work commences.

The FS screens the identified technologies and develops a set of remedial alternatives. The alternatives are evaluated based on the data from the RI field work and their projected effectiveness, implementability, and cost. At this stage in the process, additional field work and treatability testing occur.

The short listed remedial alternatives undergoes a detailed analysis after the performance of any additional field work or treatability testing. Each short listed alternative undergoes comparative analysis against nine criteria points. For most, points are:

(1) Overall protection of human health and the environment,
(2) compliance with identified ARARs,
(3) cost effectiveness,
(4) long term effectiveness, and
(5) reduction of toxicity, mobility or volume.

The remaining points are:

(6) Short term effectiveness,
(7) implementability,
(8) state acceptance, and
(9) community acceptance.

The remedial alternative of choice is presented in the proposed plan for review and comment by appropriate regulations and any other concerned individuals. If there are no significant decision altering comments received, a Record of Decision is prepared and signed by the EPA and the state.

The final remedial alternative as described in the Record of Decision is designed, constructed, and implemented until the remedial goals are achieved.

The Federal FAcility Agreement (FFA) signed by the U.S. Navy, the U.S. EPA, and the state of Florida requires the Navy submit a State Management Plan (SMP). The SMP provides the schedules for performing CERCLA activities at NAS Jacksonville. The Navy is to update and submit a revised schedule yearly.

Attachment K-2 is the current SMP.

ATTACHMENT K-2
SITE MANAGEMENT PLAN

August 30, 1991

Revision 0.0

SITE MANAGEMENT PLAN

NAS JACKSONVILLE, FL.

CALENDAR YEAR 1992

PREPARED BY

Joel G. Murphy

Southern Division

Naval Facilities Engineering Command

2155 Eagle Drive

P.O. Box 10068

Code 18213

Charleston, South Carolina

29411-0068

1. THE BASIS FOR A SITE MANAGEMENT PLAN

The requirement for this Site Management Plan (SMP) is identified in the Federal Facilities Agreement (FFA) signed by the Environmental Protection Agency, the State of Florida, Department of Environmental Regulation and the US Navy. The FFA was entered into based on the requirement for an interagency agreement identified in the Superfund Amendments and Reauthorization Act (SARA), section 120(e)(1). The intent of the plan is to provide: (1) an action deemed necessary to mitigate any immediate threat to human health of the environment, (2) a list of operable units subject to the tenets of the FFA, (3) a prioritization and rationale for the operable units at the Site, (4) activities and schedules for work planned for the current year, including the submittal schedule for primary and secondary documents, and (5) work projections for subsequent calendar years. The FFA was signed on 16 October, 1990 and has an effective date of 1 November, 1990.

2. OVERALL SITE MANAGEMENT APPROACH

Three major investigation activities have been conducted at NAS Jacksonville, the Site, under the Navy Installation Restoration (IR) Program (NIRP) or Superfund Program: Preliminary Assessment (PA) or Initial Assessment Study, Site Inspection (SI) or Verification Study, and Extended Site Inspection (ESI) or Confirmation Study. The PA (1983) identified and assessed 38 potential sources of contamination (PSC) on the Site that could pose a potential threat to human health or the environment as a result of contamination derived from past naval operations. Two additional PSCs were identified for a total of 40 post-PA PSCs. The SI (1985) and ESI (1986) were conducted to confirm or refute the presence of hazardous substances at the PSCs identified in the PA; and, if contamination was detected, evaluate its magnitude and extent to a degree that would allow for the recommendation of future remedial response actions. As a result of further IR activities, five additional sites were identified for a total of 45 post-ESI PSCs.

In addition to the NIRP/CERCLA program, the station has other active regulatory programs. A Florida RCRA permit was issued to NAS Jacksonville by the Florida Department of Environmental Regulation (FDER). Concurrently, a RCRA/HSWA permit was issued to the installation by the U.S. EPA in June, 1987. A RCRA Facility Assessment (RFA) was included in the EPA issued permit. An Underground Storage Tank Program is currently investigating over 50 tanks as provided for in Florida Administrative Code Section 17-770.

Of the 45 identified IR PSCs, thirteen are currently being addressed as Remedial Investigation/Feasibility Study PSCs with the remaining requiring FFA site screening efforts due to present data quality objective inadequacies and data gaps, or due to a preliminary determination that no further action is required. Due to the proximity of 23 PSCs, the US Navy shall assess the state of the St. Johns River in the immediate area about those PSCs.

The SMP provides a PSC-IR Program event management plan. Included is a description of the Site's PSC program arrangement into Remedial Activity groupings or Operable Units (OU). The Plan ONLY discusses the management of PSCs that are identified as needing to undergo Phase II: Remedial Investigation, Feasibility Study, and Record of Decision, and possibly Phase III: Remedial Design and Remedial Action, of the IR/CERCLA Program. A list of projected schedule tasks through the deletion of the Site from the National Priority List is furnished. Detailed are program events to take place in the upcoming year and the delivery dates for draft primary documents and target dates for secondary program documents. The Navy shall update the SMP yearly. A SMP addenda is scheduled when significant changes in scheduling time frames occur. Updates may reflect changes in project priorities, refining each OU's project schedule, and PSC additions or deletions due to program accomplishments or field conditions.

3. RATIONALE FOR OPERABLE UNIT PSC GROUPINGS

In order to facilitate implementation of NAS Jacksonville's IR Program, the 45 PSCs are organized into five groups: 3 RI/FS Operable Units (OUs), a PSC Screening group, and Petroleum PSC group. The screening group consisting of 29 PSCs and the petroleum group consisting of 3 PSCs will not be further considered in this SMP. The criteria used to generate the RI/FS OU arrays are as follows:

1) geographic proximity of sites;
2) similar contaminant types;
3) similar aquifer contamination zones;
4) similar potential investigation methods;
5) potential scope and complexity of the investigation;
6) mission impact of remedial activities;
7) regulatory concerns; and
8) similarity of potential remedial actions.

The PSCs in each OU are:

OU#1 : Oil and Solvent Disposal Pits Area

PSC 26, The Old Main Registered Disposal Area

PSC 27, Ex Transformer Storage Area

OU#2 : Wastewater Treatment Area

PSC 2, Aircraft Fire Fighting Training Area

PSC 3, Ex Sludge Disposal Area

PSC 4, Pine Tree Planting Area

PSC 41, Domestic Sludge Drying Beds

PSC 42, Polishing Pond

PSC 43, IWTP Sludge Drying Beds

OU#3 : Industrial Area

PSC 11, Hanger 101

PSC 12, Old Test Cell Building 101K

PSC 13, Radium Paint Waste Disposal Pit

PSC 14, Battery Shop

PSC 15, Solvent and Paint Sludge Disposal Area

Operable Unit remedial activities are being phased based on investigation and hazard priorities, schedule effectiveness and task management. Due to the large number of PSCs on the Site overall, the number of PSCs in each RI/FS OU, and the aggregate complexity of the contamination problem at each OU, the commencement of work at all OUs concurrently is not feasible; therefore, a phased approach has been implemented. Present management plans, based on hazardous assessment, are to proceed with RI/FS OU#1 first, then activate RI/FS OU#2, and then commence RI/FS OU#3. The scheduled staggering provides for a coherent effort by the investigative and engineering team enabling a higher quality assessment of the problem and more accurate identification of a suitable remedial response action. The aggregation of the PSCs and the assignment of phasing priorities was based on the seven criteria stated above. The specific aggregation issues are discussed in the accompanying OU Narratives. The assignment of priorities was driven by the actual or potential threat posed by the PSC's known or suspected contamination.

The Oil and Solvent Disposal, OU#1, is situated on a topographical high and contains halogenated hydrocarbons and petroleum hydrocarbons. The area drains into a St. Johns River estuary and adjoining wetlands and abuts a military housing area. The potential environmental and human health threat is sufficient to commence

IR program RI/FS work at this OU first.

The Wastewater Treatment Area, OU#2, has a known, large areal, heavy metal and potential halogenated hydrocarbon contamination problem. Due to the proximity of the OU to the St. Johns River, there is a sufficient potential environmental threat that makes this OU a number two priority.

Although the Industrial Area, OU#3, has known halogenated hydrocarbon contamination, the extent of the problem is unknown. Because the OU abuts the St. Johns River, there is concern about an environmental threat. The areal industrial development effects a complex investigation. Due to the anticipated time and mission sensitivity of this area, IR efforts at this OU are scheduled to commence last.

NAS Jacksonville's Navy IR Program (NIRP) Plan, the Plan, details the overall and specific management of addressing IR remedial activities at 45 PSCs in seven volumes. Due to the large number of PSCs at the Site, economies of scale dictate the singular establishment of plan methodologies and protocols. Volume 1, Organization and Planning, addresses the organization of the Plan, data and project management functions, specific IR Program sub-plans: Health and Safety Plan, and Community Relations Plan, Site and PSC background information, OU PSC aggregation process, and activity/ OU priority formulation. Volumes 2 and 3, not yet developed, shall contain, respectfully, No Further Action and Site Screening activities. Volume 4 contains the basic methodologies and protocols for conducting field investigations, doing field sampling work - Basic Field Sampling Plan (BFSP), and performing field and laboratory analytical activities - Quality Assurance Program Plan (QAPP); the BFSP and the QAPP are combined into one document called the Basic Sampling and Analysis Plan (BSAP). The specific RI/FS Work Plans for each OU are contained in Volume 5-OU#1, Volume 6-OU#2, and Volume 7-OU#3; Volumes 6 and 7 are not yet developed. Once this basic set of IR/CERCLA work protocols and methodologies containing the OU#1 specific work plan are approved, the development of additional work plans shall commence. The Navy's Installation Restoration Program Plan for NAS Jacksonville is available for viewing in the information repository at the Webb Wesconnett Branch Library of the City of Jacksonville Public Libraries located at 6887 103rd Street, Jacksonville, Fl. 32212-6897.

4. SITE PSCs SMP EXCLUSIONS

The 29 PSCs identified in Attachment A to the FFA are not included nor otherwise addressed herein, except in this section. After screening the 29 PSCs, the Navy will determine future response activities. See NIRP Plan Volume I for additional information. If RI/FS activities are recommended, the US Navy shall create additional OUs to address PSC(s) problems. When established, the future additional OUs shall be incorporated into the SMP. The Petroleum PSC Group, consisting of three PSCs: 7, 19, and 33, have been transferred to the Underground Storage Tank Program for response activities detailed in Florida Administrative Code 17-770 and are not included in the SMP or the Navy's IR Program.

5. OPERATIONAL UNIT SCHEDULING

The schedules of operable units #2 and #3 are based on the issuance of the draft RI/FS Work Plan for the previous operable unit. The start of the next OU's work plan is commenced during the review process of previous OU's Draft Final Work Plan. Presently, the time projected for this staggered scheduling is the result of the extensive review comments being received on the initial NIRP Plan, and for inclusion of Federal Facilities Agreement review and comment periods. Upon obtaining an agreement on the level of information required in a specific work plan and if the FFA review and comment durations are shortened by the parties by their ability to perform the required review in less than the provided time frames, the Navy shall be able to exepidite and execute plans earlier.

6. 1992 - 1993 GENERAL SCHEDULE

The following is a list of the general deliverables that are associated with the overall management of the site and their target transmittal date.

1992 GENERAL DELIVERABLES	TARGET DATES
1st Qtr. Quarterly Progress Report	30 April, 1992
2nd Qtr. Quarterly Progress Report	30 July, 1992
1993 Site Management Plan	1 September, 1992
3rd Qtr. Quarterly Progress Report	30 October, 1992
4th Qtr. Quarterly Progress Report	30 January, 1993

1993 GENERAL DELIVERABLES	TARGET DATE
1st Qtr. Quarterly Progress Report	30 April, 1993
2nd Qtr. Quarterly Progress Report	30 July, 1993
1992 Site Management Plan	1 September, 1993
3rd Qtr. Quarterly Progress Report	30 October, 1993
4th Qtr. Quarterly Progress Report	30 January, 1994

7. OPERATIONAL UNIT NARRATIVES

The following are narratives describing the contents of each OU. A description of the physical location and terrain is furnished. What is known about the contamination and an assessment of its present threat is included. The events for the upcoming year are listed and the due dates of primary documents and the target dates of secondary documents are provided. A schedule of the projected submittal dates for primary documents only is included for the first outlying year. The upcoming and outlying year are on one time line Gantt Chart schedule. For the long term view, a list of projected schedule program tasks thru the finalization of the Record of Decision is included.

A. RI/FS Operable Unit #1 : The Oil and Solvent Disposal Area PSCs

Description :

An area of approximately 20 acres located in the south central part of the Site. The topology is open and relatively flat. The unit is located within a drainage ditch network. In an included area approximately 150 feet square, PCB transformers were stored. This unit is comprised of PSC 26 - The Old Main Registered Disposal Area and PSC 27 - Ex-Transformer Storage Area. Previous studies have identified ground water and subsurface soils contaminated with industrial solvents, heavy metals, PCBs and petroleum hydrocarbons. The unit has experienced interim remedial measures that have removed the direct exposure threat to the public's health or the environment.

1992 Primary Deliverables:	Due Date :
-- NONE --	-- NONE --
1992 Secondary Deliverables :	Target Dates :
Preliminary Site Characterization Report	5 December, 1992
Projected 1993 Primary Deliverables :	Target Dates :
Draft Baseline Risk Assessment	19 January, 1993
[Agency Review Comments]	90 days after receipt of document
Draft Final Baseline RA	120 days after reciept of review comments
Draft Remedial Investigation Report	20 March, 1993
[Agency Review Comments]	90 days after receipt of document
Draft Final RI Report	120 days after reciept of review

	comments
Draft Feasibility Study	27 March, 1993
[Agency Review Comments]	90 days after receipt of document
Draft Final FS	120 days after reciept of review comments

** : Action occurs unless Dispute Resolution evoked by one of the three FFA Parties.

Schedule Name : SMP Work Schedule for OU# 1
Responsible : US NAVY
As-of Date : 27-Aug-91 Schedule File : OU19293B

The proposed schedule for performing CERCLA response actions at OU#1 - Oil and Solvent Disposal Pits Area.

Task Name	Start Date	Duration	End Date
NAVY MAILS DFINAL	13-Sep-91	7.0 days	20-Sep-91
RI/FS WP GOES FINAL	20-Sep-91	30.0 days	20-Oct-91
RI/FS WP FINALIZED	20-Oct-91	0.0	20-Oct-91
RI Field Work	5-Oct-91	427.0 day	5-Dec-92
AWARD WORK	5-Oct-91	75.0 days	19-Dec-91
FW Mobilization	19-Dec-91	30.0 days	18-Jan-92
Do Field Work	18-Jan-92	187.0 day	23-Jul-92
Data Validation	23-Jul-92	45.0 days	6-Sep-92
Data Analysis	6-Sep-92	45.0 days	21-Oct-92
Gen D-PCSR	21-Oct-92	45.0 days	5-Dec-92
Review & Gen F-PCSR	5-Dec-92	89.0 days	4-Mar-93
Transmit D-PCSR	5-Dec-92	7.0 days	12-Dec-92
AGENCY REVIEW	12-Dec-92	30.0 days	11-Jan-93
Agency Transmits RCs	11-Jan-93	7.0 days	18-Jan-93
Navy Rvs RCs, Gen F-Rpt	18-Jan-93	45.0 days	4-Mar-93
Additional RI Field Wk.	4-Mar-93	1.0 day	5-Mar-93
NUMERICAL MODELING	5-Oct-91	472.0 day	19-Jan-93
AWARD WORK	5-Oct-91	75.0 days	19-Dec-91
Phase I NM Tasks	19-Dec-91	150.0 day	17-May-92
Phase II NM Tasks	21-Oct-92	60.0 days	20-Dec-92
Gen DNM Rpt.	20-Dec-92	30.0 days	19-Jan-93
Review & Gen F-NMRpt.	19-Jan-93	89.0 days	18-Apr-93

Task Name	Start Date	Duration	End Date
Transmit D-PCSR	19-Jan-93	7.0 days	26-Jan-93
AGENCY REVIEW	26-Jan-93	30.0 days	25-Feb-93
Agency Transmits RCs	25-Feb-93	7.0 days	4-Mar-93
Navy Rvs RCs, Gen F-Rpt	4-Mar-93	45.0 days	18-Apr-93
BASELINE RISK ASSESSMENT	5-Oct-91	479.0 day	26-Jan-93
AWARD WORK	5-Oct-91	75.0 days	19-Dec-91
Phase I BLRA Tasks	19-Dec-91	150.0 day	17-May-92
Phase II BLRA Tasks	21-Oct-92	60.0 days	20-Dec-92
PREPARE DRFT BASELINE	20-Dec-92	30.0 days	19-Jan-93
SUBMIT DRAFT BASELINE	19-Jan-93	7.0 days	26-Jan-93
Transmit D-BLRA	19-Jan-93	0.0	19-Jan-93
Gen Final BRA	26-Jan-93	254.0 day	7-Oct-93
AGENCY REVIEW	26-Jan-93	90.0 days	26-Apr-93
NAVY RECVS COMMENTS	26-Apr-93	7.0 days	3-May-93
NAVY R ON RCs	3-May-93	60.0 days	2-Jul-93
NAVY MAIL R ON RCs	2-Jul-93	7.0 days	9-Jul-93
PREPARE DRAFT/FINAL	2-Jul-93	60.0 days	31-Aug-93
SUBMIT DRAFT/FINAL	31-Aug-93	7.0 days	7-Sep-93
BASELINE FINALIZED	7-Sep-93	30.0 days	7-Oct-93
DF-BLRA RPT Transmit.	31-Aug-93	0.0	31-Aug-93
RI REPORT GENERATION	5-Oct-91	539.0 day	27-Mar-93
AWARD WORK	5-Oct-91	75.0 days	19-Dec-91
WORK RI TASKS	19-Dec-91	232.0 day	7-Aug-92
Develop Draft RI Rpt.	19-Jan-93	60.0 days	20-Mar-93
SUBMIT DRAFT RI RPT	20-Mar-93	7.0 days	27-Mar-93
DRAFT RI RPT DLVD	27-Mar-93	0.0	27-Mar-93
GEN FINAL RI RPT	27-Mar-93	254.0 day	6-Dec-93
AGENCY REVIEW	27-Mar-93	90.0 days	25-Jun-93

Task Name	Start Date	Duration	End Date
NAVY RECVS COMMENTS	25-Jun-93	7.0 days	2-Jul-93
NAVY R on RCs	2-Jul-93	60.0 days	31-Aug-93
NAVY MAILS COMENTS	31-Aug-93	7.0 days	7-Sep-93
PREPARE DRAFT/FINAL	31-Aug-93	60.0 days	30-Oct-93
SUBMIT DRAFT/FINAL	30-Oct-93	7.0 days	6-Nov-93
RI REPORT FINALIZED	6-Nov-93	30.0 days	6-Dec-93
RI Finalized	6-Dec-93	0.0	6-Dec-93
TREATABILITY STUDY	5-Oct-91	478.0 day	25-Jan-93
AWARD WORK Plan Gen	5-Oct-91	75.0 days	19-Dec-91
Gen Work Plans	19-Dec-91	45.0 days	2-Feb-92
Award T/T WP	2-Feb-92	75.0 days	17-Apr-92
PERFORM TREATABILITY	17-Apr-92	150.0 day	14-Sep-92
Gen. D-T/T Rpt.	14-Sep-92	45.0 days	29-Oct-92
SUBMIT DRFT TREAT	29-Oct-92	7.0 days	5-Nov-92
AGENCY REVIEW	5-Nov-92	30.0 days	5-Dec-92
AGENCY MAILS RCs	5-Dec-92	7.0 days	12-Dec-92
NAVY Assess RCs	5-Dec-92	14.0 days	19-Dec-92
NAVY SENDS R OF RCs	19-Dec-92	7.0 days	26-Dec-92
TREAT STDY FINALIZED	26-Dec-92	30.0 days	25-Jan-93
FEASIBILITY STUDY	5-Oct-91	539.0 day	27-Mar-93
AWARD WORK	5-Oct-91	75.0 days	19-Dec-91
DO FS WORK TASKS	19-Dec-91	360.0 day	13-Dec-92
GEN. DRAFT FS RPT	19-Jan-93	60.0 days	20-Mar-93
SUBMIT DRAFT FS	20-Mar-93	7.0 days	27-Mar-93
DRAFT FS RPT DLVD	27-Mar-93	0.0	27-Mar-93
GEN FINAL FS RPT	27-Mar-93	254.0 day	6-Dec-93
AGENCY REVIEW	27-Mar-93	90.0 days	25-Jun-93
NAVY RECVS COMMENTS	25-Jun-93	7.0 days	2-Jul-93

Task Name	Start Date	Duration	End Date
NAVY R of RCs	2-Jul-93	60.0 days	31-Aug-93
NAVY Mail R of RCs	31-Aug-93	7.0 days	7-Sep-93
PREPARE DRFT/FINAL	31-Aug-93	60.0 days	30-Oct-93
SUBMIT DRAFT/FINAL	30-Oct-93	7.0 days	6-Nov-93
FS RPT goes final	6-Nov-93	30.0 days	6-Dec-93
FS Finalized	6-Dec-93	0.0	6-Dec-93
PROPOSED PLAN	6-Dec-93	142.0 day	27-Apr-94
AWARD PP & ROD WORK	6-Dec-93	75.0 days	19-Feb-94
PREPARE PP	19-Feb-94	60.0 days	20-Apr-94
SUBMIT DRAFT PP	20-Apr-94	7.0 days	27-Apr-94
DPP ISSUED	27-Apr-94	0.0	27-Apr-94
GEN FINAL PP	27-Apr-94	254.0 day	6-Jan-95
AGENCY REVIEW	27-Apr-94	90.0 days	26-Jul-94
AGENCY MAILS COMMENTS	26-Jul-94	7.0 days	2-Aug-94
NAVY R of RCs	2-Aug-94	60.0 days	1-Oct-94
NAVY MAILS COMENTSS	1-Oct-94	7.0 days	8-Oct-94
PREPARE DRAFT/FINAL	1-Oct-94	60.0 days	30-Nov-94
SUBMIT DRAFT/FINAL	30-Nov-94	7.0 days	7-Dec-94
PP goes final	7-Dec-94	30.0 days	6-Jan-95
PP FINAL ISSUED	6-Jan-95	0.0	6-Jan-95
PP PUB. MTG.	6-Jan-95	90.0 days	6-Apr-95
PREP PUB. MTG NOTICE	6-Jan-95	15.0 days	21-Jan-95
PUBLISH MTG NOTICE	21-Jan-95	30.0 days	20-Feb-95
COMMENTS FROM PUBLIC	20-Feb-95	45.0 days	6-Apr-95
PP Finalized	6-Apr-95	0.0	6-Apr-95
GEN DRAFT ROD	6-Apr-95	112.0 day	27-Jul-95
GEN RESPON. SUM	6-Apr-95	45.0 days	21-May-95
Review Pub Comments	6-Apr-95	15.0 days	21-Apr-95

Task Name	Start Date	Duration	End Date
Gen Summary	21-Apr-95	30.0 days	21-May-95
PREPARE DRAFT ROD	21-May-95	60.0 days	20-Jul-95
NAVY MAILS DROD	20-Jul-95	7.0 days	27-Jul-95
DRAFT ROD SUBMITTED	27-Jul-95	0.0	27-Jul-95
GEN FINAL ROD	27-Jul-95	254.0 day	6-Apr-96
AGENCY REVIEW	27-Jul-95	90.0 days	25-Oct-95
AGENCY MAILS COMMENTS	25-Oct-95	7.0 days	1-Nov-95
NAVY R of RCs	1-Nov-95	60.0 days	31-Dec-95
NAVY COMENTS mailed	31-Dec-95	7.0 days	7-Jan-96
NAVY GEN DFinal	31-Dec-95	60.0 days	29-Feb-96
NAVY mails DFinal	29-Feb-96	7.0 days	7-Mar-96
ROD GOES FINAL	7-Mar-96	30.0 days	6-Apr-96
ROD FINALIZED	6-Apr-96	0.0	6-Apr-96
ROD OFFICIAL	6-Apr-96	46.0 days	22-May-96
ROD SIGNATURE	6-Apr-96	1.0 day	7-Apr-96
PREP PUB. NOTICE	7-Apr-96	15.0 days	22-Apr-96
PUBLISH NOTICE	22-Apr-96	30.0 days	22-May-96
ROD FINAL & OFFICIAL	22-May-96	0.0	22-May-96

B. RI/FS Operable Unit #2 : The Wastewater Treatment Area PSCs

Description :

An area on the Northwest end of the air station comprising six PSCs: 2 - Fire Fighting Training Area, 3 - Ex-Sludge Disposal Area, 4 - Pine Tree Planting Area, 41 - Ex-Domestic Sludge Drying Beds, 42 - Ex-Polishing Pond, and 43 - Ex-IWTP Sludge Drying Beds. The area is the location of the stations domestic and industrial was-tewater plants, is bounded on the north by the St. Johns River and, even though relatively flat, is a hydrologic high. The area's groundwater has known contamination consisting of industrial solvents and heavy metals. No direct exposure threat presently exists to public health or the environment.

1992 Primary Deliverables :	Due Dates :
Draft RI/FS Work Plan	19 April, 1992
[Agency Review Comments]	90 Days after receipt of document
Final RI/FS Work Plan	120 Days after reciept of review comments

1992 Secondary Deliverables :	Target Dates
OU#2 RI/FS Sampling & Analysis Plan	19 April, 1992
OU#2 RI/FS Health and Safety Plan	19 April, 1992
[Agency Review Comments]	30 Days after reciept of document

Projected 1993 Primary Deliverables :	Projected Due Dates
-- NONE --	-- NONE --

** : Action occurs unless Dispute Resolution evoked by one of the three FAA Parties

Schedule Name : SMP Work Schedule for OU# 2
Responsible : US NAVY
As-of Date : 1-Oct-91 Schedule File : OU29293A

The proposed FFA CERCLA schedule for response actions at OU#2, Wastewater Treatment Area.

Task Name	Start Date	Duration	End Date
GEN Draft RI/FS WP	1-Oct-91	187.0 day	26-Apr-92
AWARD WORK	1-Oct-91	75.0 days	20-Dec-91
Develop Rough WP	20-Dec-91	30.0 days	3-Feb-92
NAVY Review Rough	3-Feb-92	30.0 days	5-Mar-92
Gen Draft WP	5-Mar-92	45.0 days	19-Apr-92
NAVY Mail Draft RI/FSWP	19-Apr-92	7.0 days	26-Apr-92
Draft RI/FS WP Issued	19-Apr-92	0.0	19-Apr-92
Gen Final RI/FS WP	26-Apr-92	254.0 day	26-Jan-93
Agency R&C Draft WP	26-Apr-92	90.0 days	27-Jul-92
AGENCY MAIL RCs	27-Jul-92	7.0 days	3-Aug-92
NAV ASSESS R&C	3-Aug-92	60.0 days	3-Oct-92
NAVY MAIL R OF RCs	3-Oct-92	7.0 days	10-Oct-92
NAVY GEN FINAL RI/FS WP	3-Oct-92	60.0 days	7-Dec-92
NAVY MAILS DFINAL	7-Dec-92	7.0 days	14-Dec-92
RI/FS WP GOES FINAL	14-Dec-92	30.0 days	26-Jan-93
RI/FS WP FINALIZED	26-Jan-93	0.0	26-Jan-93
RI Field Work	10-Jan-93	427.0 day	8-Apr-94
AWARD WORK	10-Jan-93	75.0 days	28-Mar-93
FW Mobilization	28-Mar-93	30.0 days	27-Apr-93
Do Field Work	27-Apr-93	187.0 day	4-Nov-93
Data Analysis	4-Nov-93	45.0 days	6-Jan-94

Task Name	Start Date	Duration	End Date
Data Validation	6-Jan-94	45.0 days	22-Feb-94
Gen D-PCSR	22-Feb-94	45.0 days	8-Apr-94
Review & Gen F-PCSR	8-Apr-94	89.0 days	8-Jul-94
Transmit D-PCSR	8-Apr-94	7.0 days	15-Apr-94
AGENCY REVIEW	15-Apr-94	30.0 days	15-May-94
Agency Transmits RCs	15-May-94	7.0 days	22-May-94
Navy Rvs RCs, Gen F-Rpt	22-May-94	45.0 days	8-Jul-94
Additional RI Field Wk.	8-Jul-94	1.0 day	9-Jul-94
NUMERICAL MODELING	10-Jan-93	472.0 day	23-May-94
AWARD WORK	10-Jan-93	75.0 days	28-Mar-93
Phase I NM Tasks	28-Mar-93	150.0 day	27-Aug-93
Phase II NM Tasks	22-Feb-94	60.0 days	23-Apr-94
Gen DNM Rpt.	23-Apr-94	30.0 days	23-May-94
Review & Gen F-NMRpt.	23-May-94	89.0 days	22-Aug-94
Transmit D-PCSR	23-May-94	7.0 days	31-May-94
AGENCY REVIEW	31-May-94	30.0 days	30-Jun-94
Agency Transmits RCs	30-Jun-94	7.0 days	8-Jul-94
Navy Rvs RCs, Gen F-Rpt	8-Jul-94	45.0 days	22-Aug-94
BASELINE RISK ASSESSMENT	10-Jan-93	479.0 day	31-May-94
AWARD WORK	10-Jan-93	75.0 days	28-Mar-93
Phase I BLRA Tasks	28-Mar-93	150.0 day	27-Aug-93
Phase II BLRA Tasks	22-Feb-94	60.0 days	23-Apr-94
PREPARE DRFT BASELINE	23-Apr-94	30.0 days	23-May-94
SUBMIT DRAFT BASELINE	23-May-94	7.0 days	31-May-94
Transmit D-BLRA	23-May-94	0.0	23-May-94
Gen Final BRA	31-May-94	254.0 day	2-Mar-95
AGENCY REVIEW	31-May-94	90.0 days	30-Aug-94
NAVY RECVS COMMENTS	30-Aug-94	7.0 days	7-Sep-94

Task Name	Start Date	Duration	End Date
NAVY R ON RCs	7-Sep-94	60.0 days	7-Nov-94
NAVY MAIL R ON RCs	7-Nov-94	7.0 days	15-Nov-94
PREPARE DRAFT/FINAL	7-Nov-94	60.0 days	23-Jan-95
SUBMIT DRAFT/FINAL	23-Jan-95	7.0 days	30-Jan-95
BASELINE FINALIZED	30-Jan-95	30.0 days	2-Mar-95
D-BLRA RPT Transmit.	23-Jan-95	0.0	23-Jan-95
DRAFT RI RPT DLVD	31-Jul-94	0.0	31-Jul-94
RI REPORT GENERATION	10-Jan-93	539.0 day	31-Jul-94
AWARD WORK	10-Jan-93	75.0 days	28-Mar-93
WORK RI TASKS	28-Mar-93	232.0 day	20-Nov-93
Develop Draft RI Rpt.	23-May-94	60.0 days	24-Jul-94
SUBMIT DRAFT RI RPT	24-Jul-94	7.0 days	31-Jul-94
GEN FINAL RI RPT	31-Jul-94	254.0 day	25-May-95
AGENCY REVIEW	31-Jul-94	90.0 days	31-Oct-94
NAVY RECVS COMMENTS	31-Oct-94	7.0 days	7-Nov-94
NAVY R on RCs	7-Nov-94	60.0 days	23-Jan-95
NAVY MAILS COMENTS	23-Jan-95	7.0 days	30-Jan-95
PREPARE DRAFT/FINAL	23-Jan-95	60.0 days	4-Apr-95
SUBMIT DRAFT/FINAL	4-Apr-95	7.0 days	13-Apr-95
RI REPORT FINALIZED	13-Apr-95	30.0 days	25-May-95
RI Finalized	25-May-95	0.0	25-May-95
TREATABILITY STUDY	10-Jan-93	478.0 day	29-May-94
AWARD WORK Plan Gen	10-Jan-93	75.0 days	28-Mar-93
Gen Work Plans	28-Mar-93	45.0 days	12-May-93
Award T/T WP	12-May-93	75.0 days	28-Jul-93
PERFORM TREATABILITY	28-Jul-93	150.0 day	14-Jan-94
Gen. D-T/T Rpt.	14-Jan-94	45.0 days	2-Mar-94
SUBMIT DRFT TREAT	2-Mar-94	7.0 days	9-Mar-94

Task Name	Start Date	Duration	End Date
AGENCY REVIEW	9-Mar-94	30.0 days	8-Apr-94
AGENCY MAILS RCs	8-Apr-94	7.0 days	15-Apr-94
NAVY Assess RCs	15-Apr-94	14.0 days	29-Apr-94
NAVY SENDS R OF RCs	29-Apr-94	7.0 days	6-May-94
TREAT STDY FINALIZED	29-Apr-94	30.0 days	29-May-94
FEASIBILITY STUDY	10-Jan-93	539.0 day	31-Jul-94
AWARD WORK	10-Jan-93	75.0 days	28-Mar-93
DO FS WORK TASKS	28-Mar-93	360.0 day	16-Apr-94
GEN. DRAFT FS RPT	23-May-94	60.0 days	24-Jul-94
SUBMIT DRAFT FS	24-Jul-94	7.0 days	31-Jul-94
DRAFT FS RPT DLVD	31-Jul-94	0.0	31-Jul-94
GEN FINAL FS RPT	31-Jul-94	254.0 day	25-May-95
AGENCY REVIEW	31-Jul-94	90.0 days	31-Oct-94
NAVY RECVS COMMENTS	31-Oct-94	7.0 days	7-Nov-94
NAVY R of RCs	7-Nov-94	60.0 days	23-Jan-95
NAVY Mail R of RCs	23-Jan-95	7.0 days	30-Jan-95
PREPARE DRFT/FINAL	23-Jan-95	60.0 days	4-Apr-95
SUBMIT DRAFT/FINAL	4-Apr-95	7.0 days	13-Apr-95
FS RPT goes final	13-Apr-95	30.0 days	25-May-95
FS Finalized	25-May-95	0.0	25-May-95
PROPOSED PLAN	25-May-95	142.0 day	19-Dec-95
AWARD PP & ROD WORK	25-May-95	75.0 days	12-Sep-95
PREPARE PP	12-Sep-95	60.0 days	8-Dec-95
SUBMIT DRAFT PP	8-Dec-95	7.0 days	19-Dec-95
DPP ISSUED	19-Dec-95	0.0	19-Dec-95
GEN FINAL PP	19-Dec-95	254.0 day	23-Dec-96
AGENCY REVIEW	19-Dec-95	90.0 days	29-Apr-96
AGENCY MAILS COMMENTS	29-Apr-96	7.0 days	8-May-96

Task Name	Start Date	Duration	End Date
NAVY R of RCs	8-May-96	60.0 days	2-Aug-96
NAVY MAILS COMENTSS	2-Aug-96	7.0 days	13-Aug-96
PREPARE DRAFT/FINAL	2-Aug-96	60.0 days	29-Oct-96
SUBMIT DRAFT/FINAL	29-Oct-96	7.0 days	7-Nov-96
PP goes final	7-Nov-96	30.0 days	23-Dec-96
PP FINAL ISSUED	23-Dec-96	0.0	23-Dec-96
PP PUB. MTG.	23-Dec-96	90.0 days	2-May-97
PREP PUB. MTG NOTICE	23-Dec-96	15.0 days	15-Jan-97
PUBLISH MTG NOTICE	15-Jan-97	30.0 days	28-Feb-97
COMMENTS FROM PUBLIC	28-Feb-97	45.0 days	2-May-97
PP Finalized	2-May-97	0.0	2-May-97
GEN DRAFT ROD	2-May-97	112.0 day	10-Oct-97
GEN RESPON. SUM	2-May-97	45.0 days	8-Jul-97
Review Pub Comments	2-May-97	15.0 days	23-May-97
Gen Summary	23-May-97	30.0 days	8-Jul-97
PREPARE DRAFT ROD	8-Jul-97	60.0 days	1-Oct-97
NAVY MAILS DROD	1-Oct-97	7.0 days	10-Oct-97
DRAFT ROD SUBMITTED	10-Oct-97	0.0	10-Oct-97
GEN FINAL ROD	10-Oct-97	254.0 day	16-Oct-98
AGENCY REVIEW	10-Oct-97	90.0 days	24-Feb-98
AGENCY MAILS COMMENTS	24-Feb-98	7.0 days	5-Mar-98
NAVY R of RCs	5-Mar-98	60.0 days	29-May-98
NAVY COMENTS mailed	29-May-98	7.0 days	9-Jun-98
NAVY GEN DFinal	29-May-98	60.0 days	24-Aug-98
NAVY mails DFinal	24-Aug-98	7.0 days	2-Sep-98
ROD GOES FINAL	2-Sep-98	30.0 days	16-Oct-98
ROD FINALIZED	16-Oct-98	0.0	16-Oct-98
ROD OFFICIAL	16-Oct-98	46.0 days	23-Dec-98

Task Name	Start Date	Duration	End Date
ROD SIGNATURE	16-Oct-98	1.0 day	19-Oct-98
PREP PUB. NOTICE	19-Oct-98	15.0 days	9-Nov-98
PUBLISH NOTICE	9-Nov-98	30.0 days	23-Dec-98
ROD FINAL & OFFICIAL	23-Dec-98	0.0	23-Dec-98

C. RI/FS Operable Unit #3 : The Industrial Area PSCs

Description :

An area on the east side of the air station comprising five PSCs: 11 - Hanger 101, 12 - Old Test Cell Building 101k, 13 - Radium Paint Waste Disposal Pit, 14 - Battery Shop, 15 - Ex-Solvent and Paint Sludge Disposal Area. The area is flat and adjacent to the St. Johns River. Located within this industrial complex is the Naval Aviation Depot and several helicopter squadrons. Previous studies have identified groundwater and subsurface soils contaminated with industrial solvents and heavy metals. No direct exposure threat presently exists to public health or the environment.

1992 Primary Documents :	Due Dates :
-- NONE --	-- NONE --
1992 Secondary Documents :	Target Dates :
-- NONE --	-- NONE --
Projected 1993 Primary Deliverables :	Projected Due Dates :
Draft RI/FS Work Plan	3 July, 1993
[Agency Review Comments]	90 Days after receipt of document
Final RI/FS Work Plan	120 Days after reciept of review comments

** : Action occurs unless Dispute Resolution evoked by one of the three FAA Parties

Schedule Name : SMP Work Schedule for OU# 3
Responsible : US NAVY
As-of Date : 27-Aug-91 Schedule File : OU39293C

The proposed FFA CERCLA schedule for response actions at OU#2, Wastewater Treatment Area.

Task Name	Start Date	Duration	End Date
GEN Draft RI/FS WP	4-Jan-93	187.0 day	10-Jul-93
AWARD WORK	4-Jan-93	75.0 days	20-Mar-93
Develop Rough WP	20-Mar-93	30.0 days	19-Apr-93
NAVY Review Rough	19-Apr-93	30.0 days	19-May-93
Gen Draft WP	19-May-93	45.0 days	3-Jul-93
NAVY Mail Draft RI/FSWP	3-Jul-93	7.0 days	10-Jul-93
Draft RI/FS WP Issued	3-Jul-93	0.0	3-Jul-93
Gen Final RI/FS WP	10-Jul-93	254.0 day	21-Mar-94
Agency R&C Draft WP	10-Jul-93	90.0 days	8-Oct-93
AGENCY MAIL RCs	8-Oct-93	7.0 days	15-Oct-93
NAV ASSESS R&C	15-Oct-93	60.0 days	14-Dec-93
NAVY MAIL R OF RCs	14-Dec-93	7.0 days	21-Dec-93
NAVY GEN FINAL RI/FS WP	14-Dec-93	60.0 days	12-Feb-94
NAVY MAILS DFINAL	12-Feb-94	7.0 days	19-Feb-94
RI/FS WP GOES FINAL	19-Feb-94	30.0 days	21-Mar-94
RI/FS WP FINALIZED	21-Mar-94	0.0	21-Mar-94
RI Field Work	6-Mar-94	427.0 day	7-May-95
AWARD WORK	6-Mar-94	75.0 days	20-May-94
FW Mobilization	20-May-94	30.0 days	19-Jun-94
Do Field Work	19-Jun-94	187.0 day	23-Dec-94
Data Analysis	23-Dec-94	45.0 days	6-Feb-95
Data Validation	6-Feb-95	45.0 days	23-Mar-95

Task Name	Start Date	Duration	End Date
Gen D-PCSR	23-Mar-95	45.0 days	7-May-95
Review & Gen F-PCSR	7-May-95	89.0 days	4-Aug-95
Transmit D-PCSR	7-May-95	7.0 days	14-May-95
AGENCY REVIEW	14-May-95	30.0 days	13-Jun-95
Agency Transmits RCs	13-Jun-95	7.0 days	20-Jun-95
Navy Rvs RCs, Gen F-Rpt	20-Jun-95	45.0 days	4-Aug-95
Additional RI Field Wk.	4-Aug-95	1.0 day	5-Aug-95
NUMERICAL MODELING	6-Mar-94	472.0 day	21-Jun-95
AWARD WORK	6-Mar-94	75.0 days	20-May-94
Phase I NM Tasks	20-May-94	150.0 day	17-Oct-94
Phase II NM Tasks	23-Mar-95	60.0 days	22-May-95
Gen DNM Rpt.	22-May-95	30.0 days	21-Jun-95
Review & Gen F-NMRpt.	21-Jun-95	89.0 days	18-Sep-95
Transmit D-PCSR	21-Jun-95	7.0 days	28-Jun-95
AGENCY REVIEW	28-Jun-95	30.0 days	28-Jul-95
Agency Transmits RCs	28-Jul-95	7.0 days	4-Aug-95
Navy Rvs RCs, Gen F-Rpt	4-Aug-95	45.0 days	18-Sep-95
BASELINE RISK ASSESSMENT	6-Mar-94	479.0 day	28-Jun-95
AWARD WORK	6-Mar-94	75.0 days	20-May-94
Phase I BLRA Tasks	20-May-94	150.0 day	17-Oct-94
Phase II BLRA Tasks	23-Mar-95	60.0 days	22-May-95
PREPARE DRFT BASELINE	22-May-95	30.0 days	21-Jun-95
SUBMIT DRAFT BASELINE	21-Jun-95	7.0 days	28-Jun-95
Transmit D-BLRA	21-Jun-95	0.0	21-Jun-95
Gen Final BRA	28-Jun-95	254.0 day	12-Mar-96
AGENCY REVIEW	28-Jun-95	90.0 days	26-Sep-95
NAVY RECVS COMMENTS	26-Sep-95	7.0 days	3-Oct-95
NAVY R ON RCs	3-Oct-95	60.0 days	2-Dec-95

Task Name	Start Date	Duration	End Date
NAVY MAIL R ON RCs	2-Dec-95	7.0 days	9-Dec-95
PREPARE DRAFT/FINAL	2-Dec-95	60.0 days	31-Jan-96
SUBMIT DRAFT/FINAL	31-Jan-96	7.0 days	7-Feb-96
BASELINE FINALIZED	7-Feb-96	30.0 days	12-Mar-96
D-BLRA RPT Transmit.	31-Jan-96	0.0	31-Jan-96
DRAFT RI RPT DLVD	27-Aug-95	0.0	27-Aug-95
RI REPORT GENERATION	6-Mar-94	539.0 day	27-Aug-95
AWARD WORK	6-Mar-94	75.0 days	20-May-94
WORK RI TASKS	20-May-94	232.0 day	7-Jan-95
Develop Draft RI Rpt.	21-Jun-95	60.0 days	20-Aug-95
SUBMIT DRAFT RI RPT	20-Aug-95	7.0 days	27-Aug-95
GEN FINAL RI RPT	27-Aug-95	254.0 day	5-Jun-96
AGENCY REVIEW	27-Aug-95	90.0 days	25-Nov-95
NAVY RECVS COMMENTS	25-Nov-95	7.0 days	2-Dec-95
NAVY R on RCs	2-Dec-95	60.0 days	31-Jan-96
NAVY MAILS COMENTS	31-Jan-96	7.0 days	7-Feb-96
PREPARE DRAFT/FINAL	31-Jan-96	60.0 days	12-Apr-96
SUBMIT DRAFT/FINAL	12-Apr-96	7.0 days	23-Apr-96
RI REPORT FINALIZED	23-Apr-96	30.0 days	5-Jun-96
RI Finalized	5-Jun-96	0.0	5-Jun-96
TREATABILITY STUDY	6-Mar-94	478.0 day	27-Jun-95
AWARD WORK Plan Gen	6-Mar-94	75.0 days	20-May-94
Gen Work Plans	20-May-94	45.0 days	4-Jul-94
Award T/T WP	4-Jul-94	75.0 days	17-Sep-94
PERFORM TREATABILITY	17-Sep-94	150.0 day	14-Feb-95
Gen. D-T/T Rpt.	14-Feb-95	45.0 days	31-Mar-95
.SUBMIT DRFT TREAT	31-Mar-95	7.0 days	7-Apr-95
AGENCY REVIEW	7-Apr-95	30.0 days	7-May-95

Task Name	Start Date	Duration	End Date
AGENCY MAILS RCs	7-May-95	7.0 days	14-May-95
NAVY Assess RCs	14-May-95	14.0 days	28-May-95
NAVY SENDS R OF RCs	28-May-95	7.0 days	4-Jun-95
TREAT STDY FINALIZED	28-May-95	30.0 days	27-Jun-95
FEASIBILITY STUDY	6-Mar-94	539.0 day	27-Aug-95
AWARD WORK	6-Mar-94	75.0 days	20-May-94
DO FS WORK TASKS	20-May-94	360.0 day	15-May-95
GEN. DRAFT FS RPT	21-Jun-95	60.0 days	20-Aug-95
SUBMIT DRAFT FS	20-Aug-95	7.0 days	27-Aug-95
DRAFT FS RPT DLVD	27-Aug-95	0.0	27-Aug-95
GEN FINAL FS RPT	27-Aug-95	254.0 day	5-Jun-96
AGENCY REVIEW	27-Aug-95	90.0 days	25-Nov-95
NAVY RECVS COMMENTS	25-Nov-95	7.0 days	2-Dec-95
NAVY R of RCs	2-Dec-95	60.0 days	31-Jan-96
NAVY Mail R of RCs	31-Jan-96	7.0 days	7-Feb-96
PREPARE DRFT/FINAL	31-Jan-96	60.0 days	12-Apr-96
SUBMIT DRAFT/FINAL	12-Apr-96	7.0 days	23-Apr-96
FS RPT goes final	23-Apr-96	30.0 days	5-Jun-96
FS Finalized	5-Jun-96	0.0	5-Jun-96
PROPOSED PLAN	5-Jun-96	142.0 day	30-Dec-96
AWARD PP & ROD WORK	5-Jun-96	75.0 days	20-Sep-96
PREPARE PP	20-Sep-96	60.0 days	18-Dec-96
SUBMIT DRAFT PP	18-Dec-96	7.0 days	30-Dec-96
DPP ISSUED	30-Dec-96	0.0	30-Dec-96
GEN FINAL PP	30-Dec-96	254.0 day	5-Jan-98
AGENCY REVIEW	30-Dec-96	90.0 days	8-May-97
AGENCY MAILS COMMENTS	8-May-97	7.0 days	19-May-97
NAVY R of RCs	19-May-97	60.0 days	13-Aug-97

Task Name	Start Date	Duration	End Date
NAVY MAILS COMENTSS	13-Aug-97	7.0 days	22-Aug-97
PREPARE DRAFT/FINAL	13-Aug-97	60.0 days	7-Nov-97
SUBMIT DRAFT/FINAL	7-Nov-97	7.0 days	19-Nov-97
PP goes final	19-Nov-97	30.0 days	5-Jan-98
PP FINAL ISSUED	5-Jan-98	0.0	5-Jan-98
PP PUB. MTG.	5-Jan-98	90.0 days	13-May-98
PREP PUB. MTG NOTICE	5-Jan-98	15.0 days	27-Jan-98
PUBLISH MTG NOTICE	27-Jan-98	30.0 days	11-Mar-98
COMMENTS FROM PUBLIC	11-Mar-98	45.0 days	13-May-98
PP Finalized	13-May-98	0.0	13-May-98
GEN DRAFT ROD	13-May-98	112.0 day	22-Oct-98
GEN RESPON. SUM	13-May-98	45.0 days	17-Jul-98
Review Pub Comments	13-May-98	15.0 days	4-Jun-98
Gen Summary	4-Jun-98	30.0 days	17-Jul-98
PREPARE DRAFT ROD	17-Jul-98	60.0 days	13-Oct-98
NAVY MAILS DROD	13-Oct-98	7.0 days	22-Oct-98
DRAFT ROD SUBMITTED	22-Oct-98	0.0	22-Oct-98
GEN FINAL ROD	22-Oct-98	254.0 day	27-Oct-99
AGENCY REVIEW	22-Oct-98	90.0 days	5-Mar-99
AGENCY MAILS COMMENTS	5-Mar-99	7.0 days	16-Mar-99
NAVY R of RCs	16-Mar-99	60.0 days	9-Jun-99
NAVY COMENTS mailed	9-Jun-99	7.0 days	18-Jun-99
NAVY GEN DFinal	9-Jun-99	60.0 days	2-Sep-99
NAVY mails DFinal	2-Sep-99	7.0 days	14-Sep-99
ROD GOES FINAL	14-Sep-99	30.0 days	27-Oct-99
ROD FINALIZED	27-Oct-99	0.0	27-Oct-99
ROD OFFICIAL	27-Oct-99	46.0 days	5-Jan-00
ROD SIGNATURE	27-Oct-99	1.0 day	28-Oct-99

Task Name	Start Date	Duration	End Date
PREP PUB. NOTICE	28-Oct-99	15.0 days	19-Nov-99
PUBLISH NOTICE	19-Nov-99	30.0 days	5-Jan-00
ROD FINAL & OFFICIAL	5-Jan-00	0.0	5-Jan-00

Schedule Name : Informal Expedited Work Schedule for 1992 - 1993
Responsible : US NAVY
As-of Date : 27-Aug-91 9:00a . Schedule File : IEXS9293

Task Name	Start Date	Duration	End Date
OU#1 SCHEDULE	30-Jul-91	850.0 day	26-Nov-93
Gen. DF RI/FS WP	30-Jul-91	45.0 days	13-Sep-91
RI/FS WP FINALIZED	13-Sep-91	15.0 days	28-Sep-91
FIELD WORK START	28-Sep-91	50.0 days	17-Nov-91
FIELD WORK COMPLETED	17-Nov-91	217.0 day	21-Jun-92
DATA VAL. & ASSESSMENT	21-Jun-92	90.0 days	19-Sep-92
GEN. DRAFT RI/FS REPORT	19-Sep-92	90.0 days	18-Dec-92
AGENCY REVIEW	18-Dec-92	45.0 days	1-Feb-93
GEN. DFINAL RI/FS REPORT	1-Feb-93	90.0 days	2-May-93
GEN. DRAFT PROPOSED PLAN	2-Apr-93	30.0 days	2-May-93
FINAL RI/FS REPORT	2-May-93	15.0 days	17-May-93
RECEIVE PP REVIEW COMMENTS	2-May-93	21.0 days	23-May-93
DRAFT FINAL PROPOSED PLAN	23-May-93	21.0 days	13-Jun-93
PP FINALIZED	13-Jun-93	0.0	13-Jun-93
PUBLIC NOTICE	13-Jun-93	30.0 days	13-Jul-93
PUBLIC MEETING	13-Jul-93	1.0 day	14-Jul-93
COMMENT PERIOD BEGINS	14-Jul-93	0.0	14-Jul-93
END OF COMMENT PERIOD	14-Jul-93	45.0 days	28-Aug-93
DRAFT RESPONSIVENESS SUMMARY	28-Aug-93	30.0 days	27-Sep-93
DRAFT RECORD OF DECISION	6-Sep-93	21.0 days	27-Sep-93
AGENCY REVIEW	27-Sep-93	30.0 days	27-Oct-93
DRAFT FINAL ROD	27-Oct-93	30.0 days	26-Nov-93

August 26, 1991

REVISION 1.0

INFORMAL EXPEDITED SCHEDULE

INSTALLATION RESTORATION PROGRAM

NAVAL AIR STATION JACKSONVILLE, FL.

OPERABLE UNITS No.s 1, 2, AND 3

SOUTHERN DIVISION

NAVAL FACILITIES ENGINEERING COMMAND

CHARLESTON, SOUTH CAROLINA

Task Name	Start Date	Duration	End Date
OU#2 SCHEDULE	1-Oct-91	1,076.0 d	11-Sep-94
AWARD & GEN. DRI/FS WP	1-Oct-91	135.0 day	13-Feb-92
D RI/FS WP DLVD.	13-Feb-92	1.0 day	14-Feb-92
AGENCY REVIEW	14-Feb-92	45.0 days	30-Mar-92
Gen. DF RI/FS WP	30-Mar-92	90.0 days	28-Jun-92
RI/FS WP FINALIZED	28-Jun-92	15.0 days	13-Jul-92
FIELD WORK START	13-Jul-92	50.0 days	1-Sep-92
FIELD WORK COMPLETED	1-Sep-92	217.0 day	6-Apr-93
DATA VAL. & ASSESSMENT	6-Apr-93	90.0 days	5-Jul-93
GEN. DRAFT RI/FS REPORT	5-Jul-93	90.0 days	3-Oct-93
AGENCY REVIEW	3-Oct-93	45.0 days	17-Nov-93
GEN. DFINAL RI/FS REPORT	17-Nov-93	90.0 days	15-Feb-94
GEN. DRAFT PROPOSED PLAN	16-Jan-94	30.0 days	15-Feb-94
FINAL RI/FS REPORT	15-Feb-94	15.0 days	2-Mar-94
RECEIVE PP REVIEW COMMENTS	15-Feb-94	21.0 days	8-Mar-94
DRAFT FINAL PROPOSED PLAN	8-Mar-94	21.0 days	29-Mar-94
PP FINALIZED	29-Mar-94	0.0	29-Mar-94
PUBLIC NOTICE	29-Mar-94	30.0 days	28-Apr-94
PUBLIC MEETING	28-Apr-94	1.0 day	29-Apr-94
COMMENT PERIOD BEGINS	29-Apr-94	0.0	29-Apr-94
END OF COMMENT PERIOD	29-Apr-94	45.0 days	13-Jun-94
DRAFT RESPONSIVENESS SUMMARY	13-Jun-94	30.0 days	13-Jul-94
DRAFT RECORD OF DECISION	22-Jun-94	21.0 days	13-Jul-94
AGENCY REVIEW	13-Jul-94	30.0 days	12-Aug-94
DRAFT FINAL ROD	12-Aug-94	30.0 days	11-Sep-94

Task Name	Start Date	Duration	End Date
OU#3 SCHEDULE	13-Jul-92	1,076.0 d	24-Jun-95
AWARD & GEN. DRI/FS WP	13-Jul-92	135.0 day	25-Nov-92
D RI/FS WP DLVD.	25-Nov-92	1.0 day	26-Nov-92
AGENCY REVIEW	26-Nov-92	45.0 days	10-Jan-93
Gen. DF RI/FS WP	10-Jan-93	90.0 days	10-Apr-93
RI/FS WP FINALIZED	10-Apr-93	15.0 days	25-Apr-93
FIELD WORK START	25-Apr-93	50.0 days	14-Jun-93
FIELD WORK COMPLETED	14-Jun-93	217.0 day	17-Jan-94
DATA VAL. & ASSESSMENT	17-Jan-94	90.0 days	17-Apr-94
GEN. DRAFT RI/FS REPORT	17-Apr-94	90.0 days	16-Jul-94
AGENCY REVIEW	16-Jul-94	45.0 days	30-Aug-94
GEN. DFINAL RI/FS REPORT	30-Aug-94	90.0 days	28-Nov-94
GEN. DRAFT PROPOSED PLAN	29-Oct-94	30.0 days	28-Nov-94
FINAL RI/FS REPORT	28-Nov-94	15.0 days	13-Dec-94
RECEIVE PP REVIEW COMMENTS	28-Nov-94	21.0 days	19-Dec-94
DRAFT FINAL PROPOSED PLAN	19-Dec-94	21.0 days	9-Jan-95
PP FINALIZED	9-Jan-95	0.0	9-Jan-95
PUBLIC NOTICE	9-Jan-95	30.0 days	8-Feb-95
PUBLIC MEETING	8-Feb-95	1.0 day	9-Feb-95
COMMENT PERIOD BEGINS	9-Feb-95	0.0	9-Feb-95
END OF COMMENT PERIOD	9-Feb-95	45.0 days	26-Mar-95
DRAFT RESPONSIVENESS SUMMARY	26-Mar-95	30.0 days	25-Apr-95
DRAFT RECORD OF DECISION	4-Apr-95	21.0 days	25-Apr-95
AGENCY REVIEW	25-Apr-95	30.0 days	25-May-95
DRAFT FINAL ROD	25-May-95	30.0 days	24-Jun-95

APPENDIX B-2

1996 CLOSURE PLAN FOR POTENTIAL SOURCES OF CONTAMINATION 41, 42, AND 43 AT NAVAL AIR STATION JACKSONVILLE

ATTACHMENT T

CLOSURE PLANS

ATTACHMENT T

CLOSURE PLANS

T-1.0 INTRODUCTION

Information provided in this section is submitted in accordance with the requirements of FDEP instructions (II.K.) regarding closure and post-closure of the hazardous waste units.

NAS Jacksonville is included on the CERCLA National Priority List (NPL) of contaminated sites. The Navy is addressing its CERCLA responsibilities at NAS Jacksonville under the Navy Installation Restoration Program (IRP). The manner and means in which the Navy will perform remedial actions at the sites and interact with the FDEP and the USEPA are detailed in the Federal Facilities Agreement (FFA). Therefore, closure of these units will be in accordance with the FFA.

T-2.0 THE OLD PLATING SHOP - BUILDING 101

Foster Wheeler was retained by Naval Environmental and Energy Support Agency (NEESA) to perform the closure of the Old Plating Shop - Building 101. The report titled, *Certification and Closure Report and Comprehensive Environmental Response, Compensation and Liability Act Soil Contamination Reduction, Building 101, Naval Aviation Depot's Former Plating Shop* was completed in November 1995 by ABB Environmental Services, Inc. for closure of the Old Plating Shop - Building 101. The Old Plating Shop - Building 101 closure report provided the following:

- site background
- an outline of the closure activities
- waste disposal procedures
- demobilization procedures, and
- CERCLA soil contaminant reduction

A copy of this report was submitted to FDEP on November 30, 1995.

T-3.0 SLUDGE DRYING BEDS

Bechtel Environmental, Inc. was retained by Southern Division, Naval Facilities Engineering

Command to prepare a work plan for the closure of the industrial and domestic sludge drying beds. The report prepared under the NAS Jacksonville CERCLA Installation Restoration Program titled, *Interim Remediation Work Plan for Potential Source of Contamination 41 and 43* was completed in July 1995. The work plan provides the following information:

- site background
- remedial action objectives and interim action description
- contaminants of concern and cleanup criteria
- an outline of closure activities include soil excavation and stabilization
- site restoration, and
- a sampling and analysis plan

T-4.0 THE POLISHING POND

Bechtel Environmental, Inc. was retained by Southern Division, Naval Facilities Engineering Command to prepare a work plan for the closure of the polishing pond. The report prepared under the NAS Jacksonville CERCLA Installation Restoration Program titled, *Interim Remediation Work Plan Serpentine Pond (PSC 42), In-Situ Sludge/Soil Stabilization* was completed in September 1995. The work plan provides the following information:

- site background
- remediation activities such as water treatment and soil stabilization
- waste management
- a quality control plan, and
- a sampling and analysis plan

T-5.0 POST CLOSURE REQUIREMENTS FOR THE OLD PLATING SHOP-BUILDING 101

In order to establish clean closure at the Old Plating Shop - Building 101, ground water sampling will occur quarterly for one year and semi-annually thereafter.

Two wells are to be installed and sampled in addition to an existing piezometer (PZ021) at that site. It is proposed that sampling begin in July 1997 to allow for well installation. The ground water will be sampled for Appendix IX volatiles, semi-volatile organics, metals and cyanide. A cap is not proposed for the Old Plating Shop-Building 101 as a new building has been constructed which covers this site and as such is acting as a cap.

In the event contamination is determined, remedial activities will be addressed under the CERCLA Remediation Program for which RCRA will be an ARAR.

T-6.0 ADDITIONAL CLOSURE REQUIREMENTS - ISDB, DSDB, AND PP

A partnering meeting with representatives from FDEP, EPA, NAS Jacksonville, and Southern Division Naval Facilities Engineering Command took place on February 13, 1996 in order to discuss the closure and post-closure activities of the ISDB, DSDB and PP. In order to establish clean closure, it was decided that ground-water at the polishing pond (PSC42) and the domestic sludge drying bed (PSC 41) would be sampled utilizing selected monitoring wells.

Representatives of NAS Jacksonville subsequently met with FDEP on March 15, 1996 and agreed that ground-water monitoring at the polishing pond would be semi-annual for the first year, annually for the next four years with a review at the fifth year to determine clean closure. The industrial and domestic sludge drying beds would be monitored quarterly the first year. A complete statistical analysis of contaminants found would be performed at the end of one year to determine if clean closure had been achieved. A copy of the partnering meeting minutes and subsequent correspondence has been included at the end of this section.

After execution of the above referenced work plans and groundwater monitoring program for the ISDBs, DSDBs, and PP, any other remedial work required by the IR Program at the ISDB, DSDB, or PP will be addressed under the CERCLA Remediation Program for which RCRA will be an ARAR.

T-7.0 QUALITY ASSURANCE PLAN [FAC 62-160]

The laboratory selected to perform the analytical work for the closure will have an approved Quality Assurance Plan (QAP) on file with the FDEP. NAS Jacksonville will notify FDEP of its laboratory choice before closure work begins.

To: Jodi L Lloveras@Code 18
From: Dana D Gaskins@Code 18
Originated by: diane_lancaster@ABBSMTP.abb.com (diane lancaster)@NAVFAC EFDSOUTH
Cc: Anthony B Robinson@Code 18,Mark J Turnbull@Code 18
Bcc:
Subject: fwd: OU2/RCRA meeting at FDEP
Attachment: Headers.822
Date: 3/18/96 7:44 AM

Post-it™ brand fax transmittal memo 7671 | # of pages ▸

To Nicole Shope	From Jodi Lloveras
Co. KUST	Co. SOUTHDIV
Dept.	Phone # 820-5583
Fax # 572-5661	Fax # -7465

Jodi,
For you from Diane and Jane.
Dana

Original text
From diane_lancaster@ABBSMTP.abb.com (diane lancaster), on 3/18/96 7:37 AM:
To: <ddgaskins@efdsouth.navfac.navy.mil>, <berry.martha@epamail.epa.gov>, <caspary_j@dep.state.fl.us>, <G=hermann%S=bauer%bechtel@mcimail.com>, <G=valerie%S-mccain%bechtel@mcimail.com>, <phylissa_miller@ABBSMTP.abb.com>, <CN=JesseTremaine/OU=USEVS/O=ABB@ABB_USEVS.abb.com>

Dana, please also pass this to Jodi:

Jane and I met with Jorge, Merlyn Russell and a couple other people from FDEP, with Lissa and Jesse, on Friday, March 15, 1996.

Discussed was the proposed plan for the compliance wells for OU2 (PSCs 41,42, and 43). Our plan was modified from the one we agreed to at the Partnering meeting.

At PSC 42, Polishing Pond, semi-annual for first year, annually for the next four years, review at year five. The wells to be monitored are 42-5, 42-6D, 42-7, and an additional well to be installed as close as possible at the northeast of the pond (on the north side).

At PSCs 41 and 43, the sludge drying beds, quarterly monitoring the first year (four samples for each event allowing the well casing to clear of sampled water based on groundwater flow). Complete statistical analysis of contaminants found will be done at the completion of one year to determine if clean closure has been achieved and beds can be removed from RCRA. The wells to be sampled are 4, 5, and 12D at the industrial beds, and 41-6 and either 3 or 4, plus a deep well at the domestic beds.

The analytical for the routine monitoring will be the same we sample for now. One set of confirmatory Appendix IX samples will be required for PSCs 41 and 43. We can delete, with justification in the report, pesticides, furans,

NAS JACKSONVILLE PARTNERING MEETING
FEBRUARY 13 & 14, 1996

ıES

ıirperson: Jorge Caspary (FDEP)

əmbers: Martha Berry (gatekeeper/time keeper) (EPA), Mark Turnbull, Jesse Tremaine, Dana Gaskins (recorder), Phylissa Miller, Diane Lancaster, Herman Bauer

ˑcilitator: Tim Schofield

ər II: Absent

ıpport: Hal Davis (USGS), Larry Blackburn (ROICC), Ed Walker (Bechtel), Bill Doughtery (NAS), Kelly Murray (ABB), Sandy Maynard (NAS)

ıests: Jodi Lloveras (SDIV), Denise Klimas (NOAA), John Barnard (Timiquana Country Club)

ıcation: The Winterbourne House, Orange Park, Fl

February, 1996

Item 1.0 Team Meeting and Introductions

The meeting began with the team check-in and guests introduction. The team ground rules were read by Jorge.

ISENSUS ITEM: Consensus was reached on last meeting agreements.

Last meeting action items were reviewed:
OU1 LNAPL - Document from Foster Wheeler is to be signed and sealed.
OU2 Groundwater - FDEP talked with EPA about concerns they had and the agreements which were reached.
RRDS - NOAA to review the appendices and contact Diane with comments.
OU1 RI/FS - FS to be out 15 March 1996. Mailing list for RI/FS was updated.
PSC 42 - mixing/stabilization comments from FDEP were incorporated.
PSC 47 - SJWMD (Bob Brodie) to sample only for PCBs. FDEP and EPA agreed.
PSC 30 - Awaiting results from Brown and Root.
Casa Linda Lake - NELP - has to be DERA funds. Not going to happen.
PSC 42 communication - no longer an issue. Notice to proceed issued.
OU3 EECA - Negotiated. Awaiting funds.
PSC 18 Update - Ed Walker to look at. Preparing to backfill.
OU1 FS to be reviewed.

PSC 42/Timiquana Country Club Golf Course Retention Pond

John Barnard from Timiquana country club gave a presentation on the golf course retention pond which they are preparing to build. The pond will hold water from the domestic waste water treatment plant. The pond is to be 1.9 acres. They will have to de-water for about one week approximately one week for construction. They have concerns about the piping which will come from the chlorination unit to the pond. Bids to be out 12 Feb and they should be able to support furnishing the soil for PSC 42 remediation. They would like access through the fence. The base CO had said that is no problem. There is to be a deep well placed at the pond.

- **ACTION ITEM:** (Timiquana Country Club) Provide logs of the well to NAS Jacksonville (Diane Lancaster).

- **ACTION ITEM:** (NAS) Provide well logs to USGS (Hal Davis).

3. **Radiological Characterization**

Ed Walker gave a presentation on the Radiological Characterization of the sites which received a radiological survey.
- PSC 13 and 26A are finished.
- The survey protocol was "expect to find nothing".

PSC 3 - a large area
- 3 above background areas were found.
- no samples were taken therefore we don't know if readings were from radium.
- Conclusion: The area cannot be released for unrestricted used.

PSC 9 - size is several acres
- several hot spots
- Conclusion: Max hot spot dose rate of 50 microcuries/hr. Needs remediation.

PSC 15 - 3 hot spots
- hit of 20 picoCurie/gram
- Conclusion: - Needs remediation.

PSCs 25, 32, 41, 43
- one elevated area in PSC 32.
- 25, 41, and 43 - unrestricted release.
- 32 -look at on a tighter grid.

PSCs 16, 40, 42
- sediment samples
- no further radiological action required.

PSC 3 needs radiological data in RI.
BEI needs funding for radiological reports.

- **ACTION ITEM:** (SDIV) See if funding can be obtained for PSC 3 RAD Issue.

- **CONCENSUS ITEM:** Team will leave PSC 3 out of OU2 RI if SDIV cannot get funding.

4. **OU2 GROUNDWATER**

Groundwater monitoring/confirmation was discussed with the following plan decided upon:
- Five new monitoring wells will be installed.
  - PSC 2 - One well will be located at the center of the fire fighting training area near location 40.
  - PSC 2 - One well will be located downgradient of the fire fighting training area near DPT18.
  - PSC 3 - One well will be located at location 25.
  - PSC 4 - One well will be located at location 36.
  - PSC 42 - One well will be located at location 12.
- PSC 41 and 43 will used compliance wells.
- PSC 42 will use monitoring wells MW 42-5 and 42-7 in addition to the new well above.
- Monitoring will be as follows:
  - PSC 42 will be semiannual for the first year, once for the second year, and then once at year five.
  - PSC 41 will be the same as stated for PSC 42 above. PSC 41 sampling will be reduced to one time after removal to PSC 42.
  - PSC 43 will be sampled one time to prove clean closure.

- **CONSENSUS ITEM:** Consensus was reached on the well installation locations and monitoring plan.

- **TEAM AGREEMENT:** OU2 RI will be delayed until installation of new wells to allow consolidation of OU2 and OU3 well drilling.

14 February 1996

5. **SMP Discussion**
The SMP was discussed and the team decided to go with the best dates we have based on current funding. FDEP is not sure about how RCRA is going to react without the SMP being final. RCRA may not wait for enforcement.

- **ACTION ITEM:** (ABB) ABB will provide a new SMP schedule with input from SDIV, Bechtel, NAS and will provide to FDEP and EPA by 2/21.

6. **OU1 RI/FS**
Final RI/FS will be out from production 15 March.
Team to select alternative at the 19 March meeting.
- FDEP and EPA currently like alternative 2.
NOAA is going to look at Ecological data.

7. **Partnering Issues**
Tim Schofield from Galileo addressed "Where does the team stand".
- Team Manual needs to be developed/finished.

- **ACTION ITEM:** (FDEP) Provide mission statement and charter to Galileo.

"Do we need a facilitator?"
- Tim to talk with Jerry Arcaro to see if we still need them.
Can Tier II give the Jacksonville team an evaluation?
- Are we doing well?

8. **OU1 LNAPL UPDATE**
Still producing about fifty-five gallons a month.
One of the wells is not plumb. Pump hangs up but can be manipulated to raise/lower.

9. **NOAA: Denise Klimas gave a presentation on NOAA's role.**

10. **OU3 EECAs for Building 106 and 780**
Bechtel can change system with ABB approval.
Detail shop drawings from the vendors to be submitted at completion of installation.

11. **OU3 Plating Shop Closure Report**
FDEP reviewing.
POC @ NAS - Jane Mears
POC @ SDIV - Jodi Lloveras

- **ACTION ITEM:** (FDEP) Update @ next meeting.

12. **OU3 Other Issues**
Tank 101-12 was pulled and there was evidence of a release. FDEP Northeast District was notified.

13. **Miscellaneous**

Brown and Root Sampling

FDEP did not understand what the sampling which was being done was for. It was explained that this sampling was for the Navy's Relative Risk Program and not for site screening. They took samples at several bases and not just Jacksonville.

SOUTHDIV will update team on the results of the sampling.

14. **April Meeting**

Due to difficulty in finding lodging in close proximity to a meeting place in Atlanta, The meeting location has been changed to Jacksonville.

- **Consensus Item:** The team agreed to change the location for the April meeting from Atlanta to Jacksonville.

15. **Partnering Meeting Times**

A discussion was held to determine if the time of the partnering meetings could be changed to meet on the third Tuesday of the month to coincide with the RAB meetings. This was found not to be possible due to existing commitments by Partnering Team members. FDEP stated they would only be able to attend every other RAB due to budget constraints.

16. **PSC 18 Remediation**

Most of the remediation has been completed. There is a five foot strip that has not been completed due to its proximity to the shoreline.

It was stated that if there is mitigation required, then CNO has to notified.

There will have to be a permit required due to wetlands being disturbed.

The permit will be submitted and NAS will then meet with FDEP (Ernie Fry) to try to expedite processing.

- **Action Item:** (NAS) Coordinate with Bechtel regarding Environmental Resource Permit.

17. **Partnering**

- **Consensus Item:** Lissa Miller was made a member of the team.

ENTITY	ACTION NEEDED
NAS	Provide well logs to USGS (Hal Davis).
SDIV	See if funding can be obtained for PSC 3 RAD issue.
ABB	ABB will provide a new SMP schedule with input from SDIV, Bechtel, NAS and will provide to FDEP and EPA by 2/21.
FDEP	Provide mission statement and charter to Galileo.
FDEP	Update on plating shop closure report @ next meeting.
NAS	Coordinate with Bechtel regarding Environmental Resource Permit.

* This is the meeting we agreed to do interim removal actions using EE/CA (Engineering Evaluation / Cost Analysis) vice IRA, and will incorporate all into RI/FS for Operable Unit 3 (NADEP). In English - we will address contaminated groundwater at 101 through CERCLA, using EE/CA to perform removal actions.
YES

NAS JACKSONVILLE PARTNERING MEETING
Feb 13-15, 1995

MINUTES

Chairman: Dana Gaskins

Members: Jorge Caspary, Diane Lancaster, Hermann Bauer, Peter Redfern, Martha Berry, Kevin Gartland, Fred Milton

Absent: Tom Trainor

Tier II Link: None

Facilitator: Wandy Browne

Support: Mark Turnbull, Jesse Tremaine, Bill Weber, Fred Bragdon

Location: Atlanta, GA

---

1. The meeting began with the team huddle, team member greeting and check-in, and assignment of team meeting organizational roles. Mark Turnbull introduced as the proposed SODIV co-member.

2. Members present completed Conflict Resolution and New Member Entrance Procedure norms.

3. Guests Bill Weber and Mike Maughon were introduced and team ground rules were read in the afternoon. Meeting minutes reviewed and consensus reached on 2/15. Action items reviewed.

4. CONSENSUS ITEM: Consensus reached concerning Conflict Resolution norms and New Member Entrance Procedures.

5. OU3

   a. GOAL: Consensus on course of action for OU3 Phase I field investigation.

Presentation by Jesse Tremaine concerning the characterization logic for the approach to be used to investigate OU3. Discussion followed concerning contractual requirements to implement proposed logic.

Non-time critical removal action, funds currently not slated,

ACTION: SODIV (Dana) will check to see if money will be available sooner for OU3 Phase I field investigation.

Team members requested to make timely decisions as data is presented based on characterization logic. Mike Maughon requested that the tree be modified to include another question at each decision block: "Does the Source Area warrant Interim Removal?" If no, decision will be to postpone removal action.

CONSENSUS ITEM: Team agreed to use characterization logic as modified.

FDEP expressed concerned that the removal action at OU3 will not be timely enough to warrant an EE/CA based on Navy funding constraints.

ACTION: SODIV to contact FDEP concerning funding availability for time critical removal action based upon water quality degradation at OU3.

ACTION: ABB to provide timeline for EE/CA action at OU3 as part of the POA process

ACTION: SODIV to investigate whether ABB/Bechtel can produce products such as "OU3 characterization logic" or "OU3 hotspots list with the reasoning for hot spots" to team w/o contract change.

ACTION: SODIV to provide SOW to ABB regarding characterization logic.

ACTION: ABB to prepare POA response, which will be distributed to all partnering members (less the cost data) using characterization logic.

b. EPA Grant Opportunity for Bioremediation

GOAL: Information

$150K grant to ABB, Wakefield office for bioremediation of soil contaminated with TCE/PCE. Possible site would be Bldg 106.

ACTION: Willard Murray from ABB Wakefield Office will provide more information at the March Telecon concerning EPA Bioremediation Grant funds.

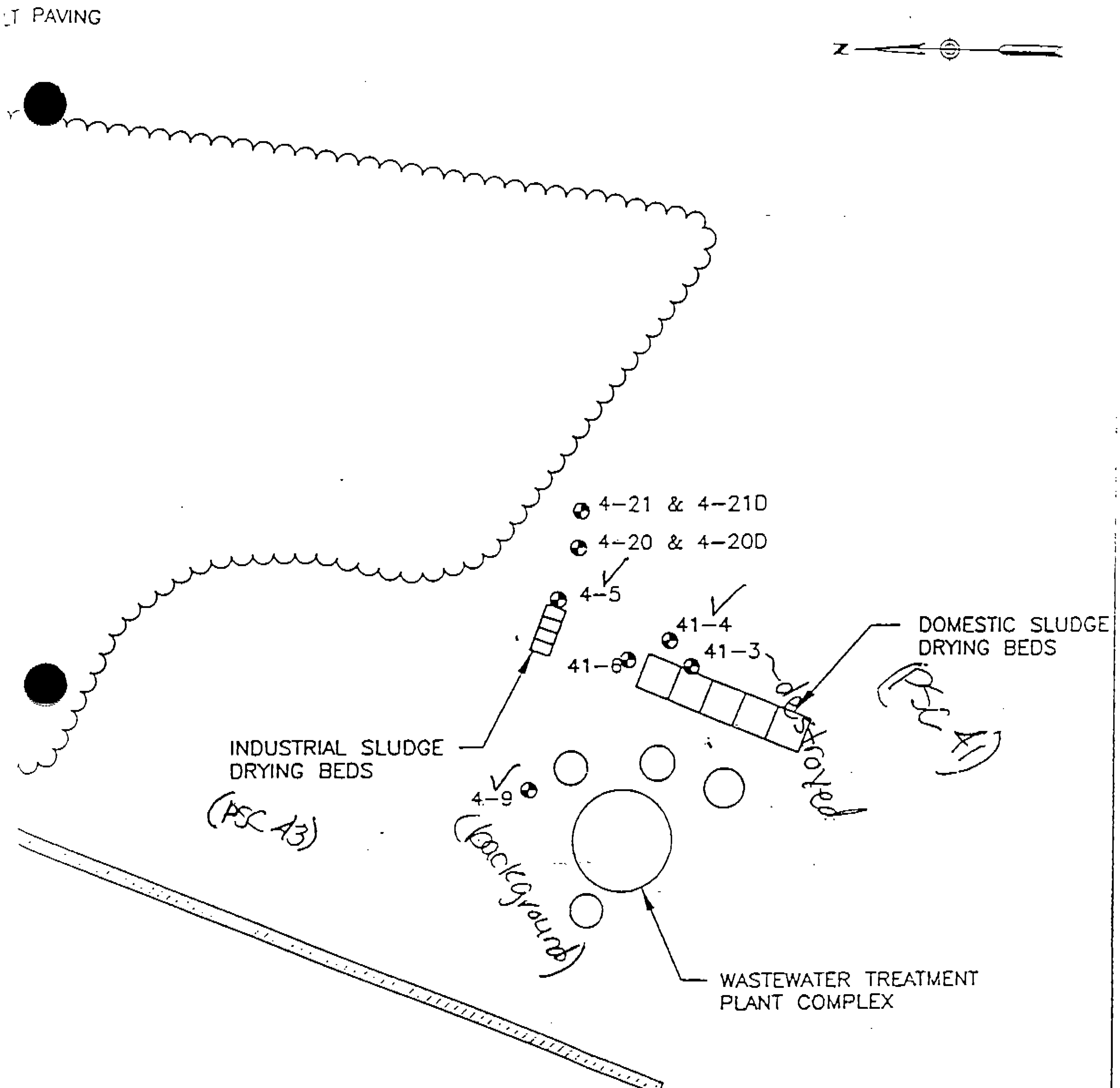
c. OU3 Workplan

GOAL: Update

OU3 workplan will be published on or before March 17, 1995. Only changes will be published. Pen and ink changes will be made by individual members to the draft workplan.

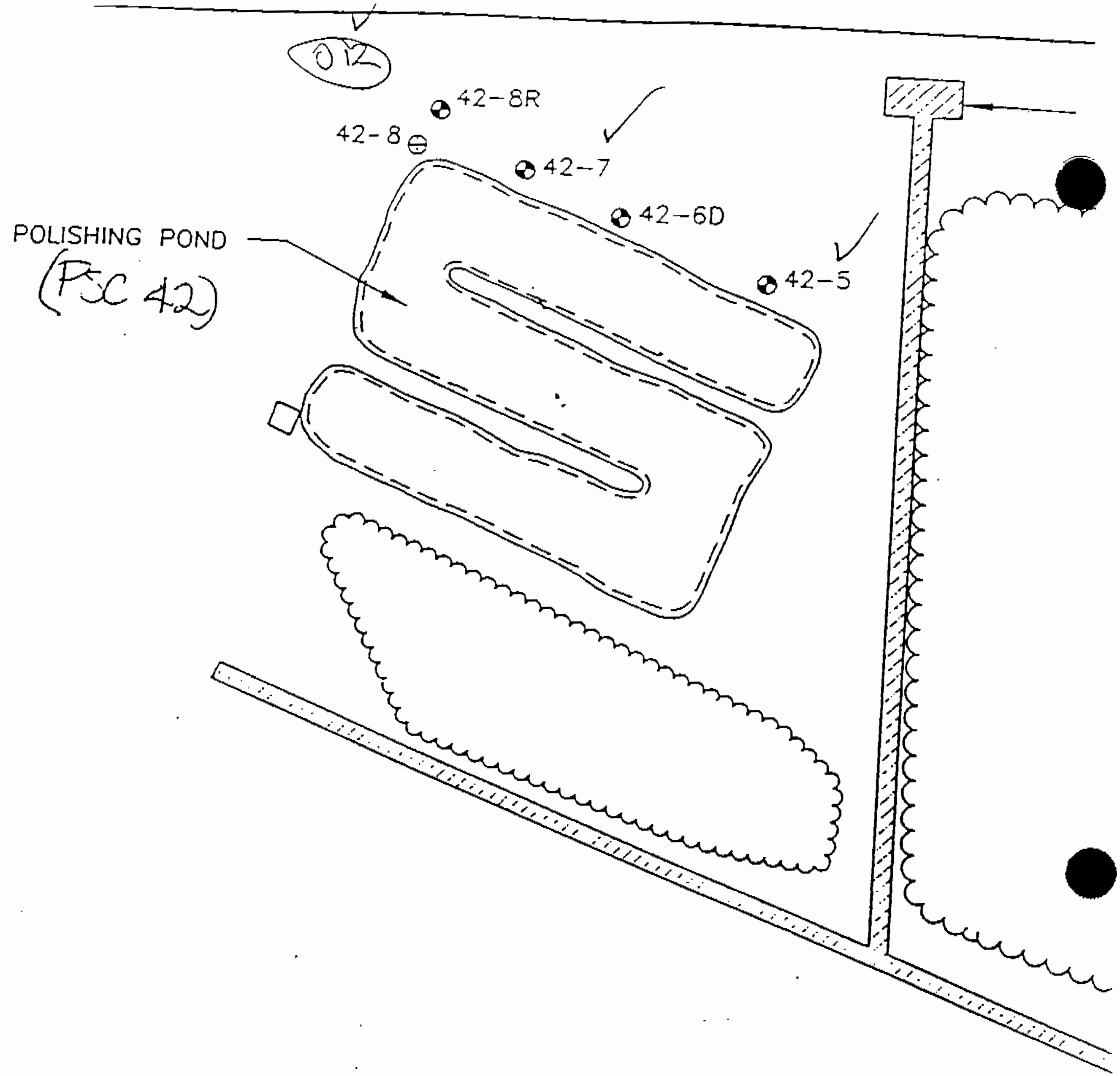
d. Plating Shop

GOAL: Information to FDEP concerning Northeast District



Source:
RUST ENVIRONMENT & INFRASTRUCTURE

FIGURE 2-2
LOCATION OF MONITORING WELLS
NAS JACKSONVILLE

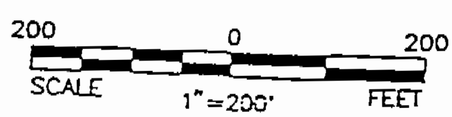


LEGEND

42-8R ⊕ MONITOR WELL

42-8 ⊕ ABANDONED MONITOR WELL

D DESIGNATES DEEP WELL (35 ft.)



1.0 INTRODUCTION

The purpose of this proposal is to identify the locations for monitoring well installations across OU 2. Monitoring well installations are necessary to provide additional data to verify the results of statistical analysis and comparative correlations between DPT groundwater data and unfiltered groundwater data from existing permanent monitoring wells. Monitoring well placement determinations were made based on data correlation and verification objectives. The additional data sources used to support the analytical data obtained during the DPT groundwater investigation are briefly addressed in this proposal. The results of the statistical correlations and comparative analysis used to evaluate all groundwater data are presented entirely in the *Preliminary Groundwater Data Evaluation for Operable Unit 2* (ABB-ES, October 1995). This proposal presents a brief discussion of the groundwater data sources and statistical and comparative methods used to evaluate and select proposed monitoring well installation locations.

2.0 DATA SOURCES

A groundwater investigation was performed as part of the RI field investigation at OU 2 using DPT methodology in accordance with the OU 2 workplan and FSAP. The intent of the groundwater investigation was to evaluate possible impacts to groundwater across OU 2, based on the current understanding and interpretation of the known source areas (ie. Fire Training Area, Sludge Drying Beds, etc.). Groundwater samples were collected using DPT methodology to provide an innovative, cost effective, and less intrusive method for contaminant plume characterization.

DPT groundwater analytical data obtained during the field investigation was statistically compared, where applicable, to analytical data from existing background and compliance monitoring wells to establish a correlation between groundwater samples obtained in situ and from permanent wells. Figure 2-1 shows the DPT sampling locations at OU 2.

2.1 OU 2 DPT Groundwater Samples

DPT groundwater sampling locations were chosen based on the sampling grid by geographic spread. Initially, 8 locations were selected in the Open Field Area (OFA) at PSC 4 on the 300 x 300 ft. sampling grid, and 31 locations were sampled across the rest of OU 2 on the 200 x 200 ft. sampling grid. Groundwater samples were collected from one to three depth intervals at each sampling location. Samples were generally collected immediately above clayey layers that were determined by piezocone soundings as presented in the *Preliminary Groundwater Data Evaluation for OU 2* (ABB-ES, October 1995). The maximum contaminant concentrations were anticipated to be above the clay layers. Initially, a total of 70 depth intervals were sampled and analyzed for TCL VOCs and TAL inorganics. Later, additional locations were added around the Fire Training Area (FTA) to evaluate the effectiveness of recent remedial activities. A total of 83 samples were collected during the groundwater investigation. Sampling location and depth information is presented in Table 2-1.

Inorganic analyses were performed on filtered samples from all depth intervals and on unfiltered samples from approximately 88% of the depth intervals. While turbidity measurements were not made, turbidity was determined by visual inspection of the unfiltered samples, and although variable, appeared to be greater than 5 ntu.

2.4 Statistical Analysis and Groundwater Data Evaluation

Both statistical and comparative analysis methods were used to evaluate the DPT groundwater data.

2.4.1 Unfiltered vs. Filtered DPT Data

As outlined in the *Preliminary Groundwater Data Evaluation for OU 2* (ABB-ES, October 1995), the statistical comparison of unfiltered and filtered DPT data suggested that filtering samples did not result in a consistent reduction either within a specific parameter or between parameters. The inconsistency was most likely due to the variability of the turbidity in the unfiltered samples.

2.4.2 DPT Data vs. Background Monitoring Wells

As outlined in the *Preliminary Groundwater Data Evaluation for OU 2* (ABB-ES, October 1995), the Mann-Whitney U test for population evaluation was used to statistically determine if the either the filtered or the unfiltered DPT data sets came from the same parent population as the unfiltered basewide background data set. The results indicated that the unfiltered DPT data did not come from the same parent population as the unfiltered basewide background data set, but the filtered DPT data did. The U test indicated the unfiltered DPT data set could not be statistically compared to the background data set, but the filtered data set could.

2.4.3 DPT Data vs. Compliance Monitoring Wells

As outlined in the *Preliminary Groundwater Data Evaluation for OU 2* (ABB-ES, October, 1995), a comparative evaluation was performed between filtered and unfiltered DPT data and unfiltered data from nearby compliance monitoring well data obtained during quarterly, semiannual and annual compliance monitoring events. The comparison indicated that the unfiltered DPT data did not correlate with unfiltered compliance well data, but the filtered DPT data did. This indicated that the filtered DPT data is most comparable to unfiltered monitoring well data. Therefore the filtered DPT data was used for comparison with FDEP guidance concentrations and unfiltered compliance monitoring well data.

2.4.4 Kriging

Kriging, the statistical method to evaluate predictability, was then applied to the filtered DPT data in order to predict analytical concentrations at locations where samples had not been collected. Since kriging works best when it is used to predict concentrations within a contaminant plume, the kriging demonstrated only a random distribution of a few isolated, slightly elevated detections among otherwise background-level detections. This distribution suggests the absence of a contaminant plume.

Table 3-1

**Summary of Positive Detections - Volatile Organic Compounds
DPT Groundwater Sampling**

**Operable Unit 2
NAS Jacksonville, Florida**

Sample ID	Sample Location	Sample Collection Depth, ft	Contaminant	Concentration, ug/L
U2Q01802	DPT-52	23-24	Benzene Chlorobenzene Ethylbenzene	27 3 7
U2Q03902	FTA 3	32-33	Benzene	12
U2Q04002	FTA 4	25-26	1,2-Dichloroethene(total) Benzene 4-Methyl-3-pentanone Chlorobenzene Ethylbenzene Xylene (total)	20 69 4 10 52 31
U2Q04102	FTA 5	25-26	Benzene	3

Based on the analytical results of the DPT sampling, a monitoring well location is proposed at the center of the FTA near sampling location 040. The monitoring well will be installed as outlined in the OU 2 FSAP. The well will be screened from 17 - 27′ bls, as the subsurface lithology determined by the piezocone sounding at sampling location 040 indicated a 5 ft. thick clay layer was encountered from 27 - 32′ bls, and the DPT groundwater sample was collected at 25′ bls from this location.

Additionally, a downgradient monitoring well will be installed at sampling location 018. The sample was collected at 23′ bls. The subsurface lithology determined by the piezocone sounding indicated a clay layer from 28 - 33′ bls. The well will be screened from 18 - 28′ bls.

Analytical data from the proposed monitoring wells will be used to support the correlation of DPT data with monitoring well data and therefore support the recommendation of transferring the FTA to the UST program under 62-770. Historical data from a previously installed shallow surficial monitoring well installed in the center of the FTA will be evaluated and compared to data obtained from the proposed monitoring wells to support the correlation between DPT data and monitoring well data. The previously installed well was removed prior to the remedial activities at PSC 2.

3.0 PROPOSED MONITORING WELL LOCATIONS

Based on the interpretation of the available groundwater data and discussions with FDEP and EPA, the following locations have been selected for permanent monitoring well installations. Monitoring wells will be installed to provide additional data to verify the results of the statistical and comparative analysis. Monitoring wells will be installed in accordance with the installation procedures detailed in the OU 2 FSAP. Surficial stratigraphy determined by DPT piezocone soundings performed during the groundwater investigation was used to select screened interval depths based on stratigraphic conditions. All monitoring wells will be sampled once, to verify the correlation between filtered DPT data and analytical data from permanently installed monitoring wells.

3.1 PSC 2

Twelve locations were selected for DPT sampling in the vicinity of the FTA. The results of the DPT investigation indicated slightly elevated detections for organic compounds in four filtered samples collected near the FTA. As outlined in the *Preliminary Groundwater Data Evaluation for OU 2* (ABB-ES, October 1995), benzene was detected at 69 ug/L in sample number 40 from 25' bls. The results of the statistical analysis indicated this detection was a statistical outlier. Table 3-1 presents the positive detections for volatile organic compounds at PSC 2.

3.2 PSC 3

Two locations were selected for DPT sampling in the vicinity of PSC 3. The results of the DPT investigation indicated positive detections for inorganic compounds at both locations. Table 3-2 presents the positive detections for selected inorganics detected at PSC 3. Organic compounds were not detected at the sampling locations.

Table 3-2

Summary of Positive Detections - Inorganics

Operable Unit 2
NAS Jacksonville, Florida

DPT Sample ID	Sampling Depth	Soluble Cadmium	Soluble Chromium	Soluble Lead	Soluble Manganese	Soluble Nickel
U2Z01701	10-11	1.2	42.3	4.4	76.8	11.2
U2Z01702	51-52	1.2	1.7	0.40	134	58.8
U2Z02501	10-11	3.8	8.9	3.3	39.5	30.3
U2Z02502	39-40	2.9	5.9	1.5	64.2	7.2

To verify the statistical and comparative correlation of DPT data with data from permanently installed monitoring wells as presented in the *Preliminary Groundwater Data Evaluation for OU 2* (ABB-ES, October 1995), one well is proposed for installation at PSC 3 based on groundwater flow direction. The well would be installed downgradient from source soils at DPT sampling location 025. The DPT groundwater sample was collected from 10-11' bls at this location. The subsurface lithology determined by the piezocone sounding indicated approximately 1 foot of clay at 12' bls. The well will therefore be screened from 4-14' bls.

3.3 PSC 4

DPT samples were collected at 13 locations at PSC 4. The results of the DPT investigation indicated positive detections for inorganic compounds. Table 3-3 presents the positive detections for selected inorganics.

To verify the statistical and comparative correlation of DPT data with data from permanently installed monitoring wells as presented in the *Preliminary Groundwater Data Evaluation for OU 2* (ABB-ES, October 1995), one well is proposed for installation at PSC 4 based on the DPT sample location with the highest positive detections for inorganics. The sample location with the highest inorganic detections was location 036, collected from 31 - 32' bls. The subsurface lithology determined by the piezocone sounding indicated 3 feet of clay at 32 - 35' bls, therefore the well will be screened from 27 - 32' bls.

Table 3-3

Summary of Positive Detections - Inorganics

Operable Unit 2
NAS Jacksonville, Florida

DPT Sample ID	Sampling Depth	Soluble Cadmium	Soluble Chromium	Soluble Lead	Soluble Manganese	Soluble Nickel
U2Z00101	14-15	3.4	5.5	4.9	84.6	20.6
U2Z00102	49-50	12.1	86.7	23.9	333	48.4
U2Z00701	9-10	1.2	1.7	0.60	24.7	16.3
U2Z00702	41-42	1.2	1.7	0.80	93.3	20.6
U2Z00901	16-17	1.2	1.8	0.80	12.0	5.7
U2Z00902	38-39	1.2	1.7	0.50	81.3	5.7
U2Z01101	9-11	3.4	3.4	1.5	13.7	15.6
U2Z01102	33-34	3.1	3.1	1.5	59.5	14.2
U2Z01401	10-11	1.2	88.5	2.0	20.8	60.1
U2Z01402	47-48	1.2	9.0	1.1	42.5	7.4
U2Z02001	9-10	2.4	2.0	1.3	17.2	11.2
U2Z02002	51-52	2.4	2.0	1.3	53.4	11.2
U2Z02301	11-12	2.4	2.0	1.3	22.5	11.2
U2Z02701	9-10	1.2	4.2	1.5	31.2	20.3
U2Z02702	20-21	2.4	25.0	1.8	63.6	23.8
U2Z02801	10-11	1.2	1.9	1.5	13.8	5.7
U2Z02802	57-58	1.2	1.7	0.70	55.6	5.7
U2Z02901	8-9	2.4	2.0	1.3	93.0	20.2
U2Z02902	51-52	2.4	2.0	1.3	54.1	12.6
U2Z03401	7-8	2.4	2.0	1.3	9.1	11.2

DPT Sample ID	Sampling Depth	Soluble Cadmium	Soluble Chromium	Soluble Lead	Soluble Manganese	Soluble Nickel
U2Z03402	31-32	2.6	3.2	1.3	11.0	11.2
U2Z03501	8-9	2.4	2.3	1.3	4.2	11.2
U2Z03502	31-32	2.4	2.0	1.3	8.3	11.2
U2Z03601	9-10	2.4	5.2	1.3	8.2	11.2
U2Z03602	31-32	2.4	34.4	96.9	126	25.6

3.4 PSC 41

No monitoring well installation is proposed, based on the correlation of the filtered DPT data with compliance monitoring well data (ie. quarterly, semiannual and annual compliance monitoring) as presented in the *Preliminary Groundwater Data Evaluation for OU 2* (ABB-ES, October 1995) and FDEP and EPA concurrence. Table 3-4 presents the compliance wells construction details.

Table 3-4

Compliance Monitoring Well Construction Details - PSC 41

Operable Unit 2
NAS Jacksonville, Florida

Well ID	Screen Interval, ft. bls	Total Depth, ft. bls
41-3	9.72 - 14.72	14.72
41-4	11.51 - 16.51	16.51
41-6	8.02 - 13.02	13.02

3.5 PSC 42

One monitoring well installation is proposed to determine the effects, if any, of remedial activities at PSC 42. Although the results of the DPT investigation indicate positive detections for inorganic compounds below MCLs, the well will be installed at DPT sampling location 012, as groundwater flow direction appears to trend toward location 012. Based on the correlation of the filtered DPT data with compliance monitoring well data (ie. quarterly, semiannual and annual compliance monitoring) as presented in the *Preliminary Groundwater Data Evaluation for OU 2* (ABB-ES, October 1995) and FDEP and EPA concurrence, the historical data from compliance monitoring wells will be used to verify the comparative correlations between DPT and monitoring well data. Table 3-5 presents the compliance wells construction details that will be used to support the data correlations.

Table 3-5

Compliance Monitoring Well Construction Details - PSC 42

Operable Unit 2
NAS Jacksonville, Florida

Well ID	Screen Interval, ft. bls	Total Depth, ft. bls
42-5	9.19 - 14.19	14.19
42-6D	30.00 - 35.00	35.00
42-7	8.31 - 13.31	13.31
42-8R	10.04 - 15.04	15.04

3.6 PSC 43

No monitoring well installation is proposed, based on the correlation of the filtered DPT data with compliance monitoring well data (ie. quarterly, semiannual and annual compliance monitoring data) as presented in the *Preliminary Groundwater Data Evaluation for OU 2* (ABB-ES, October 1995) and FDEP and EPA concurrence. Table 3-6 presents the compliance wells construction details.

Table 3-6

Compliance Monitoring Well Construction Details - PSC 43

Operable Unit 2
NAS Jacksonville, Florida

Well ID	Screen Interval, ft. bls	Total Depth, ft. bls
4-5	8.61 - 13.61	13.61
4-20	9.11 - 14.11	14.11
4-20D	30.24 - 35.24	35.24
4-21	10.35 - 15.35	15.35
4-21D	30.06 - 35.06	35.06

Proposal for Monitoring Well Installation Locations

Operable Unit 2
NAS Jacksonville, Florida

Survey ID	Piezocone ID	Total Depth, ft. bls	Sample ID	Sample Date	Sample Depth, ft. bls
DPT-84	DPT 6	53'	U2Q01701 U2Z01701 U2Q01702 U2Z01702	7/26/95 7/26/95 7/26/95 7/26/95	10-11 10-11 51-52 51-52
SS/DPT-17	DPT 7	53'	no sample collected	no sample collected	No sample collected
DPT-9	DPT 8	22'	U2Q01601	7/26/95	15-16
SS/DPT-6	DPT 9	48'	no sample collected	no sample collected	no sample collected
DPT-24	DPT 10	34'	U2Q00501 U2Z00501 U2Q00502 U2Z00502	7/13/95 7/13/95 7/20/95 7/20/95	9-10 9-10 25-26 25-26
DPT-38	DPT 11	37'	U2Q01101 U2Z01101 U2Q01102 U2Q01102D U2Z01102 U2Z01102D	7/18/95 7/18/95 7/18/95 7/18/95 7/18/95 7/18/95	9-11 9-11 33-34 33-34 33-34 33-34
DPT-62	DPT 12	39'	U2Q01201 U2Z01201 U2Q01202 U2Q01202	7/19/95 7/19/95 7/19/95 7/19/95	10-11 10-11 30-34 30-34
DPT-31	DPT 13A	68'	U2Q01301 U2Z01301 U2Q01302 U2Z01302	7/21/95 7/21/95 7/21/95 7/21/95	10-12 10-12 41-42 41-42

Summary of Proposed Monitoring Well Installation Details

Operable Unit 2
NAS Jacksonville, Florida

ABB Well ID Number	Well Installation Location by Sample ID	Proposed Screened Interval (ft. bls)	Screen Length (ft.)	Remarks
U2MW013	Center of FTA	17 - 27	10	Installed at PSC 2 in the center of FTA near sampling location 040 to verify DPT data correlation.
U2MW014	018	18 - 28	10	Installed at PSC 2 downgradient of FTA at location 018 to verify DPT data correlation.
U2MW015	025	4 - 14	10	Installed at PSC 3 downgradient of past source area at location 025 to verify DPT data correlation.
U2MW016	036	27 - 32	5	Installed at PSC 4 at location 036 based on highest overall inorganic detections to verify DPT data correlation.
U2MW017	012	5 - 15	10	Installed at PSC 42 downgradient of the Polishing Pond to verify DPT data correlation and check the effectiveness of remedial activities.

Table 2-1
DPT Sample Location Log

Operable Unit 2
NAS Jacksonville, Florida

Survey ID	Piezocone ID	Total Depth, ft. bls	Sample ID	Sample Date	Sample Depth, ft. bls
SS/DPT-1	DPT 1	79'	U2Q00101	6/30/95	14-15
			U2Z00101	6/30/95	14-15
			U2Q00102	7/24/95	49-50
			U2Z00102	7/24/95	49-50
DPT-42	DPT 2	49'	U2Q00201	7/10/95	9-11
			U2Z00201	7/10/95	9-11
			U2Q00202	7/10/95	39-40
			U2Z00202	7/10/95	39-40
DPT-6	DPT 3	47'	U2Q00301	7/11/95	20-21
			U2Z00301	7/11/95	20-21
			U2Q00302	7/11/95	40-41
			U2Q00302D	7/11/95	40-41
			U2Z00302	7/11/95	40-41
			U2Z00302D	7/11/95	40-41
DPT-50	DPT 4	55.5'	U2Q00401	7/12/95	13-14
			U2Z00401	7/12/95	13-14
			U2Q00402	7/12/95	39-40
			U2Q00402MS	7/12/95	39-40
			U2Q00402MSD	7/12/95	39-40
			U2Z00402	7/12/95	39-40
			U2Z00402MS	7/12/95	39-40
			U2Z00402MSD	7/12/95	39-40
DPT-80	DPT 5	53'	U2Q01501	7/25/95	10-11
			U2Z01501	7/25/95	10-11
			U2Q01502	7/25/95	29-30
			U2Z01502	7/25/95	29-30
			U2Q01503	7/26/95	no depth recorded
			U2Z01503	7/26/95	
			U2Q01503D	7/26/95	
			U2Z01503D	7/26/95	

Proposal for Monitoring Well Installation Locations

Operable Unit 2
NAS Jacksonville, Florida

Survey ID	Piezocone ID	Total Depth, ft. bls	Sample ID	Sample Date	Sample Depth, ft. bls
SS/DPT-9	DPT 14	57'	U2Q01401 U2Z01401 U2Q01402 U2Q01402D U2Q01402MS U2Q01402MSD U2Z01402 U2Z01402D U2Z01402MS U2Z01402MSD	7/24/95 7/25/95 7/25/95 7/25/95 7/25/95 7/25/95 7/25/95 7/25/95 7/25/95 7/25/95	10-11 10-11 47-48 47-48 47-48 47-48 47-48 47-48 47-48 47-48
DPT-39	DPT 15	43'	U2Q00701 U2Z00701 U2Q00702 U2Z00702	7/28/95 7/28/95 7/28/95 7/28/95	9-10 9-10 41-42 41-42
DPT-36	DPT 16	57'	U2Q00601 U2Z00601 U2Q00602 U2Z00602	7/28/95 7/28/95 7/28/95 7/28/95	7-8 7-8 52-53 52-53
DPT-12	DPT 17	49'	U2Q01901 U2Z01901 U2Q01902 U2Z01902	7/27/95 7/27/95 7/27/95 7/27/95	6-7 6-7 42-43 42-43
DPT-52	DPT 18	51'	U2Q01801 U2Z01801 U2Q01802 U2Z01802 U2Q01803 U2Z01803	7/27/95 7/27/95 7/27/95 7/27/95 7/27/95 7/27/95	7-8 7-8 23-24 23-24 47-48 47-48

Survey ID	Piezocone ID	Total Depth, ft. bls	Sample ID	Sample Date	Sample Depth, ft. bls
DPT-59	DPT 19	37′	U2Q00901	7/31/95	16-17
			U2Z00901	7/31/95	16-17
			U2Q00901D	7/31/95	16-17
			U2Z00901D	7/31/95	16-17
			U2Q00901MS	7/31/95	16-17
			U2Z00901MS	7/31/95	16-17
			U2Q00901MSD	7/31/95	16-17
			U2Z00901MSD	7/31/95	16-17
			U2Q00902	7/31/95	38-39
			U2Q00902	8/1/95	36-37
			U2Z00902	8/1/95	36-37
DPT-20	DPT 20	53′	U2Q02001	8/8/95	9-10
			U2Z02002	8/8/95	9-10
			U2Q02002	8/8/95	51-52
			UQZ02002	8/8/95	51-52
DPT-79	DPT 21	52′	U2Q02101	7/31/95	22-23
			U2Z02101	7/31/95	22-23
			U2Q02102	7/31/95	43-44
			U2Z02102	7/31/95	43-44
DPT-69	DPT 22	53.5′	U2Q00801	7/28/95	10-11
			U2Z00801	7/28/95	10-11
			U2Q00801D	7/28/95	10-11
			U2Z00801D	7/28/95	10-11
			U2Q00802	7/28/95	47-48
			U2Z00802	7/28/95	47-48
DPT-19	DPT-23, 23A	18′	U2Q02301	8/8/95	11-12
			U2Z02301	8/8/95	11-12
DPT-64	DPT-24	40′	U2Q02401	8/1/95	9-10
			U2Z02401	8/1/95	9-10
			U2Q02402	8/1/95	35-36
			U2Z02402	8/1/95	35-36
DPT-89	DPT 25A	55.5′	U2Q02501	8/11/95	10-11
			U2Z02501	8/11/95	10-11
			U2Q02502	8/11/95	39-40
			U2Z02502	8/11/95	39-40

Proposal for Monitoring Well Installation Locations

Operable Unit 2
NAS Jacksonville, Florida

Survey ID	Piezocone ID	Total Depth, ft. bls	Sample ID	Sample Date	Sample Depth, ft. bls
DPT-14	DPT 26	61'	U2Q02601 U2Z02601 U2Q02602 U2Z02602	8/7/95 8/7/95 8/7/95 8/7/95	13-14 13-14 52-53 52-53
SS/DPT-13	DPT 27	21'	U2Q02701 U2Z02701 U2Q02702 U2Z02702	8/1/95 8/1/95 8/7/95 8/7/95	9-10 9-10 20-21 20-21
SS/DPT-15	DPT 28	60'	U2Q02801 U2Z02801 U2Q02802 U2Z02802	8/1/95 8/1/95 8/1/95 8/1/95	10-11 10-11 57-58 57-58
SS/DPT-19	DPT 29	61'	U2Q02901 U2Z02901 U2Q02901D U2Z02901D U2Q02902 U2Z02902	8/7/95 8/7/95 8/7/95 8/7/95 8/8/95 8/8/95	8-9 8-9 8-9 8-9 51-52 51-52
FTA 1	DPT 30	55'	U2Q03001 U2Z03001 U2Q03002 U2Z03002 U2Q03002MS UQZ03002MS U2Q03002MSD U2Z03002MSD	8/9/95 8/9/95 8/9/95 8/9/95 8/9/95 8/9/95 8/9/95 8/9/95	7-8 7-8 49-50 49-50 49-50 49-50 49-50 49-50
FTA 2	DPT-31	not in logbook	U2Q03101 U2Z03101 U2Q03102 U2Z03102	8/9/95 8/9/95 8/9/95 8/9/95	7-8 7-8 48-49 48-49

Proposal for Monitoring Well Installation Locations

Operable Unit 2
NAS Jacksonville, Florida

Survey ID	Piezocone ID	Total Depth, ft. bls	Sample ID	Sample Date	Sample Depth, ft. bls
DPT-70	DPT-32	50.5'	U2Q03201	8/10/95	7-8
			U2Q03201D	8/10/95	7-8
			U2Z03201	8/10/95	7-8
			U2Z03201D	8/10/95	7-8
			U2Q03202	8/10/95	17-18
			U2Z03202	8/10/95	17-18
			U2Q03203	8/10/95	48-49
			U2Z03203	8/10/95	48-49
DPT-73	DPT-33	53.5'	U2Q03301	8/11/95	11-12
			U2Z03301	8/11/95	11-12
			U2Q03302	8/11/95	49-50
			U2Q03302D	8/11/95	49-50
			U2Z03302	8/11/95	49-50
			U2Z03302D	8/11/95	49-50
SS/DPT-36	DPT-34	35'	U2Q03401	8/12/95	7-8
			U2Z03401	8/12/95	7-8
			U2Q03402	8/12/95	31-32
			U2Z03402	8/12/95	31-32
SS/DPT-27	DPT-35	33'	U2Q03501	8/12/95	8-9
			U2Z03501	8/12/95	8-9
			U2Q03502	8/12/95	31-32
			U2Z03502	8/12/95	31-32
SS/DPT-23	DPT-36	36.4'	U2Q03601	8/13/85	9-10
			U2Z03601	8/13/95	9-10
			U2Q03602	8/13/95	31-32
			U2Q03602MS	8/13/95	31-32
			U2Q03602MSD	8/13/95	31-32
			U2Z03602	8/13/95	31-32
			U2Z03602MS	8/13/95	31-32
			U2Z03602MSD	8/13/95	31-32
DPT-77	DPT-37	42.5'	U2Q03701	8/14/95	11-12
			U2Q03701D	8/14/95	11-12
			U2Z03701	8/14/95	11-12
			U2Z03701D	8/14/95	11-12
			U2Q03702	8/14/95	32-33
			U2Z03702	8/14/95	32-33

Proposal for Monitoring Well Installation Locations

Operable Unit 2
NAS Jacksonville, Florida

Survey ID	Piezocone ID	Total Depth, ft. bls	Sample ID	Sample Date	Sample Depth, ft. bls
DPT-68	DPT-38	52.8'	U2Q03801	8/15/95	11-12
			U2Z03801	8/15/95	11-12
			U2Q03802	8/15/95	29-30
			U2Z03802	8/15/95	29-30
			U2Q03803	8/15/95	49-50
			U2Z03803	8/15/95	49-50
FTA-3	DPT-39	47.9'	U2Q03901	8/28/95	10-11
			U2Z03901	8/28/95	10-11
			U2Q03902	8/28/95	32-33
			U2Z03902	8/28/95	32-33
			U2Q03903	8/28/95	47-48
			U2Z03903	8/28/95	47-48
FTA-4	DPT-40	46.5'	U2Q04001	8/29/95	10-11
			U2Z04001	8/29/95	10-11
			U2Q04002	8/29/95	25-26
			U2Z04002	8/29/95	25-26
			U2Q04003	8/29/95	46-47
			U2Z04003	8/29/95	46-47
FTA-5	DPT-41	46.7'	U2Q04101	8/30/95	10-11
			U2Z04101	8/30/95	10-11
			U2Q04102	8/30/95	25-26
			U2Z04102	8/30/95	25-26
			U2Q04103	8/30/95	46-47
			U2Z04103	8/30/95	46-47

Survey ID	Piezocone ID	Total Depth, ft. bls	Sample ID	Sample Date	Sample Depth, ft. bls
DPT-68	DPT-38	52.8'	U2Q03801 U2Z03801 U2Q03802 U2Z03802 U2Q03803 U2Z03803	8/15/95 8/15/95 8/15/95 8/15/95 8/15/95 8/15/95	11-12 11-12 29-30 29-30 49-50 49-50
FTA-3	DPT-39	47.9'	U2Q03901 U2Z03901 U2Q03902 U2Z03902 U2Q03903 U2Z03903	8/28/95 8/28/95 8/28/95 8/28/95 8/28/95 8/28/95	10-11 10-11 32-33 32-33 47-48 47-48
FTA-4	DPT-40	46.5'	U2Q04001 U2Z04001 U2Q04002 U2Z04002 U2Q04003 U2Z04003	8/29/95 8/29/95 8/29/95 8/29/95 8/29/95 8/29/95	10-11 10-11 25-26 25-26 46-47 46-47
FTA-5	DPT-41	46.7'	U2Q04101 U2Z04101 U2Q04102 U2Z04102 U2Q04103 U2Z04103	8/30/95 8/30/95 8/30/95 8/30/95 8/30/95 8/30/95	10-11 10-11 25-26 25-26 46-47 46-47

FIGURE 2-1
DPT Sampling Locations

NAS JACKSONVILLE
JACKSONVILLE, FLORIDA

/OU2/OU2DPT/DRM/09-12-95

APPENDIX C

FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION PERMIT FOR CLOSURE AND POSTCLOSURE OF THREE HAZARDOUS WASTE SURFACE IMPOUNDMENTS

Appendix C-1	Florida Department of Environmental Regulation 1991 Permit #HF16-152611 for Closure and Postclosure of Three Hazardous Waste Surface Impoundments
Appendix C-2	Florida Department of Environmental Regulation 1997 Permit #HF16-288092 for Closure and Postclosure of Three Hazardous Waste Surface Impoundments

APPENDIX C-1

FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION
1991 PERMIT #HF16-152611 FOR CLOSURE AND POSTCLOSURE
OF THREE HAZARDOUS WASTE SURFACE IMPOUNDMENTS

Florida Department of Environmental Regulat

Twin Towers Office Bldg. ● 2600 Blair Stone Road ● Tallahassee, Florida 32399

Lawton Chiles, Governor

Carol M. Browner, S

PERMITTEE:
U.S. Naval Air Station-Jacksonville
Post Office Box 5, Code 184
Jacksonville, Florida 32212-5000

Attention:
Commanding Officer
Naval Air Station - Jacksonville

I.D. Number: FL6 170 024 412
Permit/Certification Number: HF16-152611
Date of Issue: September 20, 1991
Expiration Date: September 20, 1996
County: Duval
Latitude/Longitude: 30°13'30"N/81°41'00"W
Section/Township/Range: 23/T3S/R27E
Project: Closure and Post-Closure of Three Hazardous Waste Surface Impoundments.

This permit is issued under the provision of Chapter(s) 403, Florida Statutes, and Florida Administrative Code Rule(s) 17-3, 17-4, 17-25, 17-532, 17-550 and 17-730. The above named permittee is hereby authorized to perform the work or operate the facility shown on the application and approved drawing(s), plans, and other documents attached hereto or on file with the Department and made a part hereof and specifically described as follows:

To close and post-close three surface impoundments, (Domestic Waste Sludge Drying Beds, Industrial Waste Sludge Drying Beds, and Polishing Pond), which contained hazardous waste generated from NAS-Jacksonville. The sludge generated from the wastewater treatment met the definition of hazardous waste designated as hazardous waste codes F001 through F006 and F019. These units are no longer in service.

The Industrial Waste Sludge Drying Beds are comprised of four beds used to dewater wastewater treatment sludges from electroplating operations (F006 hazardous waste). Constructed in 1980, each drying bed is approximately 15 feet by 18 feet. The drying beds are enclosed with retaining walls constructed of 8 inch thick concrete reinforced with Number 5 reinforcing steel on 12 inch spacings. The bottom of the beds is unlined and consists of a 12 inch sand layer, with an underlying 10 inch gravel layer. The beds are underdrained, and the liquids were returned to the industrial wastewater treatment plant. Approximately 8250 gallons of dried sludges were excavated from the surface impoundment annually.

The Domestic Waste Sludge Drying Beds and the Polishing Pond were used for the treatment and storage of sludges resultant from the treatment of F006 and F019 rinsewater from electroplating operations, F001 through F005 paint stripping and parts cleaning operations, in addition to sludge from the aerobic digester of the domestic wastewater treatment plant. The Domestic Sludge Drying Beds were constructed in 1970 and consist of five (5) beds. Each bed is approximately 50 feet by 50 feet with a three-foot high wall constructed of 8-inch concrete blocks and reinforced with wire tire ties. The bottom of the beds is unlined and is underlain by seven inches of sand, three inches of fine gravel and six inches to twelve inches of course gravel layers.

The Polishing Pond was built in 1970 to provide additional settling for 2.3 million gallons per day of combined domestic and industrial wastewater treated effluent. The Polishing Pond is unlined and has a surface area of 3.8 acres and an average depth of 3.5 feet.

The facility is located at U.S. Highway 17 and Yorktown Avenue, Jacksonville, Florida.

The application named in this permit consists of the following documents which are considered a part thereof:

1. Hazardous Waste Facility Closure/Post-Closure Permit Application dated August 8, 1988.
2. Hazardous Waste Facility Closure/Post-Closure Permit Application (Revision 1) dated June 2, 1989.
3. Federal Facilities Agreement Between United States Environmental Protecton Agency, Florida Department of Environmental Regulation, for the State of Florida and United States Department of the Navy Jacksonville, Jacksonville Florida dated October 23, 1990.
4. Hazardous Waste Facility Closure/Post-Closure Permit Application (Revision 2) dated November 21, 1990.
5. Hazardous Waste Facility Closure/Post-Closure Permit Application (Revision 3) dated February 26, 1991.

Florida Department of Environmental Regulati

Twin Towers Office Bldg. ● 2600 Blair Stone Road ● Tallahassee, Florida 32399-

Lawton Chiles, Governor

Carol M. Browner, S

September 20, 1991

CERTIFIED MAIL

P 318 725 807

Captain Charles R. Cramer
Commanding Officer
U.S. Naval Air Station-Jacksonville
Post Office Box 5, Code 184
Jacksonville, Florida 32212-5000

Subject: U.S. Naval Air Station-Jacksonville
FLD 170 024 412
HF16-152611
Duval County - Hazardous Waste

Dear Captain Cramer:

Enclosed is Permit Number HF16-152611 dated September 20, 1991 to conduct closure and post-closure activities at the regulated units at your facility, issued pursuant to Section 403.722, Florida Statutes and Florida Administrative Code 17-730.260. Acceptance of the permit constitutes notice and agreement that the Department may periodically review this permit for compliance, including site inspections where applicable, and may initiate enforcement actions for violation of the conditions and requirements thereof.

Any party to this permit has the right to seek judicial review of the permit pursuant to Section 120.68, Florida Statutes, by the filing of a Notice of Appeal pursuant to Rule 9.110, Florida Rules of Appellate Procedure, with the clerk of the Department in the Office of General Counsel, 2600 Blair Stone Road, Tallahassee, Florida 32399-2400; and by filing a copy of the Notice accompanied by the applicable filing fees with the appropriate District Court of Appeals.

The Notice of Appeals must be filed within thirty (30) days from the date this permit is issued.

Sincerely,

John M. Ruddell

John M. Ruddell, Director
Division of Waste Management

JR/MRo
Enclosure

cc w/enclosure:
St. John's River Water Management District
Jim Scarbrough, EPA/Region IV — Clay County Commissioners
Kent Williams, EPA/Region IV — Honorable Ron Raymond, Mayor of Orange Park
Ernie Frey, DER/Jacksonville — Duval County Commissioners
Honorable Ed Austin, Jacksonville City Hall
James Manning, Bio Environmental Services, Jacksonville

PERMITTEE
U.S. Naval Air Station-Jacksonville
Post Office Box 5, Code 184
Jacksonville, Florida 32212-5000

I.D. Number: FL6 170 024 412
Permit/Certification: HF16-152611
Date of Issue: September 20, 1991
Expiration Date: September 20, 1996

GENERAL CONDITIONS:

1. The terms, conditions, requirements, limitations, and restrictions set forth in this permit are "permit conditions" and are binding and enforceable pursuant to Sections 403.141, 403.727, or 403.859 through 403.861, F.S. The permittee is placed on notice that the Department will review this permit periodically and may initiate enforcement action for any violation of these conditions.

2. This permit is valid only for the specific processes and operations applied for and indicated in the approved drawings or exhibits. Any unauthorized deviation from the approved drawings, exhibits, specifications, or conditions of this permit may constitute grounds for revocation and enforcement action by the Department.

3. As provided in subsections 403.087(6) and 403.722(5), F.S., the issuance of this permit does not convey any vested rights or any exclusive privileges. Neither does it authorize any injury to public or private property or any invasion of personal rights, nor infringement of federal, state or local laws or regulations. This permit is not a waiver of or approval of any other Department permit that may be required for other aspects of the total project which are not addressed in the permit.

4. This permit conveys no title to land or water, does not constitute State recognition or acknowledgement of title, and does not constitute authority for the use of submerged lands unless herein provided and the necessary title or leasehold interests have been obtained from the state. Only the Trustees of the Internal Improvement Trust Fund may express State opinion as to title.

5. This permit does not relieve the permittee from liability for harm or injury to human health or welfare, animal, or plant life or property caused by the construction or operation of this permitted source, or from penalties therefore; nor does it allow the permittee to cause pollution in contravention of Florida Statutes and Department rules, unless specifically authorized by an order from the Department.

6. The permittee shall properly operate and maintain the facility and systems of treatment and control (and related appurtenances) that are installed and used by the permittee to achieve compliance with the conditions of this permit, as required by Department rules. This provision includes the operation of backup or auxiliary facilities or similar systems when necessary to achieve compliance with the conditions of the permit and when required by Department rules.

7. The permittee, by accepting this permit, specifically agrees to allow authorized Department personnel, upon presentation of credentials or other documents as may be required by law and at reasonable times access to the premises where the permitted activity is located or conducted to:

   (a) Have access to and copying any records that must be kept under conditions of the permit;

   (b) Inspect the facility, equipment, practices, or operations regulated or required under this permit; and

   (c) Sample or monitor any substances or parameters at any location reasonably necessary to assure compliance with this permit or Department rules.

Reasonable time may depend on the nature of the concern being investigated.

8. If, for any reason, the permittee does not comply with or will be unable to comply with any condition or limitation specified in this permit, the permittee shall immediately provide the Department with the following information:

   (a) A description of and cause of noncompliance; and

   (b) The period of noncompliance, including dates and times; or, if not corrected, the anticipated time the noncompliance is expected to continue, and steps being taken to reduce, eliminate, and prevent recurrence of the noncompliance. The permittee shall be responsible for any and all damages which may result and may be subject to enforcement action by the Department for penalties or revocation of this permit.

9. In accepting this permit, the permittee understands and agrees that all records, notes, monitoring data and other information relating to the construction or operation of this permitted source which are submitted to the Department may be used by the Department as evidence in any enforcement case involving the permitted source arising under the Florida Statutes or Department rules, except where such use is prescribed by Section 403.111 and 403.73, F.S. Such evidence shall only be used to the extent it is consistent with the Florida Rules of Civil Procedure and appropriate evidentiary rules.

10. The permittee agrees to comply with changes in Department rules and Florida Statutes after a reasonable time for compliance, provided, however, the permittee does not waive any other rights granted by Florida Statutes or Department rules. A reasonable time for compliance with a new or amended surface water quality standard, other than those standards addressed in Rul 17-3.051, shall include a reasonable time to obtain or be denied a mixing zone for the new or amended standard.

11. This permit is transferable only upon Department approval in accordance wit Rules 17-4.120 and 17-730.300 F.A.C., as applicable. The permittee shall be liable for any noncompliance of the permitted activity until the transfer i approved by the Department.

12. This permit or a copy thereof is required to be kept at the work site of th permitted activity.

13. This permit also constitutes:

    (a) Determination of Best Available Control Technology (BACT)

    (b) Determination of Prevention of Significant Deterioration (PSD)

    (c) Certification of Compliance with State Water Quality Standards (Section 401, PL 92-500)

    (d) Compliance with New Source Performance Standards

14. The permittee shall comply with the following:

    (a) Upon request, the permittee shall furnish all records and plans required under Department rules. During enforcement actions, the retention period for all records will be extended automatically unless otherwise stipulated by the Department.

    (b) The permittee shall hold at the facility or other location designated by this permit records of all monitoring information (including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation) required by this permit, copies of all reports required by this permit, and records of all data used to complete the application for this permit. These materials shall be retained at least three years from the date of the sample, measurement, report or application unless otherwise specified by Department rule.

(c) Records of monitoring information shall include:

1. the date, exact place, and time of sampling or measurements;
2. the person responsible for performing the sampling or measurements;
3. the dates analyses were performed;
4. the person responsible for performing the analyses;
5. the analytical techniques or methods used;
6. the results of such analyses.

15. When requested by the Department, the permittee shall within a reasonable time furnish any information required by law which is needed to determine compliance with the permit. If the permittee becomes aware that relevant facts were not submitted or were incorrect in the permit application or in any report to the Department, such facts or information shall be corrected promptly.

16. The following conditions shall also apply to a hazardous waste facility permit:

(a) The following reports shall be submitted to the Department:

1. Manifest discrepancy report. If a significant discrepancy in a manifest is discovered, the permittee shall attempt to rectify th discrepancy. If not resolved within 15 days after the waste is received, the permittee shall immediately submit a letter report, including a copy of the manifest, to the Department.

2. Unmanifested waste report. The permittee shall submit an unmanifested waste report to the Department within 15 days of receipt of unmanifested waste.

3. Biennial report. An biennial report covering facility activities during the previous calendar year shall be submitted to the Department by March 1, of each even numbered year pursuant to Chapter 17-730, F.A.C.

(b) Notification of any noncompliance which may endanger health or the environment including the release of any hazardous waste that may endanger public drinking water supplies, or the occurrence of a fire o explosion from the facility which could threaten the environment or human health outside the facility, shall be reported verbally to the Department within 24 hours, and a written report shall be provided within 5 days. The verbal report within 24 hours shall contain the name, address, I.D. number and telephone number of the facility, its owner or operator, the name and quantity of materials involved, the extent of any injuries, an assessment of actual or potential hazards, and the estimated quantity and disposition of recovered material. The written submission shall contain:

1. A description of cause of the noncompliance.

2. If not corrected, the expected time of correction and steps being taken to reduce, eliminate, and prevent recurrence of the noncompliance.

(c) Reports of compliance or noncompliance with, or any progress reports on, requirements contained in any compliance schedule shall be submitted no later than 14 days after each schedule date.

(d) All reports or information required by the Department by a hazardous waste permittee shall be signed by a person authorized to sign a permit application.

SPECIFIC CONDITIONS:

PART I - STANDARD REQUIREMENTS:

1. Two submittals in response to these permit conditions shall be submitted to:

Federal Facilities Coordinator
Bureau of Waste Cleanup
Department of Environmental Regulation
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

One submittal in response to these permit conditions shall be submitted to:

District Manager
Department of Environmental Regulation
Northeast District Office
7825 Baymeadows Way
Suite 200B
Jacksonville, Florida 32256-7577

One submittal in response to these permit conditions shall be submitted to:

Mr. James H. Scarbrough, P.E. Chief
Waste Management Division
U.S. Environmental Protection Agency
Region IV
345 Courtland Street
Atlanta, Georgia 30365

2. All documents submitted pursuant to the conditions of this permit shall be accompanied by a cover letter stating the name and date of the document submitted, the number(s) of the Specific Condition(s) affected, and the permit number and project name of the permit involved. All submittals modifying the approved Closure and/or Post-closure Plan shall be certified by the owner and operator and signed, sealed and certified by a professional engineer registered in the State of Florida except when exempted in accordance with 17-4.050 and 17-730.220(5), FAC.

3. The Department may modify, revoke, reissue, or terminate for cause this permit in accordance with the provisions of 17-730.290, FAC. The filing of a request for a permit modification, revocation, reissuance, or termination, or the notification of planned changes or anticipated noncompliance on the part of the permittee does not stay the applicability or enforceability of any permit condition. The permittee may submit any subsequent revisions to the Department for departmental approval. Should these revisions constitute a modification to the permit, the permittee shall meet the requirements of 17-730.290, FAC.

4. The permittee shall follow the emergency procedures specified in 40 CFR Part 264.56 and approved in Attachment A-2 of the application. The permittee shall give proper notification if an emergency situation arises and within fifteen (15) calendar days must submit to the Department a written report which includes all information required in 40 CFR Part 264.56(j).

5. The Department of Environmental Regulations's 24-hour emergency telephone number is (904) 488-1320. During normal business hours, the District Office may be contacted at (904) 448-4320. The Bureau of Waste Cleanup may be contacted at (904) 488-0190.

6. The permittee shall inspect the facility emergency and safety equipment in accordance with 40 CFR Part 264.15. Changes to the schedule must be approved in writing by the Department. The schedule must be maintained as part of the operating record at the facility.

7. Facility personnel must successfully complete the approved training program in accordance with 40 CFR Part 264.16. Verification of this training must be kept with the personnel training records and maintained on site. Personnel shall not work unsupervised until the appropriate training has been completed.

8. The contingency plan must be amended and distributed to the appropriate agencies if any criteria in 40 CFR Part 264.54 are met. Amendments to the plan must be approved in writing by the Department.

9. Prior to 135 calendar days before the expiration of this permit, the permittee shall submit a complete application for renewal of the permit on forms and in a manner prescribed by the Department, unless post-closure care has been completed and certified in accordance with Specific Condition IV.6 and accepted by the Department [17-730.300(1), FAC].

10. The permittee shall keep a written operating record at the facility which includes:

    a. The results of the waste analyses.

    b. A summary report and details of incidents that require implementation of the contingency plan.

    c. Manifests

    d. The results of inspections.

    e. Closure plan and closure cost estimates.

    f. Biennial reports.

    g. Monitoring, testing or analytical data where required by 40 CFR Part 264 Subpart F and 40 CFR Part 264.226.

    These records must be maintained at the facility until completion and certification of closure [40 CFR Parts 264.73 and .74].

11. The permittee shall comply with all the applicable portions of 40 CFR Parts 260 through 268 and those conditions required by 40 CFR Parts 270.30 and 270.31 (17-730.280, FAC).

12. The permittee shall revise "Part I - General" of the Application for a Hazardous Waste Facility Permit (17-730.900(2), FAC) within thirty (30) calendar days of any changes in the Part I. The revised "Part I - General" must be submitted to the Department within thirty (30) calendar days of suc changes.

PART II - STANDARD CLOSURE REQUIREMENTS:

1. The permittee shall close the hazardous waste units in a manner that minimizes or eliminates, to the extent necessary to protect human health an the environment, post-closure escape of hazardous waste, hazardous waste constituents, leachate, contaminated run-off, or hazardous waste decomposition products to the groundwater, surface waters, or to the atmosphere (40 CFR Part 264.111).

2. In accordance with the requirements of 40 CFR Part 264.112(a), the permittee shall keep a copy of the Closure Plan and all revisions to the plan until closure is completed, certified in accordance with 40 CFR Part 264.115, and accepted by the Department.

3. The permittee must complete clean-up and sampling activities in accordance with the Federal Facilities Agreement (FFA) dated October 23, 1990. Any changes in the time allowed for closure of the units after approval shall require prior Department approval (40 CFR Part 264.113).

4. The permittee shall decontaminate or dispose of all facility equipment, structures, and residues resulting from the closure activities as required by 40 CFR Part 264.114.

5. Within sixty (60) calendar days of the completion of physical closure, the permittee shall submit to the Department, by certified mail or hand delivery, a report signed by the permittee and an independent, Professional Engineer registered in the State of Florida, except when exempted, in accordance with 17-4.050 and 17-730.220(5), FAC stating that the surface impoundments have been closed in compliance with the Closure Plan, and the specific conditions of this permit (40 CFR Part 264.115).

6. The permittee shall maintain a daily log of closure activities on site throughout the closure period. Closure activities shall be reported to the Department on a quarterly basis, in accordance with the Federal Facilities Agreement dated October 23, 1990.

7. All sampling and analytical procedures shall be done in accordance with the Basic Sampling and Analysis Plan (BSAP). The permittee shall revise the Basic Sampling and Analysis Plan whenever there is a change in sampling and/or analytical procedures, including personnel. The revised plan or revisions must be submitted to the Department for approval within thirty (30) calendar days of such changes.

8. The permittee shall provide opportunities for site inspections by the Department by informing the District Office and Bureau of Waste Cleanup (Specific Conditions I.1 or I.5) in writing or verbally at least seven (7) calendar days in advance of any physical closure activity (e.g. soil sampling, pipe removal, soil removal, cap installation, decontamination of equipment, etc.).

9. If at any time the permittee determines that actions undertaken as part of closure or associated monitoring programs no longer satisfy the requirements set forth in this permit, the permittee shall, within seven (7) calendar days, notify the Department of this finding. If the Department determines that a major modification is required, the permittee shall, within sixty (60) calendar days, submit an application for a permit modification in accordance with 17-730.290 FAC, to make any appropriate changes to the permit.

10. All amendments, revisions, and modifications to any plan required by this permit shall be submitted to the Department for review and permit modification as necessary.

PART III - CLOSURE CONDITIONS FOR SURFACE IMPOUNDMENTS:

1. The surface impoundments shall be closed as approved in Section D of the application and 40 CFR Part 264 Subparts G and K.

2. The Department shall be notified seven (7) calendar days prior to taking soil samples.

3. The permittee shall maintain a daily log of closure activities on site throughout the closure peridd. Closure activities shall be reported to the Department on a quarterly basis, in accordance with the Federal Facilities Agreement dated October 23, 1990.

PART IV - POST-CLOSURE CONDITIONS FOR SURFACE IMPOUNDMENTS:

1. Upon completion of closure of the surface impoundments, the permittee shall:

   a. Begin post-closure care and continue for thirty years after that date in accordance with 40 CFR Part 264.117(a).

   b. Maintain compliance with security provisions of 40 CFR Part 264.14, throughout the post-closure care period, to prevent the unauthorized entry of persons or livestock onto the facility [40 CFR Part 264.117(b)].

   c. Never disturb the final cover or any other components of the associated structures unless previous written Department approval has been provided pursuant to 40 CFR Part 264.117(c).

d. Ensure that all post-closure care activities be in accordance with the Post-closure Plan as specified in 40 CFR Part 264.118 [40 CFR Part 264.117(d)].

2. The permittee shall keep a copy of the Post-closure Plan and all revisions to the plan at the facility until post-closure care is completed and certified in accordance with 40 CFR Part 264.120 [40 CFR Part 264.118(c)] and accepted by the Department.

3. Any proposed amendments to the Post-closure Plan shall be submitted to the Department for review and approval [40 CFR Part 264.118(d)].

4. Within sixty (60) days upon receipt of Department acceptance of the certification of closure, the permittee shall comply with the requirements of 40 CFR Part 264.119(a) (Notice to local land authority).

5. The permittee shall comply with the requirements of 40 CFR Part 264.119(b) (Notice in deed to property). The notice shall be submitted to the Department within sixty (60) days of receipt of the departmental acceptance of the certification of closure of the hazardous waste surface impoundments.

6. Within sixty (60) days from the completion of the established post-closure care period, the permittee shall submit to the Department by certified mail or hand delivery, a letter signed by the permittee and an independent professional engineer, registered in the State of Florida, except when exempted, in accordance with 17-4.050 and 17-730.220(5), FAC, stating that the post-closure care for the hazardous waste disposal unit was performed in accordance with the specifications in the approved Post-closure Plan [40 CFR Part 264.120].

7. The permittee shall comply with all applicable portions of 40 CFR Parts 260 through 268 until released from post-closure care requirements.

PART V - GROUNDWATER MONITORING PROGRAM:

1. The Waste Management Areas shall be imaginary lines circumscribing the Sludge Drying Beds and Polishing pond designated on Attachment A [40 CFR Part 264.95(b)(1) and (2)]. The Point of Compliance shall be the northern and eastern boundaries of the Waste Management Areas [40 CFR Part 264.95(a)]. If future groundwater monitoring indicates a change in groundwater flow direction within the surficial aquifer, this permit may be modified to require the installation of additional point-of-compliance monitoring wells.

2. The background water quality monitoring well for both Waste Management Areas shall be Well NAS4-9 (Attachment B).

3. The point-of-compliance wells for the combined Sludge Drying Beds shall be NAS4-5, 41-3, 41-4, and 41-6 (Attachment B).

4. The point-of-compliance wells for the Polishing Pond shall be 42-5, 42-6, 42-7 and 42-8 (Attachment B).

5. All groundwater sampling shall be conducted in accordance with the Basic Sampling and Analysis Plan noted in Section M.11 of the application.

6. The permittee shall sample the background well, all point-of-compliance wells and assessment well clusters 4-20 and 4-21 (Attachment B) in January and July of each year throughout the Compliance Periods specified in Specific Condition 14 of this part. Each of these wells must be sampled for the constituents listed in Specific Conditions 8 and 9 of this part.

7. The permittee shall submit to the Department groundwater monitoring reports that provide analytical data and information requested in Specific Conditions 6, 10, 13, 14 and 16 of this part. The groundwater monitoring data from each January sampling event shall be submitted no later than April 30 and data from each July sampling event shall be submitted no later than October 31. If for any reason the permittee is unable to submit analyses within the specified time, the permittee must comply with General Condition 8.

PERMITTEE
U.S. Naval Air Station-Jacksonville
Post Office Box 5, Code 184
Jacksonville, Florida 32212-5000

I.D. Number: FL6 170 024 412
Permit/Certification: HF16-152611
Date of Issue: September 20, 1991
Expiration Date: September 20, 1996

8. The Groundwater Protection Standard (40 CFR Part 264.92) shall be:

Parameters	Groundwater Protection Standard
tetrachloroethylene	background
methylene chloride	background
trichloroethylene	background
1,1,2-trichloroethane	background
toluene	background
carbon tetrachloride	background
chloroform	background
methyl ethyl ketone	background
ethylene dibromide	background
benzene	background
1,2-dichlorobenzene	background
chlorobenzene	background
vinyl chloride	background
total cresols	background
cryselic acid	background
total phenols	background
total xylene	background
carbon disulfide	background
trichlorofluoromethane	background
pyridine	background
2-nitropropane	background
nitrobenzene	background
1,2-dichloropropane	background
1,2,3-trichloropropane	background
arsenic	0.05 mg/l
barium	1.0 mg/l
cadmium	0.01 mg/l
total chromium	0.05 mg/l
lead	0.05 mg/l
mercury	0.002 mg/l
selenium	0.01 mg/l
silver	0.05 mg/l
nickel	background
complexed cyanide	background

mg/l = milligrams per liter; background is defined in Specific Condition 10 of this part.

9. The following constituents shall be sampled on a semi-annual basis:

pH	1,1,1-trichloroethane
specific conductance	isobutanol
turbidity	1,1,2-trichloro-1,2,2-trifluoroethane
total coliform	2-ethoxyethanol
nitrate (as N)	copper
radium 226	fluoride
radium 228	iron
gross alpha	manganese
gross beta	sodium
chloride	vanadium
1,1-dichloroethane	zinc
1,2-dichloroethane	sulfate

10. Background concentrations shall be established through sampling at the upgradient background well each time groundwater is sampled at the Point of Compliance. The background concentration limit shall be the mean of the four most recent background samples of the hazardous constituent [40 CFR Part 264.99(c)(1)].

11. The permittee may apply for Alternate Concentration Limits (ACLs) in accordance with 40 CFR Part 264.94. In accordance with 40 CFR Part 264.94(b), the Department shall establish Alternate Concentration Limits (ACLs) upon approval of the ACL demonstration.

12. The Compliance Period (40 CFR Part 264.96) for the Sludge Drying Beds began February 25, 1988 and the Compliance Period shall be 26 years long. The Compliance Period for the Polishing Pond began April 13, 1990 and the Compliance Period shall be 26 years. If the permittee is engaged in a corrective action program at the end of the Compliance Period, the Compliance Period is extended until the permittee can demonstrate that the Groundwater Protection Standard (40 CFR Part 264.92) specified in Specific Condition 8 of this part has not been exceeded for a period of three consecutive years.

13. Groundwater elevations and flow rates shall be determined each time wells are sampled [40 CFR Part 264.97(f)]. In addition, groundwater elevations for all monitoring wells must be measured on a quarterly basis in January, April, July and October of each year. All groundwater elevations must be measured within the same eight hour period and must be measured prior to sampling. The data for the January event shall be submitted no later than April 30 of each year; the data for the April event shall be submitted no later than July 31 of each year; the data for the July event shall be submitted no later than October 31 of each year and the data for the October event shall be submitted no later than January 31 of the following year. In addition, total depth of all wells must be determined by physical measurement each time a well is sampled to determine whether siltation of any well is occurring, and to calculate the casing volume to be purged prior to sampling. If infilling or siltation of wells is determined, the discovery and any corrective action taken shall be reported to the Department within fifteen (15) days.

14. The permittee shall notify the Department in writing if any damage to the groundwater monitoring wells occurs. Damage subject to this notification will be that requiring repair, not maintenance. Notification describing corrective action taken shall be given after damage has been corrected, or within fifteen (15) days from the date the damage was detected, whichever occurs first. Description of corrective action taken shall be submitted in writing to the Department, in any case, within fifteen (15) days of completion date.

15. The permittee shall provide the Department with opportunities to observe groundwater sampling and split samples by providing the District Office and Bureau of Waste Cleanup (Specific Conditions I.1 and I.5) written or verbal notification at least seven (7) days prior to each groundwater sampling event.

16. If wells are to be abandoned, they shall be abandoned in accordance with 17-532.500(4), FAC.

PART VI - POST-CLOSURE ASSESSMENT:

1. Additional assessment of contaminated groundwater must continue in conjunction with the CERCLA Remedial Investigation/Feasibility Study.

PART VII- POST-CLOSURE CORRECTIVE ACTION:

interim remedial action

1. The permittee shall submit, to the Department, a detailed corrective action plan to meet the requirements of 40 CFR Part 264.100 and CERCLA requirements in accordance with the Federal Facilities Agreement dated October 23, 1990.

2. Within thirty (30) days of Department approval, the permittee shall implement the Corrective Action Plan.

3. After the Corrective Action Plan is implemented, the permittee shall submit to the Department in March and September of eacn year a report on the effectiveness of the corrective action program [40 CFR Part 264.100(g)].

4. Corrective action measures may be terminated upon the Department's approval, when the hazardous constituents listed in Specific Condition V.8 have been below the concentrations limits established in the Groundwater Protection Standards for a period of three consecutive years [40 CFR Part 264.100(e)(2)].

5. The permittee must continue corrective action measures during the Compliance Period to the extent necessary to ensure that the Groundwater Protection Standard is not exceeded. If the permittee is conducting corrective action at the end of the Compliance Period, the permittee shall continue that corrective action until groundwater monitoring data demonstrate that the Groundwater Protection Standard has not been exceeded for a period of three consecutive years [40 CFR Parts 264.96(c) and .100(f)].

6. If corrective action is terminated prior to the termination of the post-closure care period, this permit shall be modified to address at a minimum, semi-annual groundwater monitoring throughout the remainder of the post-closure care period.

7. The corrective action program set forth in 40 CFR Part 264.100 shall extend beyond the facility property boundary [17-730.180(5)(b), FAC].

Issued 9/20/91

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL REGULATION

John M. Ruddell

John M. Ruddell, Director
Division of Waste Management

Filing and Acknowledgement
Filed on this date, pursuant
to Section 120.52, Florida
Statutes, with the designated
Clerk, receipt of which is acknowledged.

Debra Dutley 9/20/91
CLERK DATE

This is to certify that this Notice of Permit was mailed before the close of business on September 20, 1991.

PERMITTEE
U.S. Naval Air Station-Jacksonville
Post Office Box 5, Code 184
Jacksonville, Florida 32212-5000

I.D. Number: FL6 170 024 412
Permit/Certification: HF16-152611
Date of Issue: September 20, 1991
Expiration Date: September 20, 1996

ATTACHMENT A
WASTE MANAGEMENT AREAS

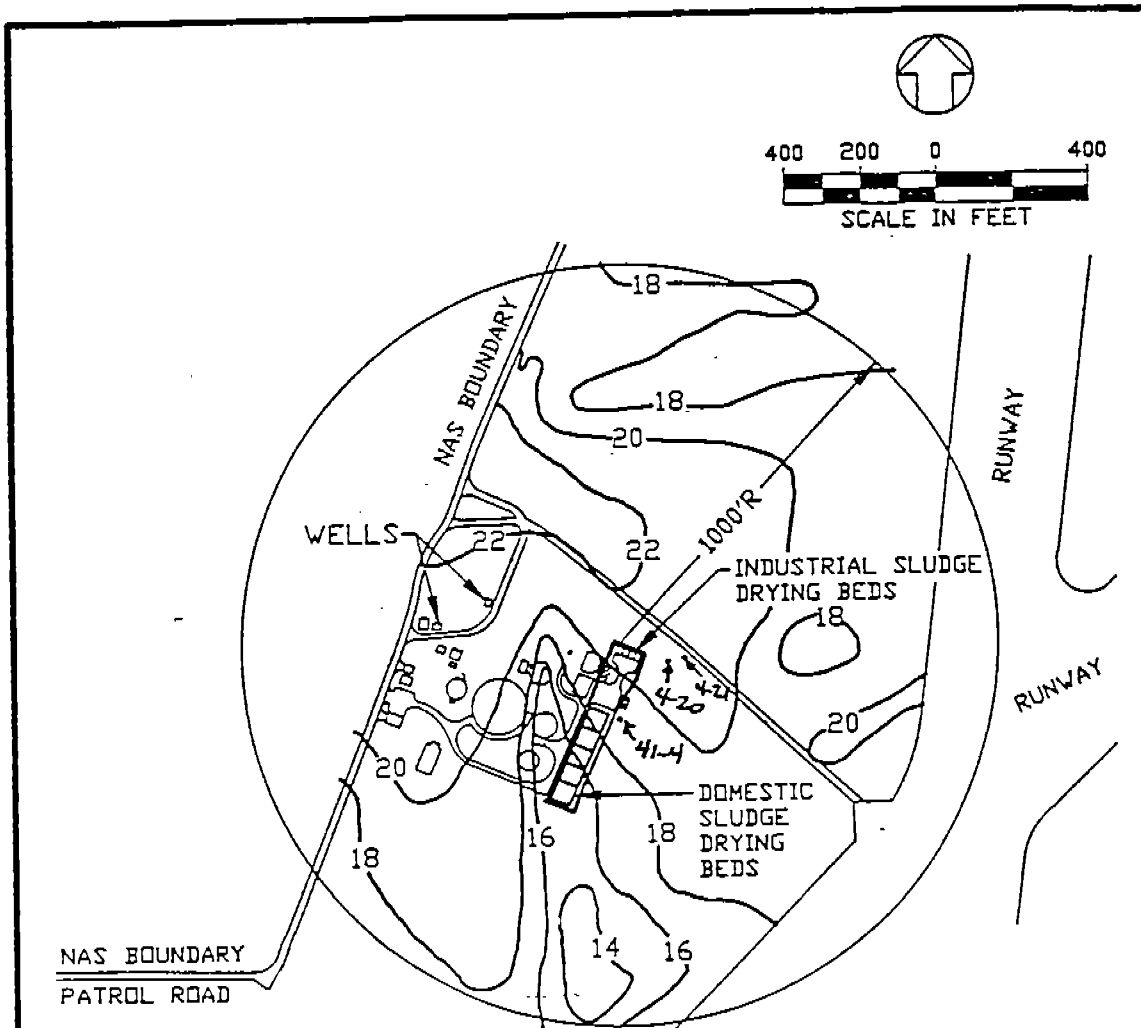


FIGURE M-17
MONITORING WELL LOCATION MAP
UNLINED SLUDGE DRYING BEDS
NAS JACKSONVILLE

MAP SOURCE: RESOURCE ENGINEERING, INC.

PERMITTEE
U.S. Naval Air Station-Jacksonville
Post Office Box 5, Code 184
Jacksonville, Florida 32212-5000

I.D. Number: FL6 170 024 412
Permit/Certification: HF16-15261
Date of Issue: September 20, 199
Expiration Date: September 20, 1

ATTACHMENT A
WASTE MANAGEMENT AREAS (continued)

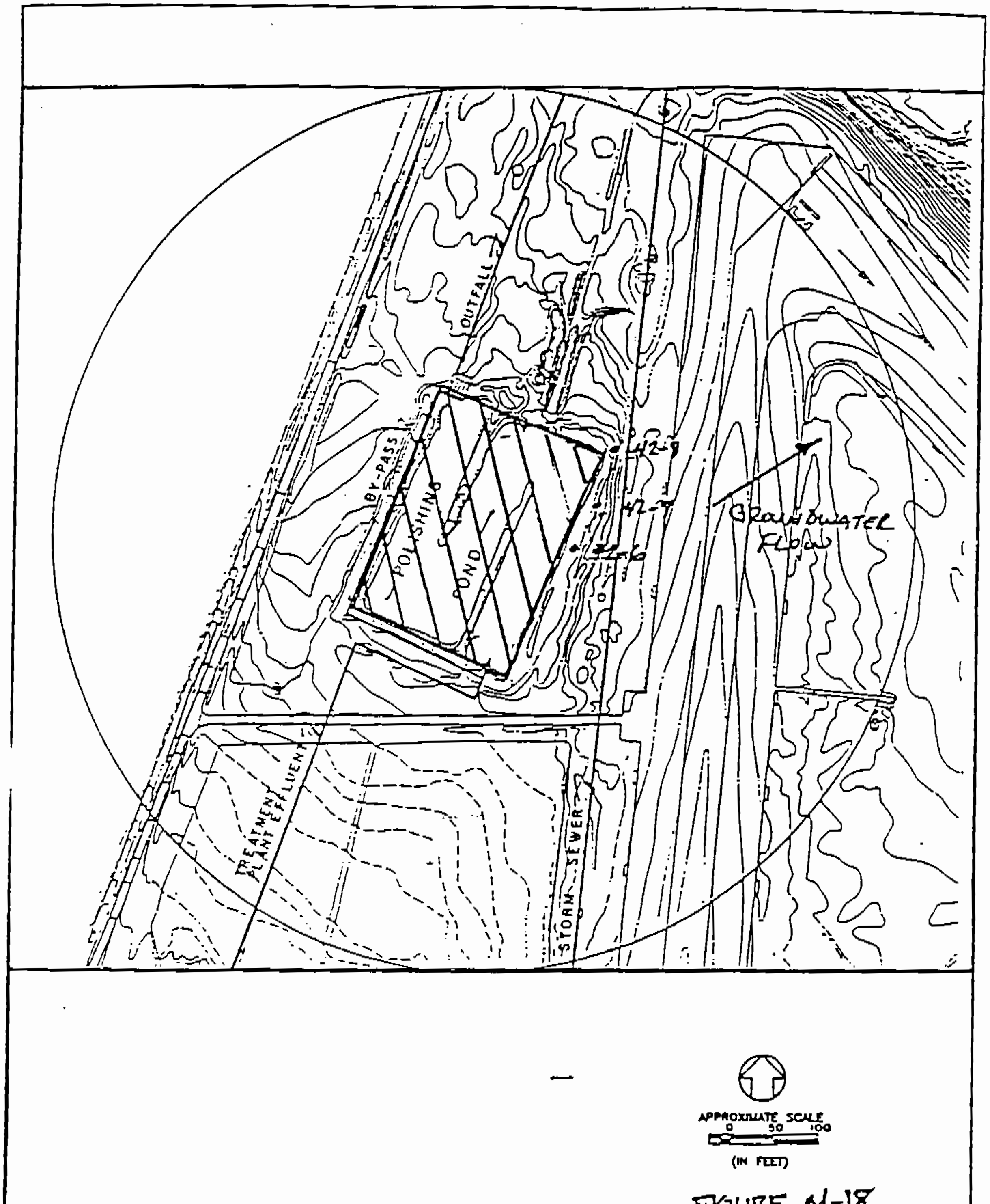


FIGURE M-18
MONITORING WELL LOCATION MAP
POLISHING POND

PERMITTEE
U.S. Naval Air Station-Jacksonville
Post Office Box 5, Code 184
Jacksonville, Florida 32212-5000

I.D. Number: FL6 170 024 412
Permit/Certification: HF16-152611
Date of Issue: September 20, 1991
Expiration Date: September 20, 1996

ATTACHMENT B
GROUNDWATER MONITORING WELLS

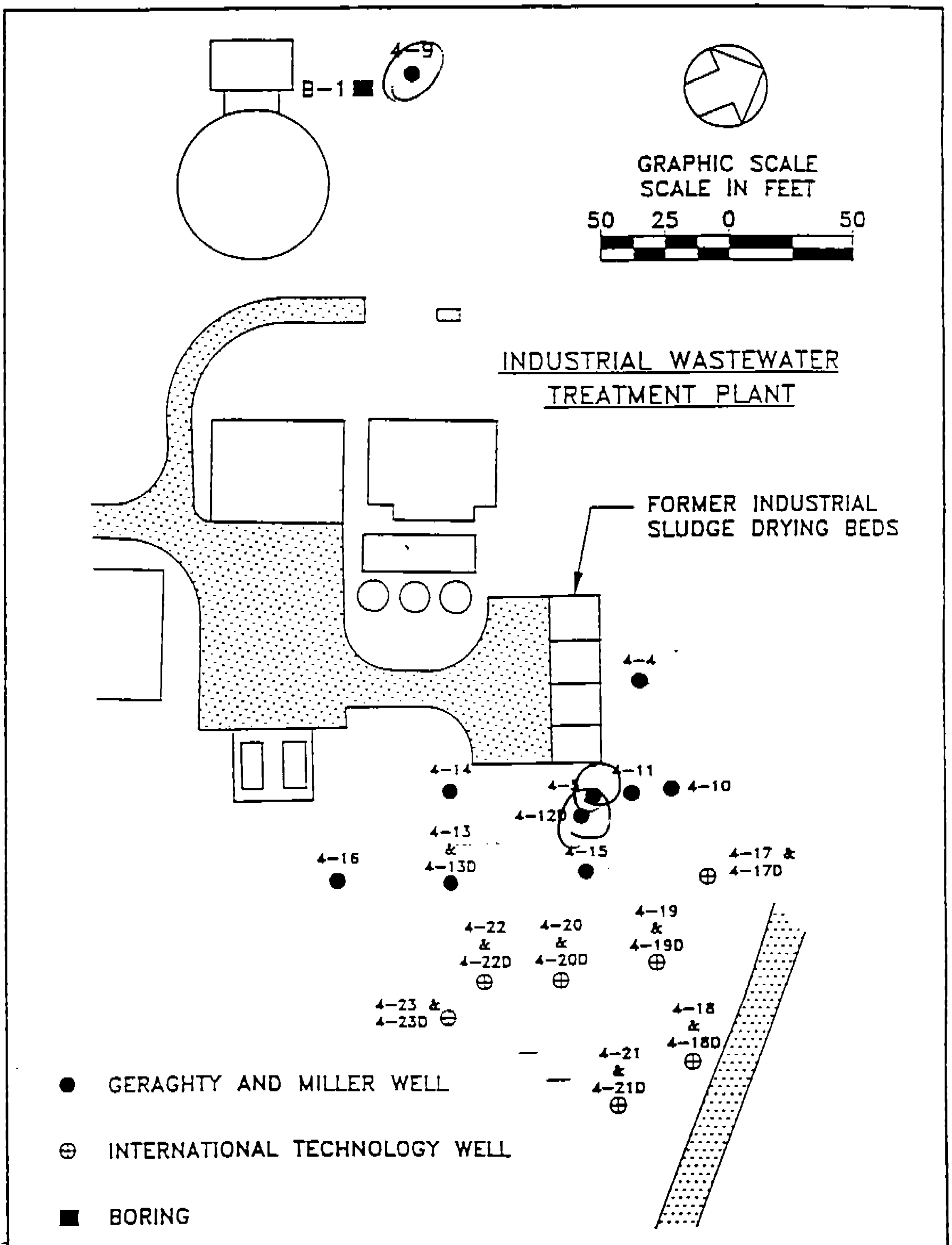
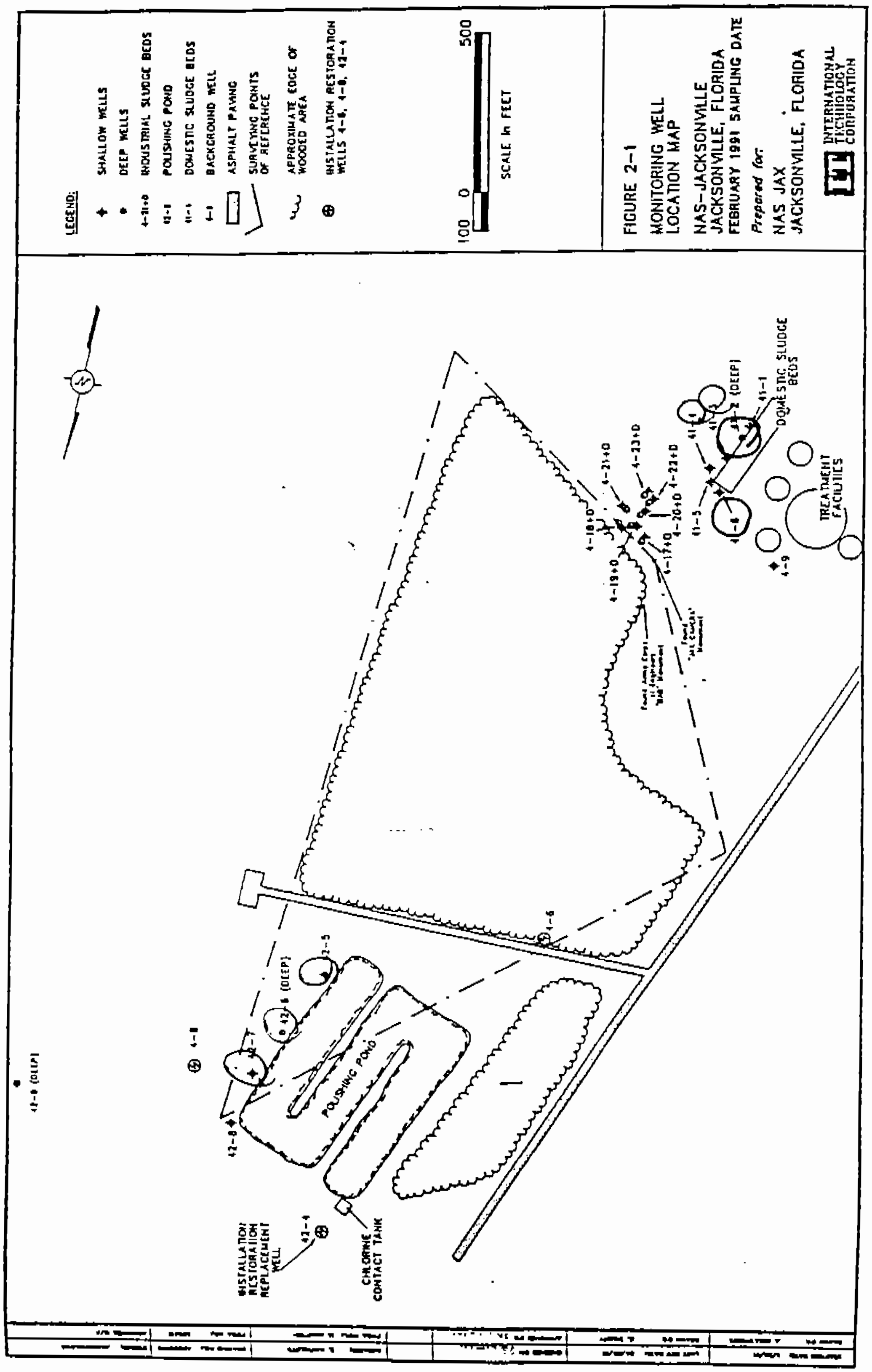


FIGURE M-1
MONITOR WELL LOCATION MAP

ATTACHMENT B
GROUNDWATER MONITORING WELLS (continued)



APPENDIX C-2

FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION
1997 PERMIT #HF16-288092 FOR CLOSURE AND POSTCLOSURE
OF THREE HAZARDOUS WASTE SURFACE IMPOUNDMENTS

Department of Environmental Protection

Lawton Chiles
Governor

Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Virginia B. Wetherell
Secretary

June 26, 1997

CERTIFIED MAIL - RETURN RECEIPT

Captain Robert D. Whitmire
Commanding Officer
U. S. Naval Air Station - Jacksonville
Post Office Box 5
Jacksonville, Florida 32212-5000

Subject: U. S. Naval Air Station - Jacksonville
FL6 170 024 412
Post-closure Permit HF16-288092
Duval County

Dear Captain Whitmire:

Enclosed is Permit Number HF16-288092 to post-close three hazardous waste surface impoundments and a hazardous waste storage unit (Building 101 - electroplating shop) being permitted issued pursuant to Section 403.722, Florida Statutes (F.S.), and Chapters 62-3, 62-4, 62-25, 62-160, 62-550, 62-522, 62-532 and 62-730, Florida Administrative Code (F.A.C.).

This permit is final and effective on the date filed with the Clerk of the Department. When the Order [Permit] is final, any party to the Order has the right to seek judicial review of the Order pursuant to Section 120.68, F.S., by the filing of a Notice of Appeal pursuant to Rule 9.110, Florida Rules of Appellate Procedure, with the Clerk of the Department in the Office of General Counsel, Department of Environmental Protection, 3900 Commonwealth Boulevard, MS #35, Tallahassee, Florida 32399-3000; and by filing a copy of the Notice of Appeal accompanied by the applicable filing fees with the appropriate District Court of Appeal. The Notice of Appeal must be filed within thirty (30) days from the date the Final Order is issued.

Sincerely,

John M. Ruddell

John M. Ruddell, Director
Division of Waste Management

JMR/cps

enclosure

cc (with enclosure):

Kent Williams, EPA/Region 4
Michael J. Fitzsimmons
Ashwin B. Patel, DEP/Jacksonville
Jorge Caspary, DEP/BWC
Jane Mears, NAS Jacksonville
Diane Lancaster, NAS Jacksonville
Mayor, City of Jacksonville
Chair, Duval County Commissioners

FLORIDA

Department of Environmental Protection

Lawton Chiles
Governor

Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Virginia B. Wetherell
Secretary

Permittee:
U. S. Naval Air Station - Jacksonville
Post Office Box 5
Jacksonville, Florida 32212-5000

Attention:
Captain Robert D. Whitmire,
Commanding Officer

I.D. Number: FL6 170 024 412
Permit/Certification Number: HF16-288092
Issue Date: June 26, 1997
Expiration Date: September 20, 2001
County: Duval
Latitude/Longitude: 30°13'30"N/81°41'40"W
Section/Township Range: 23/T3S/R27E
Project: Post-closure of three hazardous waste surface impoundments and a hazardous waste storage unit (Building 101 - electroplating shop).

This permit is issued under the provisions of Section 403.722, Florida Statutes and Florida Administrative Code Chapters 62-3, 62-4, 62-25, 62-160, 62-522, 62-532, 62-550, and 62-730. The above-named permittee is hereby authorized to perform the work or operate the facility shown on the application, and approved drawing(s), plans, and other documents attached hereto or on file with the Department and made a part hereof and specifically described as follows:

To post-close three surface impoundments that are no longer in service: Domestic Waste Sludge Drying Beds, Industrial Waste Sludge Drying Beds, and Polishing Pond. These surface impoundments contained hazardous waste generated from wastewater treatment operations at Naval Air Station-Jacksonville and had EPA Hazardous Waste Codes: F001 through F005 and F019 (as described in Table 1-1, page L-4 of the permit application dated April 22, 1996 and revised August 1, 1996).

The Industrial Waste Sludge Drying Beds were comprised of four beds used to dewater wastewater treatment sludges from electroplating operations (F006 hazardous waste). Each drying bed was approximately 15 feet by 18 feet. The drying beds were enclosed with retaining walls constructed of eight-inch thick concrete reinforced with Number 5 reinforcing steel on 12-inch spacings, with an underlying 10-inch gravel layer. The beds were underdrained and the liquids were returned to the industrial wastewater treatment plant. Approximately 8250 gallons of dried sludges were excavated annually from the surface impoundment.

The Domestic Waste Sludge Drying Beds and the Polishing Pond were used for the treatment and storage of sludges resulting from the treatment of F006 and F019 rinsewater from electroplating operations, F001 through F005 paint stripping and parts cleaning operations, and sludge from the aerobic digester of the domestic wastewater treatment plant. The Domestic Waste Sludge Drying

Beds consisted of five beds. Each bed was approximately 50 feet by 50 feet with a three-foot high wall constructed of eight-inch concrete blocks and reinforced with wire tire ties. The bottom of the beds was unlined and was underlain by seven inches of sand, three inches of fine gravel and six inches to 12 inches of coarse gravel.

The Polishing Pond was built in 1970 to provide additional settling for 2.36 million gallons per day of combined domestic and industrial wastewater treated effluent. The Polishing Pond was unlined and had a surface area of 3.8 acres and an average depth of 3.5 feet.

To post-close a hazardous waste storage unit (Building 101 - electroplating shop) which consisted of ninety-six (96) tank systems, fifty-six (56) of which were considered to be hazardous waste tanks, and had dimensions of 100' by 78'. The total capacity of the 56 hazardous waste tanks was approximately thirty-eight thousand (38,000) gallons. The shop ceased operations in 1990. Hazardous waste codes are listed in Attachment A.

The facility is located at the U.S. Naval Air Station in Jacksonville, Florida 32212-5000.

The following documents were used in the preparation of this permit:

1. **Meeting Minutes**, dated March 15, 1996 between representatives of the Department and Naval Air Station (NAS) Jacksonville.

2. **Application for: Closure Permit Old Plating Shop (Bldg. 101), Domestic Sludge Drying Beds, Industrial Sludge Drying Beds, and Polishing Pond** dated April 22, 1996.

3. Quality Assurance Project Plan approved June 20, 1993.

4. Revisions, dated August 1, 1996 to permit application.

5. **1996 Site Management Plan** dated August 30, 1996 (Gaskins to Caspary).

6. **Hazardous Waste Facility Closure/Post-Closure Permit Application** dated August 8, 1988 and revised June 2, 1989, October 23, 1990, November 21, 1990 and February 26, 1991.

7. **Federal Facilities Agreement** dated October 23, 1990.

8. **Naval Installation Restoration Program Plan, Naval Air Station, Jacksonville, Florida, Volume 1, Organization and Planning, September 1991**, by Geraghty and Miller, Inc.

9. Revisions, dated February 26, 1997 to permit application.

10. Requested Changes, dated April 8, 1997, to Post-closure Permit HF16-288092.

11. Affidavit, dated May 14, 1997, requesting deletion of groups of parameters from Appendix IX sampling for the Domestic Sludge Drying Bed, Industrial Sludge Drying Bed and Polishing Pond.

12. Change, dated June 19, 1997, to signing date of draft Record of Decision (ROD).

GENERAL CONDITIONS:

1. The terms, conditions, requirements, limitations, and restrictions set forth in this permit are "permit conditions" and are binding and enforceable pursuant to Sections 403.141, 403.727, and 403.859 through 403.861, Florida Statutes (F.S.). The permittee is placed on notice that the Department will review this permit periodically and may initiate enforcement actions for any violation of these conditions.

2. This permit is valid only for the specific processes and operations applied for and indicated in the approved drawings or exhibits. Any unauthorized deviation from the approved drawings, exhibits, specifications, or conditions of this permit may constitute grounds for revocation and enforcement action by the Department.

3. As provided in Subsections 403.087(6) and 403.722(5), F.S., the issuance of the permit does not convey any vested rights or any exclusive privileges. Neither does it authorize any injury to public or private property or any invasion of personal rights, nor infringement of federal, state, or local laws or regulations. This permit is not a waiver of or approval of any other Department permit that may be required for other aspects of the total project which are not addressed in the permit.

4. This permit conveys no title to land or water, does not constitute State recognition or acknowledgment of title, and does not constitute authority for the use of submerged lands unless herein provided and the necessary title or leasehold interests have been obtained from the state. Only the Trustees of the Internal Improvement Trust Fund may express State opinion as to title.

5. This permit does not relieve the permittee from liability for harm or injury to human health or welfare, animal, or plant life or property caused by the construction or operation of this permitted source, or from penalties therefore; nor does it allow the permittee to cause pollution in contravention of Florida Statutes and Department Rules, unless specifically authorized by an order from the Department.

6. The permittee shall properly operate and maintain the facility and systems of treatment and control (and related appurtenances) that are installed and used by the permittee to achieve compliance with the conditions of this permit, as required by Department Rules. This provision includes the operation of backup of auxiliary facilities or similar systems when necessary to achieve compliance with the conditions of the permit and when required by Department Rules.

7. The permittee, by accepting this permit, specifically agrees to allow authorized Department personnel, upon presentation of credentials or other documents as may be required by law and at reasonable times, access to the premises where the permitted activity is located or conducted to:

   a. have access to and copy any records that must be kept under conditions of the permit;

b. inspect the facility, equipment, practices, or operations regulated or required under this permit;

c. sample or monitor any substances or parameters at any location reasonably necessary to assure compliance with this permit or Department Rules.

Reasonable times may depend on the nature of the concern being investigated.

8. If, for any reason, the permittee does not comply with or will be unable to comply with any condition or limitation specified in this permit, the permittee shall immediately provide the Department with the following information:

   a. a description of cause of noncompliance; and,

   b. the period of noncompliance, including dates and times; or, if not corrected, the anticipated time the noncompliance is expected to continue, and steps being taken to reduce, eliminate, and prevent recurrence of the noncompliance. The permittee shall be responsible for any and all damages which may result and may be subject to enforcement action by the Department for penalties or revocation of this permit.

9. In accepting this permit, the permittee understands and agrees that all records, notes, monitoring data and other information relating to the construction or operation of this permitted source which are submitted to the Department may be used by the Department as evidence in any enforcement case involving the permitted source arising under the Florida Statutes or Department Rules, except where such use is prescribed by Sections 403.111 and 403.73, F.S. Such evidence shall only be used to the extent it is consistent with the Florida Rules of Civil Procedure and appropriate evidentiary rules.

10. The permittee agrees to comply with changes in Department Rules and Florida Statutes after a reasonable time for compliance provided, however, the permittee does not waive any other rights granted by Florida Statutes or Department Rules. A reasonable time for compliance with a new or amended surface water quality standard, other than those standards addressed in Rule 62-302.500, F.A.C. shall include a reasonable time to obtain or be denied a mixing zone for the new or amended standard.

11. This permit is transferable only upon Department approval in accordance with Rules 62-4.120 and 62-730.300, F.A.C., as applicable. The permittee shall be liable for noncompliance of the permitted activity until the transfer is approved by the Department.

12. This permit or a copy thereof is required to be kept at the work site of the permitted activity.

13. This permit also constitutes:

    a. determination of Best Available Control Technology (BACT).

b. determination of Prevention of Significant Deterioration (PSD).

c. certification of compliance with State Water Quality Standards (Section 401, Public Law 92-500).

d. compliance with new Source Performance Standards.

14. The permittee shall comply with the following:

a. Upon request, the permittee shall furnish all records and plans required under Department Rules. During enforcement actions, the retention period for all records will be extended automatically unless otherwise stipulated by the Department.

b. The permittee shall hold at the facility or other location designated by this permit records of all monitoring information (including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation) required by this permit, copies of all reports required by this permit, and records of all data used to complete this application for this permit. These materials shall be retained at least three years from the date of the sample, measurement, report, or application unless otherwise specified by Department Rules.

c. Records of monitoring information shall include:

(1). the date, exact place, and time of sampling or measurements;

(2). the person responsible for performing the sampling or measurements;

(3). the dates the analyses were performed;

(4). the person responsible for performing the analyses;

(5). the analytical techniques or methods used; and,

(6). the results of such analyses.

15. When requested by the Department, the permittee shall, within a reasonable time, furnish any information required by law which is needed to determine compliance with the permit. If the permittee becomes aware that relevant facts were not submitted or were incorrect in the permit application dated April 22, 1996 and revised August 1, 1996 or in any report to the Department, such facts or information shall be corrected promptly.

16. The following conditions shall also apply to the hazardous waste facility permit:

a. The following reports shall be submitted to the Department:

(1). Manifest Discrepancy Report. If a significant discrepancy in a manifest is discovered, the permittee shall attempt to rectify the discrepancy. If not resolved within fifteen (15) days after the waste is received, the permittee shall immediately submit a letter report, including a copy of the manifest, to the Department.

(2). Unmanifested Waste Report. The permittee shall submit an unmanifested waste report to the Department within fifteen (15) days of receipt of unmanifested waste.

(3). Biennial Report. A biennial report covering facility activities during the previous calendar year shall be submitted to the Department pursuant to Chapter 62-730, F.A.C.

b. Notification of any noncompliance which may endanger human health or the environment including the release of any hazardous waste that may endanger public drinking water supplies, or the occurrence of a fire or explosion from the facility which could threaten the environment or human health outside the facility, shall be reported verbally to the Department within twenty-four (24) hours, and a written report shall be provided within five (5) days. The verbal report within twenty-four (24) hours shall contain the name, address, I.D. number, and telephone number of the facility, its owner or operator, the name and quantity of materials involved, the extent of any injuries, an assessment of actual or potential hazards, and the estimated quantity and disposition of recovered material. The written submission shall contain:

(1). A description of cause of the noncompliance.

(2). If not corrected, the expected time of correction and steps being taken to reduce, eliminate, and prevent recurrence of the noncompliance.

c. Reports of compliance or noncompliance with, or any progress reports on, requirements contained in any compliance schedule shall be submitted no later than fourteen (14) days after each schedule date.

d. All reports or information required by the Department by a hazardous waste permittee shall be signed by a person authorized to sign a permit application.

SPECIFIC CONDITIONS:

PART I - STANDARD REQUIREMENTS

1. All submittals in response to these conditions (except Specific Condition 2 of this Part) shall be as follows:

a. One (1) copy shall be sent to:

Hazardous Waste Supervisor

Department of Environmental Protection
7825 Baymeadows Way, Suite 200B
Jacksonville, Florida 32256-7590

b. One (1) copy shall be sent to:

Environmental Administrator
Hazardous Waste Regulation Section
Bureau of Solid and Hazardous Waste
M.S. 4560
Department of Environmental Protection
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

c. One (1) copy shall be sent to:

Environmental Administrator
Federal Facilities Group
Bureau of Waste Cleanup
M.S. 4505
Department of Environmental Protection
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

2. All documents submitted pursuant to the conditions of this permit shall be accompanied by a cover letter stating the name and date of the document submitted, the number(s) of the Specific Condition(s) affected, and the permit number and project name of the permit involved.

3. All submittals incorporating interpretation of geological data shall be signed and sealed by a Professional Geologist registered in the State of Florida in accordance with Chapter 492, F.S. and Rule 62-730.220(8), F.A.C.

4. The Department may modify, revoke, reissue or terminate for cause this permit. The filing of a request for a permit modification, revocation, reissuance, or termination or the notification of planned changes or anticipated noncompliance on the part of permittee does not stay the applicability or enforceability of any permit condition. The permittee may submit any subsequent revisions to the Department for approval. These revisions shall meet the requirements of Rule 62-730.290, F.A.C., and the fee requirements of Rule 62-4.050, F.A.C.

5. Prior to one hundred-eighty (180) calendar days before the expiration of this permit [Rule 62-730.260(2), F.A.C.], the permittee shall submit a complete application for the renewal of the permit on forms and in a manner prescribed by the Department unless post-closure has been completed and certified in accordance with Specific Condition V.10 and accepted by the Department.

6. The Department of Environmental Protection's 24-hour emergency telephone number is (904)413-9911. During normal business hours, the DEP District Office may be contacted at (904)448-4320.

7. The facility shall comply with 40 CFR Parts 260 through 268 and those conditions required by 40 CFR Parts 270.30 and .31 (Rule 62-730.280, F.A.C.).

8. The permittee shall revise "Part I - General" of the **Application for a Hazardous Waste Facility Permit** [DEP Form 62-730.900(2)(a)] within thirty (30) days of any changes in the Part I. The revised "Part I - General" must be submitted to the Department within thirty (30) days of such changes.

9. The permittee shall follow the emergency procedures required by 40 CFR Part 264.56. The permittee shall give proper notification to the Department if an emergency situation arises, and within fifteen (15) calendar days, must submit to the Department a written report which included all information required in 40 CFR Part 264.56(j).

10. Before transferring ownership or operation of this facility during the post-closure period, the permittee must notify the new owner or operator in writing of the requirements of 40 CFR Part 264 and Rule 62-730, F.A.C. [40 CFR Part 264.12(c)] The permittee shall comply with Rule 62-730.300, F.A.C.

11. The permittee shall comply with the security provisions of 40 CFR Part 264.14 and the site security provisions in Attachment G of the permit application dated April 22, 1996 and revised August 1, 1996. This site is a suspected or confirmed contaminated site where there may be a risk of exposure to the public, and therefore, the permittee must comply with the warning sign requirements of Section 403.7255, F.S. and Rule 62-730.181(3), F.A.C.

    a. Warning signs shall be at least 2 feet by 2 feet, made of a durable weather resistant material, with a white background and red lettering of a size indicated as follows:

2" Letters-------------->	WARNING NO TRESPASSING!
1" Letters------------->	CONTAMINATED AREA AVOID CONTACT WITH SOIL AND WATER FOR INFORMATION (904)448-4320

    b. Warning signs shall be placed at all entrances and other access points and around the perimeter of any contaminated sites, treatment system areas, waste site study areas and sites with hazardous waste covers, at intervals of no greater than 100 feet and in sufficient numbers as to be seen from any approach.

c. The permittee is responsible for supplying, installing and maintaining the warning signs.

12. The permittee shall visually inspect the facility emergency and safety equipment in accordance with 40 CFR Part 264.15 and Attachment I of the permit application for Permit HO16-232028 during post-closure activities.

13. Facility personnel must successfully complete the approved training program indicated in Attachment K of the permit application dated April 22, 1996 and revised August 1, 1996, within six (6) months of employment or assignment to a facility or to a new position at the facility. Verification of this training must be kept with the personnel training records and maintained on-site. Personnel shall not work unsupervised until training has been completed. The training must be reviewed by facility personnel at least annually. The permittee shall maintain an updated list of personnel handling hazardous waste and their respective job titles at the site [40 CFR Part 264.16].

14. The permittee shall comply with the following conditions concerning preparedness and prevention:

    a. At a minimum, the permittee shall have the equipment available at the facility which are described in the Contingency Plan in Attachment D of the permit application dated April 22, 1996 and revised August 1, 1996, as required by 40 CFR Part 264.32.

    b. The permittee shall test and maintain the equipment specified in Specific Condition 16.a. of this Part as necessary to assure its proper operation in time of emergency, as required by 40 CFR Part 264.33.

    c. The permittee shall maintain access to the communications or alarm system, as required by 40 CFR Part 264.34.

    d. The permittee shall maintain arrangements with state and local authorities as required by 40 CFR Part 264.37. If state or local officials refuse to enter into preparedness and prevention arrangements with the permittee, the permittee must document this refusal in the operating record.

15. The contingency plan must be reviewed periodically and immediately amended and distributed to the appropriate agencies if any criteria in 40 CFR Part 264.54 are met. Amendments to the plan must be approved in writing by the Department.

16. The permittee shall comply with the following conditions concerning the contingency plan:

    a. The permittee shall immediately carry out the provisions of the Contingency Plan, Attachment H in the permit application dated April 22, 1996 and revised August 1, 1996, and follow the emergency procedures described by 40 CFR Part 264.56, whenever there is a fire, explosion, or release of hazardous waste or hazardous waste constituents which threatens or could threaten human health or the environment. The permittee shall give proper notification if an emergency situation arises and, within fifteen (15) calendar days, must submit to the Department a written report which includes all information required in 40 CFR Part 264.56(j).

b. The permittee shall comply with the requirements of 40 CFR Part 264.53.

c. Within seven (7) calendar days of meeting any criteria listed in 40 CFR Part 264.54(a), (b) and (c), the permittee shall amend the plan and submit the amended plan for Department approval. Any other changes to the plan must be submitted to the Department within seven (7) days of the change. All amended plans must be distributed to the appropriate agencies.

d. The permittee shall comply with the requirements of 40 CFR Part 264.55, concerning the emergency coordinator.

17. The permittee shall comply with the manifest requirements of 40 CFR Parts 264.71, 264.72 and 264.76.

18. The permittee shall keep a written operating record at the Building 144 at the facility which includes:

a. the results of the waste analysis;

b. a summary report and details of incidents that require implementation of the contingency plan;

c. manifests and the land-ban certification;

d. the results of inspections;

e. the post-closure plan;

f. biennial reports; and,

g. monitoring, testing, or analytical data where required by 40 CFR Part 264 Subparts F and G, and 40 CFR Part 264.228.

19. In the event that the permittee treats, stores, or disposes of hazardous wastes onsite where such wastes were generated, then the permittee must comply with 40 CFR Part 264.73(b)(9), and the permittee must certify, no less often than annually, that:

a. the permittee has a program in place to reduce the volume and toxicity of hazardous waste generated to the degree determined by the permittee to be economically practicable;

b. the proposed method of treatment, storage or disposal is the most practicable method available to the permittee which minimizes the present and future threat to human health and the environment; and,

c. the permittee shall maintain copies of certification in the facility operating record as required by 40 CFR 264.73(b)(9).

20. If the waste minimization program, as detailed in Specific Conditions 19a and 19b of this Part, is applicable then the permittee shall, at a minimum, address the following elements:

a. **Top management support**

1). a dated and signed policy describing management support for waste minimization and for implementation of a waste minimization plan,

2). a description of employee awareness and training programs designed to involve employees in waste minimization planning and implementation to maximize the extent feasible, and

3) a description of how a waste minimization plan has been incorporated into management practices so as to ensure ongoing efforts with respect to produce design, capital planning, production operations, and maintenance;

b. **Characterization of waste generation**

identification of types, amounts, and hazardous constituents of waste streams, with the source and date of generation;

c. **Periodic waste minimization assessments**

1). identification of all points in a process where materials can be prevented from becoming a waste, or can be recycled,

2). identification of potential waste reduction and recycling techniques applicable to each waste, with a cost estimate for capital investment and implementation,

3). description of technically and economically practical waste reduction/recycling options to be implemented, and a planned schedule for implementation,

4). specific performance goals, preferably quantitative, for the source reduction of waste by stream. Whenever possible, goals should be stated as weight of waste generated per standard unit of production, as defined by the generator.

d. **Cost allocation system**

1). identification of waste management costs for each waste, factoring in liability, transportation, recordkeeping, personnel, pollution control, treatment, disposal, compliance, and oversight costs to the extent feasible,

2). description of how departments are held accountable for the wastes they generate,

3). comparison of waste management costs with costs of potential reduction and recycling techniques applicable to each waste;

e. **Technology transfer**

1). description of efforts to seek and exchange technical information on waste minimization from other parts of the company, other firms, trade associations, technical assistance programs, and professional consultants;

f. **Program evaluation**

1). description of types and amounts of hazardous waste reduced or recycled,

2). analysis and quantification of progress made relative to each performance goal established and each reduction technique to be implemented,

3). amendments to waste minimization plan and explanation,

4). explanation and documentation of reduction efforts completed or in progress before development of the waste minimization plan, and

5). explanation and documentation regarding impediments to hazardous waste reduction specific to the individual facility.

A Pollution Prevention Plan prepared in accordance with Department of Navy requirements is acceptable in lieu of a separate Waste Minimization Plan.

PART II - CLOSURE

1. The Sludge Drying Beds and the Polishing Pond shall be closed as approved in Section T of the **Hazardous Waste Facility Closure/Post-Closure Permit Application** dated August 8, 1988 and revised June 2, 1989, October 23, 1990, November 21, 1990 and February 26, 1991.

2. The Department shall be notified seven (7) calendar days prior to taking soil samples. Where the sampling will occur over an extended period on an intermittent basis, such as sampling to determine effectiveness of treatment, a one-time notification covering an extensive sampling period is acceptable.

3. The permittee shall maintain a daily log of closure activities on-site throughout the closure period. Closure activities shall be reported to the Department on a quarterly basis in accordance with the **Federal Facilities Agreement** dated October 23, 1990.

4. Within sixty (60) calendar days of the completion of closure, the permittee shall submit to the Department, by certified mail or hand delivery, a report signed by the permittee and an independent Professional Engineer registered in the State of Florida, stating that the name of unit has been closed in compliance with the Closure Plan and the specific conditions of this permit (40 CFR Part 264.115). The Closure Certification must be based on the Professional Engineer's own observation and knowledge of the closure activities. The Certification of Closure must include, but not be limited to, the following:

   a. Sampling data to verify closure;

   b. Decontamination data;

   c. Closure activities log (Specific Condition II.5);

   d. Copies of manifests for removal of all hazardous wastes; and,

   e. Groundwater monitoring data summary.

5. The permittee shall continue to submit progress reports throughout the closure period, with copies submitted quarterly to the Department. Each report must be submitted to the Department by the tenth (10th) day of each quarter for the preceding quarter until the acceptance of physical closure by the Department. Any deviation from schedule or described tasks shall be fully documented in the report. The quarterly report may be submitted as part of the Partnership quarterly meeting minutes.

6. All sampling and analytical procedures shall be done in accordance with the revised Quality Assurance Project Plan approved by the Department on June 20, 1993. The permittee shall revise the Quality Assurance Project Plan in accordance with Rule 62-160.220, F.A.C. The revised plan or revisions must be submitted to the Department for approval within thirty (30) calendar days of any necessary changes.

7. The permittee shall notify the Northeast District Office at least seven (7) calendar days in advance of any physical closure activities. When physical closure activities will occur over an extended period on an intermittent basis, a one-time notification is acceptable. Submittal as a part of the Partnership quarterly meeting minutes is acceptable.

8. The permittee shall notify the Department within seven (7) calendar days of the determination that actions undertaken as part of closure or associated monitoring programs no longer satisfy the requirements set forth in this permit. If the Department determines that a modification of the permit is required, the permittee shall, within sixty (60) calendar days, submit an application for a permit modification in accordance with Rules 62-730.290 and 62-4.050, F.A.C.

PART III - GROUNDWATER MONITORING

1. The permittee shall comply with the requirements of 40 CFR Part 264.97.

2. The Waste Management Areas [40 CFR Part 264.95(b)] shall be designated by imaginary lines circumscribing the Sludge Drying Beds and the Polishing Pond, indicated in Figure U-3 of the permit application dated April 22, 1996 and revised August 1, 1996 and February 26, 1997.

3. The Point of Compliance [40 CFR Part 264.95(a)] shall be northern and eastern boundaries of the Sludge Drying Beds and the Polishing Pond.

4. The Point-of-Compliance (POC) wells are as follows:

   a. The background well for all Waste Management Areas shall be monitor well NAS 4-9.

   b. The POC wells for the Sludge Drying Beds shall be monitor wells NAS 4-4, NAS 4-5 and NAS 4-12D (for the Industrial Sludge Drying Bed) and NAS 41-2, NAS 41-3, NAS 41-4, NAS 41-6 (for the Domestic Sludge Drying Bed).

   c. The POC wells for the Polishing Pond shall be monitor well 42-5, 42-6D, 42-7 and the well required by Specific Condition 21 of this Part. If groundwater elevations indicate a change in groundwater flow direction of the surficial aquifer, the Department may require the installation of additional monitoring wells and revisions to the Groundwater Monitoring Plan.

5. Upon permit issuance the facility shall be in compliance monitoring in accordance with 40 CFR Part 264.99.

6. The Compliance Period is the number of years equal to the active life of the Sludge Drying Beds and the Polishing Pond, including any waste management activity prior to permitting, and the closure period. The Compliance Period is specified as follows [40 CFR Part 264.96]:

   a. For the Sludge Drying Beds, the Compliance Period began February 25, 1988 and shall be twenty-six (26) years.

   b. For the Polishing Pond, the Compliance Period began April 13, 1990 and shall be twenty-six (26) years.

   Pursuant to 40 CFR Part 264.96(c), if the permittee is engaged in a corrective action program at the end of the Compliance Period, the Compliance Period is extended until the permittee can demonstrate that the Groundwater Protection Standard of 40 CFR Part 264.92 has not been exceeded for a period of three consecutive years.

7. Upon permit issuance the permittee shall use the following schedule for groundwater sampling:

   a. For the Sludge Drying Beds, the permittee shall sample background well NAS 4-9 and monitor wells NAS 4-4, NAS 4-5 and NAS 4-12D (for the Industrial Sludge Drying Bed) and NAS 41-3, NAS 41-4, NAS 41-6 and NAS-41-2

   b. For the Polishing Pond, the permittee shall sample background well NAS 4-9 and monitor wells 42-5R, 42-6R, 42-7R, 42-8-2R and MW-017.

   Sampling shall be conducted in January and July of the first year following permit issuance and annually thereafter in January until the Department accepts the Certification of Post-closure.

8. The permittee shall submit to the Department groundwater monitoring reports that include information pursuant to Specific Condition 7. The groundwater monitoring data from the January sampling event shall be submitted no later than the last day of March; data from the July sampling event shall be submitted no later than the last day of September. If, for any reason, the permittee is unable to submit analyses within the specified time, the permittee must comply with General Condition 8.

9. The permittee shall measure groundwater elevations every time any well is sampled [40 CFR Part 264.97(f)]. All groundwater elevations must be measured within the same 8-hour period. These data shall be used to determine the horizontal and vertical groundwater flow directions and flow rates. The permittee shall submit these data to the Department with each monitoring report.

10. Total depths of all wells must be determined by physical measurement in January of each year to determine if siltation has occurred in any well. If infilling or siltation of any well has occurred, the discovery and any redevelopment shall be reported to the Department within fifteen (15) calendar days of such action.

11. All groundwater sampling shall be conducted in accordance with the most-recently approved Quality Assurance Project Plan. The permittee shall revise the Quality Assurance Project Plan in accordance with Chapter 62-160, F.A.C., whenever there is a change in sampling and/or analytical procedures, including personnel or laboratory. The revised plan or revisions, along with the permit modification fee pursuant to Rule 62-4.050(4)(r)5, F.A.C., must be submitted to the Department for approval within thirty (30) days of such changes.

12. The permittee shall sample all wells specified in Specific Condition 7 of this Part for the following parameters:

benzene	cresols, total	2-ethoxyethanol

carbon disulfide	1,2-dichlorobenzene	ethylene dibromide
carbon tetrachloride	1,1-dichloroethane	isobutanol
chlorobenzene	1,2-dichloroethane	methyl ethyl ketone
chloroform	1,2-dichloropropane	methylene chloride
nitrobenzene	toluene	1,2,3-trichloropropane
2-nitropropane	1,1,1-trichloroethane	1,1,2-trichloro-1,1,2-trifluoroethane
phenols, total	1,1,2-trichloroethane	vinyl chloride
pyridine	trichloroethene	xylenes, total
tetrachloroethene	trichlorofluoromethane	arsenic
barium	lead	silver
cadmium	manganese	sodium
chromium, total	mercury	vanadium
copper	nickel	zinc
iron	selenium	chloride
cyanide, complexed	nitrate (as N)	specific conductance
fluoride	radium 226	total coliform
gross alpha	radium 228	turbidity
gross beta	pH	

13. The Groundwater Protection Standard (GWPS) for these parameters will be as follows:

Parameter	Units	GWPS
benzene	µg/l	1
carbon disulfide	µg/l	700
carbon tetrachloride	µg/l	3
chlorobenzene	µg/l	100
chloroform	µg/l	6
cresols, total	µg/l	35*
1,2-dichlorobenzene	µg/l	10
1,1-dichloroethane	µg/l	70
1,2-dichloroethane	µg/l	3
1,2-dichloropropane	µg/l	5
2-ethoxyethanol	µg/l	25,000
ethylene dibromide	µg/l	0.02
isobutanol	µg/l	2,100
methyl ethyl ketone	µg/l	4,200

methylene chloride	µg/l	5
nitrobenzene	µg/l	9.5
2-nitropropane	µg/l	PQL★
phenols, total	µg/l	PQL★
pyridine	µg/l	7
tetrachloroethene	µg/l	3
toluene	µg/l	40
1,1,1-trichloroethane	µg/l	200
1,1,2-trichloroethane	µg/l	5
trichloroethene	µg/l	3
trichlorofluoromethane	µg/l	2,100
1,2,3-trichloropropane	µg/l	42
1,1,2-trichloro-1,1,2-trifluoroethane	µg/l	500,000
vinyl chloride	µg/l	1
xylenes, total	µg/l	20
arsenic	mg/l	0.05
barium	mg/l	2
cadmium	mg/l	0.005
chromium, total	mg/l	0.1
copper	mg/l	1
iron	mg/l	0.5
lead	mg/l	0.015
manganese	mg/l	0.05
mercury	mg/l	0.002
nickel	mg/l	0.1
selenium	mg/l	0.05
silver	mg/l	0.1
sodium	mg/l	160
vanadium	mg/l	0.049
zinc	mg/l	5
chloride	mg/l	250
cyanide, complexed	mg/l	200
fluoride	mg/l	2,000
gross alpha	pCi/l	15
gross beta	pCi/l	PQL

nitrate (as N)	mg/l	10
radium 226	pCi/l	5‡‡
radium 228	pCi/l	5‡‡

*This standard is the most conservative of the three isomers.

★Practical Quantitation Limit, which is defined as minimum concentration of a chemical that can be measured and reported in accordance with the Quality Assurance Project Plan approved on June 20, 1993.

‡‡The Groundwater Protection Standard is for radium.

14. The permittee shall utilize the statistical analyses outlined on pages U-45 and U-46 of the permit application dated April 22, 1996 and revised August 1, 1996 and February 27, 1997 to determine significant evidence of contamination for any constituents listed in Specific Condition 12 of this Part in accordance with 40 CFR Part 264.99.

15. The permittee shall determine in January of each calendar year the concentration of each constituent from the 40 CFR Part 264 Appendix IX list, less pesticides, herbicides, PCBs, dioxins, furans and sulfide. This sampling shall be conducted at the point-of-compliance well or wells most representative of the groundwater quality at each Waste Management Area, as approved by the Department based on the groundwater monitoring conducted pursuant to Specific Condition 7 of this Part [40 CFR Part 264.99(g)].

16. Pursuant to Specific Condition 15 of this Part if the permittee finds 40 CFR Part 264 Appendix IX constituents (less pesticides, herbicides, PCBs, dioxins, furans and sulfide) in the groundwater that are not identified in Specific Condition 11 of this Part, the permittee may resample within one month and repeat the Appendix IX analysis for those contested constituents. If the second analysis confirms the presence of new constituents, the permittee must report the concentration of these additional constituents to the Department within seven (7) calendar days and add them to the monitoring list. If the permittee chooses not to resample, then the permittee must report the concentrations of these additional constituents to the Department within seven (7) calendar days after completion of the initial analysis and add them to the monitoring list [40 CFR Part 264.99(g)].

17. The permittee may request that the Department establish alternate concentration limits. The Groundwater Protection Standard for these additional constituents shall be the respective Florida Groundwater Guidance Concentration or, if none exists, the practical quantitation limit (PQL) unless the Department establishes such alternate concentration limits, or unless a maximum concentration level is specified in Rule 62-550.310 and .320, F.A.C. or 40 CFR Part 141.

18. The permittee shall notify the Department in writing of any damage requiring repair (not maintenance) to the groundwater monitor wells and provide a schedule for repair within

seven (7) calendar days. A description of repairs shall be provided within seven (7) calendar days after the damage has been corrected.

19. Abandonment of monitor wells shall be performed in accordance with Rule 62-532.500(4), F.A.C.

20. Within thirty (30) days of permit issuance, the permittee must submit to the Department a well installation report that includes, at a minimum, the following information on 42-5R, 42-6R, 42-7R, 42-8-2R and MW-017:

    a. A surveyed location map of all new and existing wells with correct orientation and scale;

    b A description of the protective device for MW-017;

    c. Well development procedures (for MW-017 only);

    d. Disposal of boring soils, drilling muds and fluids, and purge water (for MW-017 only).

PART IV - POST-CLOSURE

1. Upon the completion of closure of the Domestic Sludge Drying Bed, the Industrial Sludge Drying Bed and the Polishing Pond, the permittee shall:

    a. Begin post-closure care and continue for thirty (30) years after that date in accordance with 40 CFR Part 264.117(a) and in accordance with the post-closure plan included in the application.

    b. Maintain compliance with security provisions of 40 CFR Part 264.14 throughout the post-closure care period [40 CFR Part 264.117(b)].

    c. Never disturb the final cover or any other components of the associated structures unless previous Department approval has been provided pursuant to 40 CFR Part 264.117(c).

    d. Ensure that all post-closure care activities be in accordance with the post-closure plan as specified in 40 CFR Part 264.118 [40 CFR Part 264.117(d)].

2. The permittee may apply for a shortened post-closure care period in accordance with 40 CFR Part 264.117(a)(2)(i). However, the Department may extend the post-closure care period if it is determined that the extended period is necessary to protect human health and the environment in accordance with 40 CFR Part 264.117(a)(2)(ii).

3. No later than the submittal of the certification of closure (Specific Condition II.4), the permittee shall submit a survey plat in accordance with 40 CFR Part 264.116.

4. Within sixty (60) calendar days of certification of closure (Specific Condition II.4) the permittee shall submit to the authority with jurisdiction over Naval Air Station - Jacksonville land use, and to the Department, a record of the type, location, and quantity of hazardous wastes disposed of within the Industrial Sludge Drying Bed, the Domestic Sludge Drying Bed, the Polishing Pond and Building 101 (Former Electroplating Shop). For hazardous wastes disposed of before January 12, 1981, the owner or operator must identify the type, location, and quantity of the hazardous wastes to the best of his/her knowledge and in accordance with any records s/he has kept [40 CFR Part 264.119(a)] (notice to local land authority). If there is no local authority with jurisdiction over Naval Air Station - Jacksonville land use, the permittee must submit an alternate method for recording the type, location, and quantity of hazardous wastes disposed of within the Industrial Sludge Drying Bed, the Domestic Sludge Drying Bed and the Polishing Pond acceptable under the Record Of Decision (ROD).

5. The permittee shall comply with the requirements of 40 CFR Part 264.119(b) (Notice in deed to property). The notice shall be submitted to the Department within sixty (60) calendar days of receipt of certification of closure of the Industrial Sludge Drying Bed, the Domestic Sludge Drying Bed and the Polishing Pond. If the permittee cannot file a notice in the deed, the permittee must submit an alternate method for the notice requirement acceptable under the ROD.

6. Complete inspection log describing results of inspections and remedial action taken in maintaining the final cover, containment structures, groundwater monitoring equipment, surveying benchmarks and security devices in order to comply with 40 CFR Part 264.117(a) shall be maintained in the operating record.

7. The permittee shall keep a copy of the Post-closure Plan required by 40 CFR Part 264.118(a), and all revisions to the plan at the facility until post-closure care is completed and certified in accordance with 40 CFR Part 264.120 and accepted by the Department.

8. Any proposed amendments to the Post-closure Plan shall be submitted to the Department for review and approval [40 CFR Part 264.118(d)]. All documents modifying the approved Post-closure Plan submitted to the Department for review shall be signed, sealed, and certified by a Professional Engineer registered in the State of Florida, in accordance with Section 471, F.S., and Rule 62-730.220(7), F.A.C.

9. Within sixty (60) calendar days from the completion of the established post-closure care period, the permittee shall submit to the Department by certified mail or hand delivery, a letter signed by the permittee and an independent Professional Engineer, registered in the State of Florida, except when exempted, in accordance with 62-730.220(5), F.A.C., stating that the post-closure care for the Sludge Drying Beds and the Polishing Pond was performed in accordance with the specifications in the approved Post-closure Plan [40 CFR Part 264.120].

10. By no later than December 31, 1997, the permittee shall submit to the Department the draft ROD including a complete post-closure plan.

PART V - CORRECTIVE ACTION

1. The permittee shall submit to the Department the **OU2 Final Feasibility Study** to meet the requirements of 40 CFR Part 264.100. The document shall be submitted no later than April 7, 1997, along with the appropriate fee.

2. The permittee shall ensure that the Corrective Action Program will function as designed in the Corrective Action Plan. If the permittee or Department determines that the Corrective Action Plan no longer satisfies the requirements of 40 CFR Part 264.100, the permittee must, within ninety (90) calendar days, submit a permit modification to make any appropriate changes to the program [40 CFR Part 264.100(h)]. Any measures taken to meet this condition shall be reported in the semiannual report required by Specific Condition 3 of this Part.

3. The permittee shall ensure that groundwater monitoring and corrective action measures necessary to achieve compliance with 40 CFR Part 264.100 are taken during the Compliance Period. The Compliance Period began February 25, 1988 for the Sludge Drying Beds and April 30, 1990 for the Polishing Pond.

4. The permittee must continue corrective action measures throughout the Compliance Period to the extent necessary to ensure that the Groundwater Protection Standard is not exceeded. If the permittee is engaged in a corrective action program at the end of the Compliance Period, the Compliance Period is extended until the permittee can demonstrate that the Groundwater Protection Standard of 40 CFR Part 264.92 has not been exceeded for a period of three (3) consecutive years.

5. If corrective action is terminated prior to the completion of the post-closure care period, this permit shall be modified to address at a minimum, semiannual sampling for the first year, with annual sampling throughout the remainder of the post-closure care period.

PART VI - GROUNDWATER MONITORING AT THE HAZARDOUS WASTE STORAGE UNIT (BUILDING 101 - ELECTROPLATING SHOP).

1. The permittee shall comply with the requirements of 40 CFR Part 264.97.

2. The Waste Management Area [40 CFR Part 264.95(b)] shall be designated by an imaginary line circumscribing the hazardous waste storage unit, indicated in Figure U-1 of the permit application dated April 22, 1996 and revised August 1, 1996 and February 26, 1997.

3. The Point of Compliance [40 CFR Part 264.95(a)] shall be the southern boundary of the hazardous waste storage unit.

4. Upon permit issuance the facility shall be in compliance monitoring in accordance with 40 CFR Part 264.99.

5. The Compliance Period is the number of years equal to the active life of Building 101 - electroplating shop, including any waste management activity prior to permitting, and the closure period. The Compliance Period is specified as 56 years, 5 months and 20 days (January 1, 1940 until May 20, 1996) [40 CFR Part 264.96].

6. Within fifteen (15) calendar days of permit issuance, the permittee shall install monitor wells shown on Figure U-1 of the permit application dated April 22, 1996 and revised August 1, 1996 and February 26, 1997. The wells shall be installed in accordance with the most recent edition of the **RCRA Ground-water Monitoring Technical Enforcement Guidance Document** (OSWER-9950.1).

7. Within thirty (30) days of installation of the monitor wells necessary to comply with Specific Condition 6 of this Part the permittee must submit to the Department a well installation report that includes, at a minimum, the following information:

   a. A **Well Construction Summary Report** [Form 62-730.900(2)(b)] for each well;

   b. A surveyed location map of all new and existing wells with correct orientation and scale;

   c. A description of protective devices for each well;

   d. Well development procedures and duration of well development;

   e. Disposal of boring soils, drilling muds and fluids, and purge water;

   f. Detailed lithologic logs including soils classification used, the geologist or geotechnical person responsible for compiling the lithologic logs, and sampling devices and intervals.

8. The permittee shall sample the wells in Specific Conditions 6 and 7 of this Part for the parameters listed in Specific Condition 12 of this Part and shall be conducted in July, October, January and April of the first year and annually thereafter in July until the Department accepts the Certification of Post-closure. The groundwater monitoring data from the July sampling event shall be submitted no later than the last day of September; data from the October sampling event shall be submitted no later than the last day of December: the groundwater monitoring data from the January sampling event shall be submitted no later than the last day of March; data from the April sampling event shall be submitted no later than the last day of June. If, for any reason, the permittee is unable to submit analyses within the specified time, the permittee must comply with General Condition 8.

9. The permittee shall measure groundwater elevations every time any well is sampled [40 CFR Part 264.97(f)]. All groundwater elevations must be measured within the same 8-hour period. These data shall be used to determine horizontal and vertical groundwater flow directions and flow rates. The permittee shall submit these data to the Department with each monitoring report.

10. Total depths of all wells must be determined by physical measurement in January of each year to determine if siltation has occurred in any well. If infilling or siltation of any well has occurred, the discovery and any redevelopment shall be reported to the Department within fifteen (15) calendar days of such action.

11. All groundwater sampling shall be conducted in accordance with the Quality Assurance Project Plan approved on June 20, 1993. The permittee shall revise the Quality Assurance Project Plan in accordance with Chapter 62-160, F.A.C., whenever there is a change in sampling and/or analytical procedures, including personnel or laboratory. The revised plan or revisions must be submitted to the Department for approval within thirty (30) days of such changes.

12. The permittee shall sample all wells specified in Specific Conditions 6 and 7 of this Part for the following parameters:

benzene	1,1,1-trichloroethane
carbon disulfide	1,1,2-trichloroethane
carbon tetrachloride	trichloroethene
1,2-dichlorobenzene	trichlorofluoromethane
1,3-dichlorobenzene	1,1,2-trichloro-1,2,2-trifluoroethane
1,4-dichlorobenzene	vinyl chloride
dichlorodifluoromethane	barium
1,1-dichloroethane	cadmium
1,2-dichloroethane	chromium, total
cis-1,2-dichloroethene	chromium, hexavalent
trans-1,2-dichloroethene	copper
2-ethoxyethanol	iron
isobutanol	lead
methyl ethyl ketone	manganese
methylene chloride	nickel
2-methylphenol	selenium
3-methylphenol	silver
4-methylphenol	vanadium
nitrobenzene	zinc
2-nitropropane	cyanide, complexed
pyridine	pH
tetrachloroethene	specific conductance
toluene	turbidity

13. The Groundwater Protection Standard (GWPS) for these parameters will be as follows:

Parameter	GWPS	Parameter	GWPS
benzene, µg/l	1	tetrachloroethene, µg/l	3
carbon disulfide, µg/l	700	toluene, µg/l	40
carbon tetrachloride, µg/l	3	1,1,1-trichloroethane, µg/l	200
1,2-dichlorobenzene, µg/l	600	1,1,2-trichloroethane, µg/l	5
1,3-dichlorobenzene, µg/l	10	trichloroethene, µg/l	3
1,4-dichlorobenzene, µg/l	75	trichlorofluoromethane, µg/l	2,100
dichlorodifluoromethane, µg/l	1400	1,1,2-trichloro-1,2,2-trifluoroethane, µg/l	500,000
1,1-dichloroethane, µg/l	70	vinyl chloride, µg/l	1
1,2-dichloroethane, µg/l	3	barium, mg/l	2
cis-1,2-dichloroethene, µg/l	70	cadmium, mg/l	0.005
trans-1,2-dichloroethene, µg/l	100	chromium, total, mg/l	0.1
2-ethoxyethanol, µg/l	25,000	chromium hexavalent, mg/l	0.1**
isobutanol, µg/l	2,100	copper, mg/l	1
methyl ethyl ketone, µg/l	4,200	iron, mg/l	0.5
methylene chloride, µg/l	5	lead, mg/l	0.015
2-methylphenol, µg/l	350	manganese, mg/l	0.05
3-methylphenol, µg/l	350	nickel, mg/l	0.1
4-methylphenol, µg/l	35	selenium, mg/l	0.05
nitrobenzene, µg/l	9.5	silver, mg/l	0.1
2-nitropropane, µg/l	BG*	vanadium, mg/l	0.049
pyridine, µg/l	7	zinc, mg/l	5

*Background, established through sampling at the upgradient background well each time groundwater is sampled at the Point of Compliance. The background concentration limit shall be the mean of the four most recent background samples of the parameter [40 CFR Part 264.98(d)].

**This value, for total chromium, will also apply to hexavalent chromium.

14. The permittee shall determine in January of each calendar year the concentration of each constituent from the 40 CFR Part 264 Appendix IX list, less pesticides, herbicides, PCBs, dioxins, furans and sulfide. This sampling shall be conducted at the point-of-compliance

well or wells most representative of the groundwater quality at each Waste Management Area, as approved by the Department based on the groundwater monitoring conducted pursuant to Specific Condition 7 of this Part [40 CFR Part 264.99(g)].

15. Pursuant to Specific Condition 14 of this Part if the permittee finds 40 CFR Part 264 Appendix IX constituents (less pesticides, herbicides, PCBs, dioxins, furans and sulfide) in the groundwater that are not identified in Specific Condition 11 of this Part, the permittee may resample within one month and repeat the Appendix IX analysis for those contested constituents. If the second analysis confirms the presence of new constituents, the permittee must report the concentration of these additional constituents to the Department within seven (7) calendar days and add them to the monitoring list. If the permittee chooses not to resample, then the permittee must report the concentrations of these additional constituents to the Department within seven (7) calendar days after completion of the initial analysis and add them to the monitoring list [40 CFR Part 264.99(g)].

16. The permittee may request that the Department establish alternate concentration limits. The Groundwater Protection Standard for these additional constituents shall be the respective Florida Groundwater Guidance Concentration or, if none exists, the practical quantitation limit (PQL) unless the Department establishes such alternate concentration limits, or unless a maximum concentration level is specified in Rule 62-550.310 and .320, F.A.C. or 40 CFR Part 141.

17. The permittee shall notify the Department in writing of any damage requiring repair (not maintenance) to the groundwater monitor wells and provide a schedule for repair within seven (7) calendar days. A description of repairs shall be provided within seven (7) calendar days after the damage has been corrected.

18. Abandonment of monitor wells shall be performed in accordance with Rule 62-532.500(4), F.A.C.

19. The permittee shall submit a Corrective Action Plan to meet the requirements of 40 CFR Part 264.100. This shall be submitted according to the time schedule set forth in the **CERCLA Site Management Plan** dated October 22, 1996.

Permittee:
U. S. Naval Air Station - Jacksonville
Post Office Box 5
Jacksonville, Florida 32212-5000

I.D. Number: FL6 170 024 412
Permit/Certification Number: HF16-288092
Issue Date: June 26, 1997
Expiration Date: September 20, 2001

Issued 6/26/97

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL PROTECTION

John M. Ruddell

JOHN M. RUDDELL, DIRECTOR
DIVISION OF WASTE MANAGEMENT

Permittee:
U. S. Naval Air Station - Jacksonville
Post Office Box 5
Jacksonville, Florida 32212-5000

I.D. Number: FL6 170 024 412
Permit/Certification Number: HF16-288092
Issue Date: June 26, 1997
Expiration Date: September 20, 2001

Filing and Acknowledgment
Filed on this date, pursuant to
Section 120.52, Florida Statutes,
with the designated Clerk, receipt
of which is acknowledged.

Kay L. Papp-Wells
CLERK

1 JUL 97
DATE

This is to certify that this Notice of Permit was mailed before close of business on 1 JUL 97.

Attachment A - Hazardous Waste Codes for Building 101 Tanks

TABLE L-1

BASIS FOR LISTING HAZARDOUS WASTE
(40 CFR 261, Appendix VII)

EPA HAZARDOUS WASTE NO.	HAZARDOUS CONSTITUENTS FOR WHICH LISTED
F001	Tetrachloroethylene, methylene chloride, trichloroethylene, 1,1,1-trichloroethane, carbon tetrachloride, chlorinated fluorocarbons
F002	Tetrachloroethylene, methylene chloride, trichloroethylene, 1,1,1-trichloroethane, 1,1,2-trichloro-1,2,2-trifluoroethane, ortho-dichlorobenzene, trichlorofluoromethane
F003	NA
F004	Cresols and cresylic acid; nitrobenzene
F005	Toluene, methyl ethyl ketone, carbon disulfide, isobutanol, pyridine, 2-ethoxyethanol, benzene, 2-nitropropane
F006	Cadmium, hexavalent chromium, nickel, cyanide (complexed)
F019	Hexavalent chromium, cyanide (complexed)

APPENDIX D

FOCUSED REMEDIAL INVESTIGATION AND FOCUSED FEASIBILITY STUDY FOR POTENTIAL SOURCES OF CONTAMINATION 2, 41, AND 43 AT OPERABLE UNIT 2 (AUGUST 1994)

FOCUSED REMEDIAL INVESTIGATION AND FEASIBILITY STUDY

POTENTIAL SOURCES OF CONTAMINATION (PSCs) 2, 41, AND 43 AT OPERABLE UNIT 2

NAVAL AIR STATION JACKSONVILLE, FLORIDA

Unit Identification Code: N00207

Contract No. N62467-89-D-0317

Prepared by:

ABB Environmental Services, Inc.
2590 Executive Center Circle, East
Tallahassee, Florida 32301

Prepared for:

Department of the Navy, Southern Division
Naval Facilities Engineering Command
2155 Eagle Drive
North Charleston, South Carolina 29418

Dana Gaskins, Code 1857, Engineer-in-Charge

August 1994

FOREWORD

To meet its mission objectives, the U.S. Navy performs a variety of operations, some requiring the use, handling, storage, or disposal of hazardous materials. Through accidental spills and leaks and conventional methods of past disposal, hazardous materials may have entered the environment in ways unacceptable by today's standards. With growing knowledge of the long-term effects of hazardous materials on the environment, the Department of Defense (DOD) initiated various programs to investigate and remediate conditions related to suspected past releases of hazardous materials at their facilities.

One of these programs is the Navy and Marine Corps Installation Restoration (IR) program. This program complies with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA). The acts, passed by Congress in 1980 and 1986, respectively, established the means to assess and cleanup hazardous waste sites for both private-sector and Federal facilities. These acts are the basis for what is commonly known as the Superfund program.

Originally, the Navy's part of this program was called the Naval Assessment and Control of Installation Pollutants (NACIP) program. Early reports reflect the NACIP process and terminology. The Navy eventually adapted the program structure and terminology of the Navy IR program.

The Navy IR program is conducted in several stages as follows.

- The Preliminary Assessment (PA) identifies potential sites through record searches and interviews.
- A Site Inspection (SI) then confirms which areas contain contamination, constituting actual "sites." Together, the PA and SI steps were called the Initial Assessment Study (IAS) under NACIP.
- Next, the Remedial Investigation and the Feasibility Study (RI/FS) together determine the type and extent of contamination, establish criteria for cleanup, identify and evaluate any necessary remedial action alternatives, and develop cost estimates of each alternative.

As part of the RI/FS, a Risk Assessment is made to identify potential effects on human health and the environment to help evaluate remedial action alternatives.

- The selected alternative is planned and conducted in the remedial design and remedial action stages. Monitoring then ensures the effectiveness of the effort.

The investigations of potential hazardous waste sites at Naval Air Station (NAS) Jacksonville, Florida, are presently being conducted under the Navy IR program and follow CERCLA guidelines. Earlier preliminary investigations had been conducted at NAS Jacksonville, Florida, under NACIP. In 1990, in coordination with the U.S. Environmental Protection Agency (USEPA) and the Florida Department of Environmental Protection (FDEP; formerly Florida Department of Environmental Regulation), the investigation of hazardous waste sites were formalized under a Federal Facility Agreement.

NAS Jacksonville, Florida, is conducting the investigation and cleanup of hazardous waste sites at their facility by working through the Southern Division, Naval Facilities Engineering Command (SOUTHNAVFACENGCOM). The USEPA and the FDEP oversee the Navy environmental program at NAS Jacksonville. All aspects of the program are conducted in compliance with State and Federal regulations, as ensured by the participation of these regulatory agencies.

Questions regarding the Navy IR program at NAS Jacksonville, Florida, should be addressed to Mr. Dana Gaskins, Code 1857, Remedial Project Manger, at (803) 743-0628.

EXECUTIVE SUMMARY

ABB Environmental Services, Inc. (ABB-ES), has been contracted by the Department of the Navy, Southern Division, Naval Facilities Engineering Command (SOUTHNAVFAC-ENGCOM) to complete a Remedial Investigation and Feasibility Study (RI/FS) for Operable Units (OUs) 1, 2, and 3 located at the Naval Air Station (NAS) Jacksonville in Jacksonville, Florida. This document, known as a Focused RI/FS, documents the first phase of the RI/FS being conducted to address source control at potential sources of contamination (PSCs) 2, 41, and 43, which comprise a portion of OU 2. PSC 2 is a former fire-fighting training area, PSC 41 consists of abandoned domestic wastewater treatment sludge drying beds, and PSC 43 consists of abandoned industrial wastewater treatment sludge drying beds.

In August 1988, NAS Jacksonville submitted the first application for closure of the domestic and industrial sludge drying beds (PSCs 41 and 43, respectively) and the polishing pond (PSC 42). A closure permit was issued by Florida Department of Environmental Protection (FDEP) for these PSCs in September 1991. To comply with closure requirements and to address source control, ABB-ES executed field activities at the direction of the Navy from April to August 1993 at PSCs 2, 41, and 42. The purpose of the field investigation was to characterize the extent of contamination in the vadose zone at these PSCs. Data gathered during the Focused RI were used during a Focused FS to establish remedial action objectives for compliance with closure requirements, and to identify appropriate technologies and alternatives to support interim remedial actions at PSCs 2, 41, and 43. This report discusses the results and conclusions of the Focused RI field investigation; provides evaluations of risks to human health and the environment associated with contamination present at PSCs 2, 41, and 43; and presents appropriate technologies and remedial alternatives for source control. Once the conclusions of the Focused FS portion of this report are agreed upon by the Navy and the regulatory agencies, one remedial alternative identified for PSC 2 and one identified for PSCs 41 and 43 will be selected as the preferred alternatives for implementation. These alternatives will be identified in the Proposed Plan and subsequent Interim Record of Decision for PSCs 2, 41, and 43 at OU 2.

The scope of the Focused RI was limited to investigation of vadose-zone material (i.e., soil at PSC 2 and filter media at PSCs 41 and 43). As such, the results and conclusions of the field investigation are limited to characterization of the extent of any contamination at the three PSCs. A complete RI/FS will be performed for all of OU 2 at a later date to fully characterize the nature and extent of contamination. A more detailed risk assessment will be completed at that time. The remedial alternatives discussed in this report are not intended to provide permanent solutions to all risks associated with contamination at OU 2. However, initiating source control as an interim remedial action for PSCs 2, 41, and 43 will reduce a portion of those risks while maintaining consistency with the overall remedial strategy for OU 2.

This Focused RI/FS report presents a brief site history of OU 2 and an overview of the field investigation (RI) of PSCs 2, 41, and 43, along with analytical results and conclusions (Chapters 1.0 through 3.0). A summary of evaluated risks to human health and the environment associated with contamination at PSCs 2, 41, and 43 follows the RI sections (Chapter 4.0). PSCs 41 and 43 were evaluated as a whole because of their similar construction, past functions, and contaminants detected. Contaminants of potential concern (CPCs) identified in this evaluation include semivolatile organic contaminants typically found at fire-fighting training areas at PSC 2, and inorganic analytes typical of the sludges deposited in the sludge drying beds at PSCs 41 and 43. Remedial action objectives were established based on these CPCs (Chapter 5.0). Technologies applicable for removal, treatment, and/or disposal of soil at PSC 2 and filter media at PSCs 41 and 43 were identified, screened, and assembled into remedial alternatives (Chapter 6.0). Three alternatives for PSC 2 and three for PSCs 41 and 43 are discussed in a detailed analysis relative to nine criteria stipulated by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (Chapter 7.0). A comparative analysis, which identifies the advantages and disadvantages of each alternative relative to one another, follows the detailed analysis (Chapter 8.0).

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Jacksonville, Florida

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Jacksonville, Florida

GLOSSARY (Continued)

LC50	50 percent lethal concentrations
LDR	Land Disposal Restriction
LNAPL	light nonaqueous-phase liquid
mg	milligrams
mg/ℓ	milligrams per liter
mg/kg	milligrams per kilogram
mg/kg/BW/day	milligram per kilogram of body weight per day
μg/kg	micrograms per kilogram
$\mu g/m^3$	micrograms per cubic meter
NAAQS	National Ambient Air Quality Standards
NACIP	Naval Assessment and Control of Installation Pollutants
NAD83	North American Datum of 1983
NAS	Naval Air Station
NCP	National Oil and Hazardous Substances Contingency Plan
NEESA	Naval Energy and Environmental Support Activity
NOEC	no observed effect concentration
NPL	National Priority List
NSPS	New Source Performance Standards
O&M	operation and maintenance
OUs	Operable Units
PA	Preliminary Assessment
PAHs	polynuclear aromatic hydrocarbons
PCBs	polychlorinated biphenyls
PPE	personal protection equipment
ppm	parts per million
PRGs	preliminary remedial goals
PSCs	potential sources of contamination
RA	Risk Assessment
RE	Risk Evaluation
RAOs	remedial action objectives
RCRA	Resource Conservation and Recovery Act
RfD	reference dose
RI/FS	Remedial Investigation and Feasibility Study
RI/FSWP	RI/FS Workplan
RPD	relative percent difference
SARA	Superfund Amendments and Reauthorization Act
SI	Site Inspection
SOUTHNAVFACENGCOM	Southern Division, Naval Facilities Engineering Command
SQL	sample quantitation limit
STL	State target level
SVOCs	semivolatile organic compounds

GLOSSARY

AA	atomic adsorption
ABB-ES	ABB Environmental Services, Inc.
AOC	area of contamination or area of concern
ARARs	applicable or relevant and appropriate requirements
BaP	benzo(a)pyrene
BDAT	Best Demonstrated Available Technology
bls	below land surface
BTEX	benzene, toluene, ethylbenzene, and xylenes
Btu	British thermal unit
CCWE	constituent concentration waste extract
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CLP	Contract Laboratory Program
COCs	contaminants of concern
CPCs	contaminants of potential concern
CRDL	contract required detection limit
CRQLs	contract required quantitation limits
DDE	dichlorodiphenyldichloroethene
DOD	Department of Defense
DOT	Department of Transportation
°F	degrees Fahrenheit
ECAO	Environmental Criteria Assessment Office
EM	electromagnetic
FAC	Florida Administrative Code
FDEP	Florida Department of Environmental Protection
FDER	Florida Department of Environmental Regulation
FEE	Focused Ecological Evaluation
FFA	Federal Facility Agreement
FRE	focused risk evaluation
FSWP	Feasibility Study Workplan
GAC	granular activated carbon
GC	gas chromatograph
gpm	gallons per minute
HEAST	Health Effects Assessment Summary Tables
IAS	Initial Assessment Study
IDL	instrument detection limit
IR	Installation Restoration
IRIS	Integrated Risk Information System
IROD	Interim Record of Decision

TAL	target analyte list
TCL	target compound list
TCLP	toxicity characteristic leaching procedure
TEF	toxicity equivalence factor
TOC	total organic carbon
TPH	total petroleum hydrocarbons
TSD	treatment, storage, and disposal
TU	temporary unit
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
VOA	volatile organic aromatics
VOCs	volatile organic compounds
WWTP	wastewater treatment plant
yd^3	cubic yard

1.0 INTRODUCTION

This Focused Remedial Investigation and Feasibility Study (RI/FS) report was prepared for potential sources of contamination (PSCs) 2, 41, and 43, which comprise part of Operable Unit (OU) 2 at the Naval Air Station (NAS) Jacksonville. NAS Jacksonville is located in northeast Florida on the west bank of the St. Johns River, south of Jacksonville, Florida (Figure 1-1).

NAS Jacksonville is participating in the U.S. Department of Defense Installation Restoration (IR) program, which identifies and remediates conditions related to past spills or disposal of hazardous wastes. The IR program complies with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), and with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (U.S. Environmental Protection Agency [USEPA], 1990). CERCLA and SARA, passed by Congress in 1980 and 1986, respectively, establish the means to assess and clean up hazardous waste sites.

NAS Jacksonville was placed on the USEPA's National Priority List (NPL) in December 1989. In October 1990, a Federal Facility Agreement (FFA) was signed by the USEPA, the Florida Department of Environmental Regulation (FDER, now the Florida Department of Environmental Protection [FDEP]), and the Navy to coordinate IR program actions at NAS Jacksonville. Previous investigations have identified PSCs 2, 41, and 43, which comprise a part of OU 2, as areas requiring investigation under the IR program. The location of OU 2 within NAS Jacksonville is depicted on Figure 1-2. PSC 2 is a former fire-fighting training area, PSC 41 consists of abandoned domestic sludge drying beds, and PSC 43 consists of abandoned industrial sludge drying beds. Figure 1-3 shows these three PSCs within OU 2.

Volume 1 of the *Navy Installation Restoration Program Plan* for NAS Jacksonville, *Organization and Planning* (Geraghty & Miller, 1991b), Volume 4; *Base Site Work Plan* (Geraghty & Miller, 1991c, updated 1992), Volume 6; *Operable Unit 2 Remedial Investigation/Feasibility Study Workplan* (RI/FSWP) (ABB Environmental Services [ABB-ES], 1992); and *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA* (USEPA, 1988) were used as guidance materials for the Focused RI/FS.

The OU 2 workplan (Geraghty & Miller, 1991c) details the tasks and activities for the field investigation at OU 2. The appendices for the OU 2 workplan include the OU 2 Sampling and Analysis Plan (comprising the Field Sampling Plan and the OU 2 site-specific Quality Assurance Project Plan) and the OU 2 site-specific Health and Safety Plan. The workplan was modified in accordance with Statement of Work dated January 22, 1993, Contract N62467-89-D-0317, IR program Modification to Contract Task Order No. 53, Focused RI/FS and Interim Record of Decision (IROD) for PSCs 2, 41, and 43.

1.1 PURPOSE AND SCOPE. The purpose of this Focused RI/FS at OU 2 is to:

- define the extent of contamination within the vadose-zone soil at PSC 2 and within the boundaries of engineered structures present at PSCs 41 and 43;

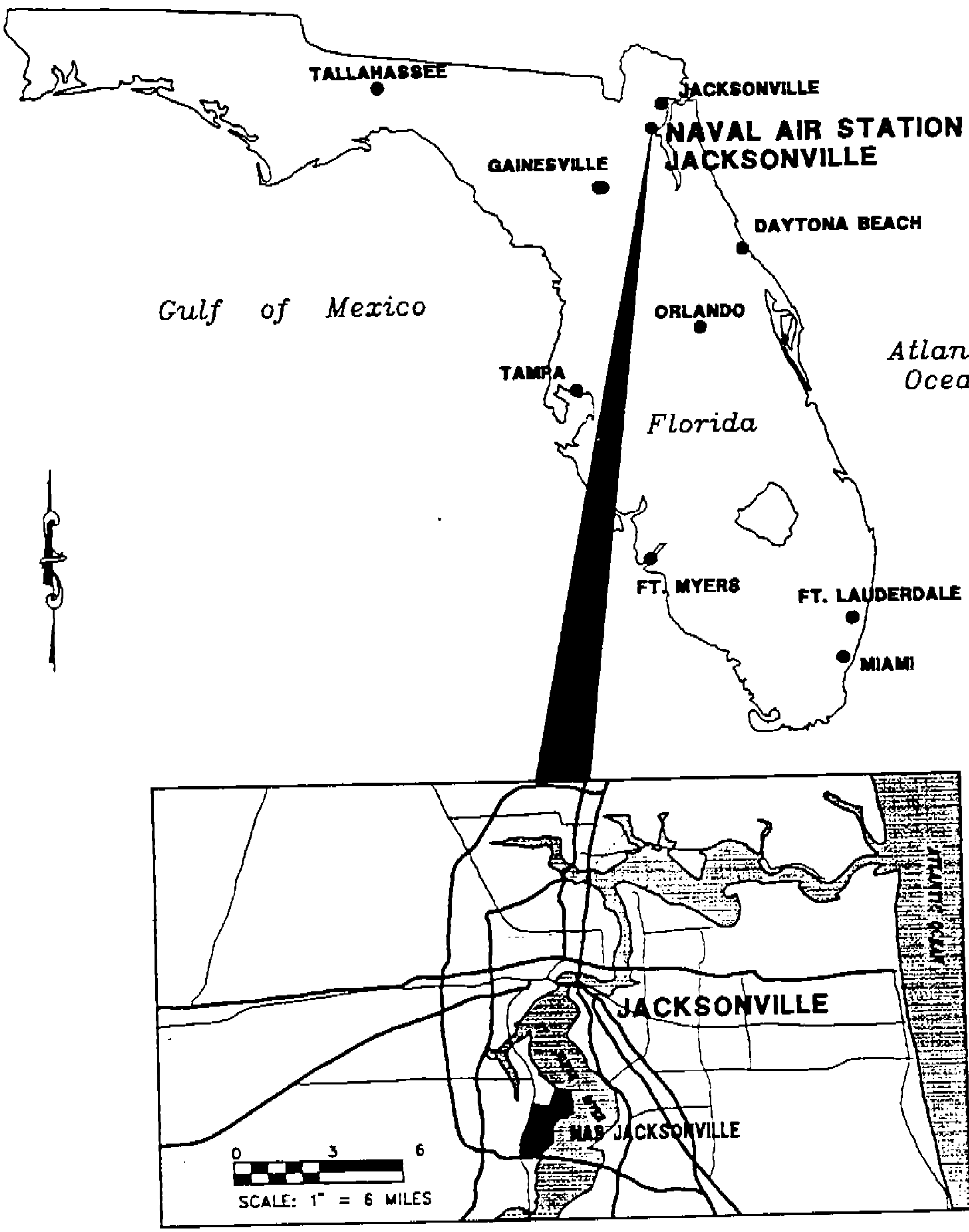

FIGURE 1-1
FACILITY LOCATION MAP

FOCUSED RI/FS REPORT FOR OU2

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JAXSITE/DRM/8-3-94

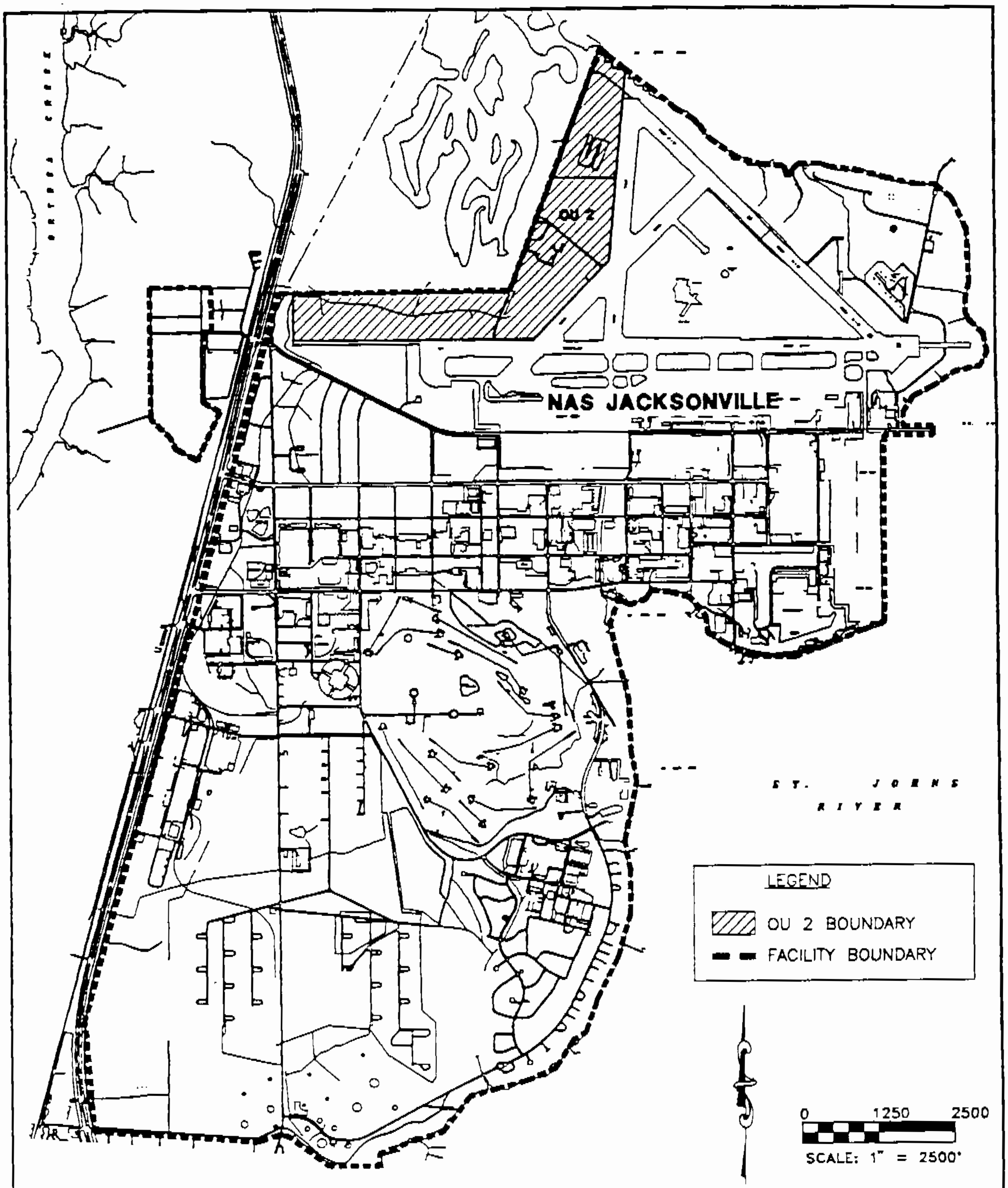

FIGURE 1-2
FACILITY MAP AND LOCATION OF OU2

FOCUSED RI/FS REPORT FOR OU2

NAS JACKSONVILLE
JACKSONVILLE, FLORIDA

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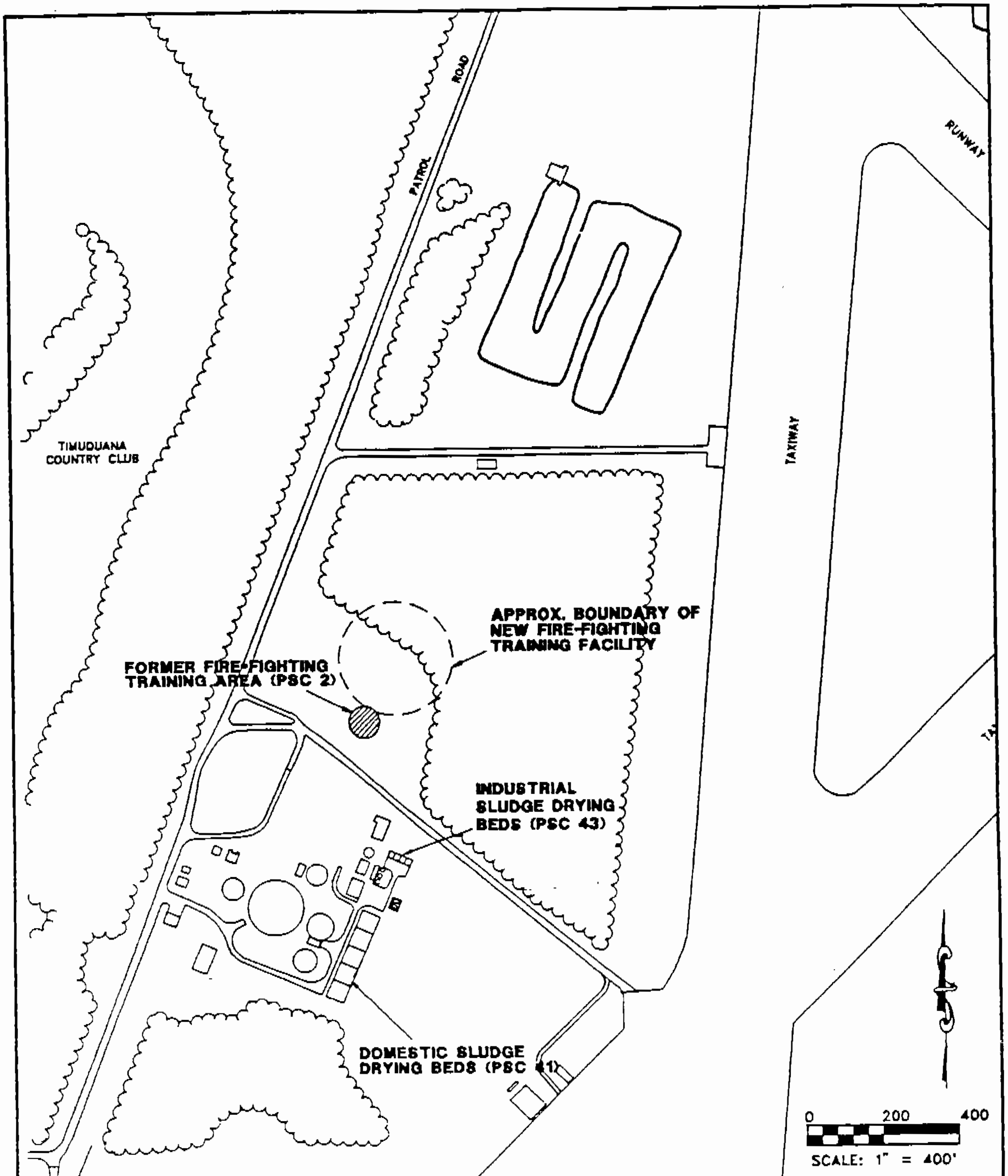

FIGURE 1-3
SITE LOCATION MAP

FOCUSED RI/FS REPORT FOR OU 2

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JACKSONVILLE, FLORIDA

OU2AREA/DRM/7-29-94

- evaluate current and future risks to human health and the environment associated with vadose-zone contamination at PSCs 2, 41, and 43; and

- present technologies and remedial alternatives appropriate for compliance with closure requirements, and source control interim remedial actions at the three PSCs.

The scope of the Focused RI was limited to investigation of vadose-zone material (i.e., soil at PSC 2 and filter media at PSCs 41 and 43). As such, the results and conclusions of the field investigation are limited to characterization of the extent of such contamination at the three PSCs. Because of the focused nature of this study, data gathered during the field effort were not intended to be used to fully characterize the nature and extent of contamination at OU 2, nor were they intended to be used to support a full baseline risk assessment. These tasks will be completed during execution of the overall RI/FS for OU 2, NAS Jacksonville. Similarly, the remedial alternatives discussed in this report are not intended to provide permanent solutions to all risks associated with contamination at OU 2. However, initiating source control as an interim remedial action for PSCs 2, 41, and 43 will reduce current and future risks while maintaining consistency with the overall remedial strategy for OU 2. The remaining three PSCs at OU 2 (PSCs 3, 4, and 42) will be investigated at a later date.

1.2 <u>REPORT ORGANIZATION</u>. This Focused RI/FS report consists of the following chapters.

1.0 INTRODUCTION. This chapter presents the purpose and scope of the Focused RI/FS.

2.0 OPERABLE UNIT 2 OVERVIEW. This chapter summarizes the environmental setting, site history, and previous investigations of OU 2, and more specifically, PSCs 2, 41, and 43.

3.0 FOCUSED REMEDIAL INVESTIGATION (RI) SCOPE AND FINDINGS. This chapter describes the field activities and findings associated with the Focused RI at PSCs 2, 41, and 43.

4.0 FOCUSED RISK EVALUATION. This chapter includes a focused human health and ecologic risk evaluation of the soil at each study area.

5.0 IDENTIFICATION OF REMEDIAL ACTION OBJECTIVES. This chapter includes a summary of the location-, chemical-, and action-specific applicable or relevant and appropriate requirements (ARARs) for OU 2 and develops remedial action objectives for the three PSCs. In addition, quantities of contaminated media of concern are identified.

6.0 DEVELOPMENT OF REMEDIAL ALTERNATIVES. This chapter identifies a selected number of technologies appropriate for source control at PSCs 2, 41, and 43; screens the technologies; and develops remedial alternatives consisting of combinations of the technologies.

7.0 DETAILED ANALYSES OF ALTERNATIVES. This chapter describes each developed alternative and presents a technical evaluation of each alternative based on criteria stipulated by CERCLA.

8.0 COMPARATIVE ANALYSES OF REMEDIAL ALTERNATIVES. This chapter presents comparative analyses of the alternatives that underwent detailed analysis relative to one another using the criteria from the detailed analysis.

2.0 OPERABLE UNIT (OU) 2 OVERVIEW

This chapter provides an overview of the setting, land use, and history of OU 2, with an emphasis on PSCs 2, 41, and 43. It also briefly summarizes prior investigations completed at the three PSCs.

2.1 SITE DESCRIPTION AND ENVIRONMENTAL SETTING. The physiography, geology, hydrology, hydrogeology, and meteorology of OU 2 are described in the following subsections. The environmental setting of NAS Jacksonville and the Jacksonville area is presented in Section 4, Volume 1, of the Navy IR program plan for NAS Jacksonville (Geraghty & Miller, 1991a).

2.1.1 Physiography OU 2 is located near the tip of a peninsula between the Ortega and St. Johns Rivers. The land surface elevation at OU 2 varies from approximately 14 feet above mean sea level in the southwestern section, rising to a high of 22 feet above mean sea level just north of the domestic waste sludge drying beds, and falling to mean sea level along the St. Johns River at the northern boundary.

2.1.2 Geology A generalized geologic cross section of OU 2 is shown and described in Volume 1 of the NAS Jacksonville IR program plan (Geraghty & Miller, 1991a). The surficial soil consists of post-Miocene fluvial deposits including fine-grained sand, silty sand, clayey sand, and sandy clay overlying the Hawthorn Group. Based on the results of a cone penetrometer survey by the U.S. Army Corps of Engineers (USACE) in 1990, the surficial deposits are at least 75 feet thick (USACE, 1991). The focus of this study is the vadose zone of the surficial soil unit overlying the Hawthorn Group.

2.1.3 Surface Hydrology A drainage divide runs northwesterly across OU 2 in the vicinity of the waste sludge drying beds (PSCs 41 and 43). South of the divide, runoff flows south and west into a drainage ditch that begins 1,200 feet south of the wastewater treatment plant (WWTP). This ditch parallels the east to west runway for approximately 3,000 feet, then turns north and heads off base. North of the divide, runoff flows toward the St. Johns River via swales on either side of the Patrol Road and two 36-inch-diameter drain pipes paralleling the taxiway on the east side of OU 2.

2.1.4 Hydrogeology Groundwater flow in the surficial aquifer is generally northward toward the St. Johns River north of the surface drainage divide and south to southwest south of the divide. Depth to groundwater ranges from 3.5 to 5 feet below land surface (bls). Dewatering operations associated with recent construction in early to mid-1993 at the WWTP temporarily altered the groundwater flow.

2.1.5 Meteorology The meteorology of the Jacksonville area is described in detail in Volume 1 of the NAS Jacksonville IR program plan (Geraghty & Miller, 1991a).

2.1.6 Land Use and Demography Historically, the OU 2 area has been used primarily for wastewater treatment since the early 1940's. A secondary use has been for fire-fighting training.

The Timuquana Country Club and Golf Course border OU 2 to the west. Access to the country club is restricted to members and guests. Two private residences abut the NAS boundary on the western side of OU 2 near the St. Johns River (see Figure 1-2). A residential area also abuts the NAS boundary west of the Timuquana Country Club. Access to OU 2 is limited because of its proximity to the NAS taxiways and runways, which have security requirements. A chain-link fence along the base boundary and continuous patrols make access by unauthorized personnel unlikely.

2.2 SITE HISTORY. The land incorporated into NAS Jacksonville has been used for U.S. Navy operations since 1940. OU 2, which is located on the northern part of NAS Jacksonville, has primarily been used for domestic and industrial wastewater treatment. Its secondary use has been for fire-fighting training.

Past operations at the domestic and industrial WWTPs located within OU 2 that could possibly have affected soil quality at the OU include:

- drying of sludge in unlined beds (PSCs 41 and 43),
- discharge of treated water from the domestic wastewater treatment plant to an unlined polishing pond (PSC 42), and
- land disposal of sludge removed from the drying beds (PSCs 3 and 4).

In addition to the treatment plant, a former fire-fighting training area (PSC 2) is located within OU 2. Burning fuel within the unlined pit at the training area has affected soil quality at PSC 2.

Probable waste materials disposed at OU 2 include aviation fuels and other petroleum products (at the former fire-fighting training area) and inorganic and organic compounds (at the domestic and industrial wastewater sludge drying beds and at PSCs 3 and 4). The three potential source areas studied as part of this investigation (PSCs 2, 41, and 43, shown on Figure 1-3) are described briefly in the following subsections and more fully in Volume 6, OU 2 Remedial Investigation/Feasibility Study Workplan (ABB-ES, 1992). PSCs 3, 4, and 42, and groundwater for OU 2 as a whole, will be investigated at a later date.

In June 1987, NAS Jacksonville was issued a permit (No. H016-119108) for management of the sludge drying beds. This permit detailed the requirements for NAS Jacksonville to stay in compliance with the USEPA standards for owners and operators of hazardous waste treatment and disposal facilities. This permit specified the installation of one additional groundwater monitoring well, semiannual sampling of groundwater monitoring wells, and discontinuance of sludge disposal activities by November 1988. In October 1987, groundwater monitoring well NAS-4-11 was installed in response to these requirements.

In June 1988, FDEP issued a consent order that NAS Jacksonville was out of compliance with permit No. H016-119108. This consent order detailed the reasons NAS Jacksonville was out of compliance and the actions necessary to stay in compliance with the permit. The consent order also specified that because hazardous constituents were found in groundwater, the following actions should be completed: an electromagnetic terrain (EM) survey, a conceptual design report, and a closure plan. The EM survey indicated possible contamination beneath the sludge drying beds and recommended the installation of five additional groundwater monitoring wells and the conceptual design report listed possible remedial activities concerning contamination beneath the sludge drying beds. In 1988, NAS Jacksonville closed the industrial sludge drying beds and removed all sludge present in the beds.

In August 1988, NAS Jacksonville submitted the first application for closure of the domestic and industrial sludge drying beds (PSCs 41 and 43, respectively) and the polishing pond (PSC 42). A closure permit was issued by FDEP for these PSCs in September 1991. This document specified closure requirements for the PSCs and stated that the Industrial Sludge Drying Beds were used to dewater wastewater treatment sludge from electroplating operations (F006 wastes) and the Domestic Sludge Drying Beds and the Polishing Ponds were used for the treatment and storage of sludge resulting from treatment of F006 and F019 rinsewater from electroplating operations. The domestic sludge drying beds and the polishing pond were also used for the treatment and storage of sludge resulting from treatment of rinsewater from paint stripping and parts cleaning operations (F001 through F005) (in addition to sludge from the aerobic digester of the domestic WWTP).

<u>2.2.1 Former Fire-fighting Training Area (Potential Source of Contamination [PSC] 2)</u> The former fire-fighting training area (PSC 2) is a shallow, unlined, circular pit, approximately 120 feet in diameter. Since 1966, obsolete vehicle chassis and parts were periodically staged on the pit, covered with JP-4, JP-5, aviation gasoline, or other petroleum product, and then ignited to simulate aircraft crashes. Fire fighters would subsequently practice extinguishing fires. An estimated 6,000 gallons of fuel were burned annually. PSC 2 was removed from service as a fire-fighting training area in 1991, and NAS Jacksonville completed construction of a new fire-fighting training area just northeast of PSC 2 in 1992 (Figure 1-3). At present, no vegetation grows on the pit although the immediate surrounding areas are vegetated with grass.

<u>2.2.2 Domestic Waste Sludge Drying Beds (PSC 41)</u> The domestic waste sludge drying beds (PSC 41) were constructed in 1970 to receive sludge from the anaerobic digester at the domestic WWTP. They were in use until 1987. The system consisted of five unlined beds, each measuring 50 by 50 feet. The 3-foot-high containment walls and outside dikes were constructed of concrete blocks. The beds were underlain with 7 inches of sand, 3 inches of fine gravel, and 6 to 12 inches of coarse gravel. An underdrain system consisting of three, 6-inch-diameter, vitrified clay drain lines collected leachate from the beds and returned it to the headworks of the domestic WWTP. During operations, approximately 300 cubic yards of dried sludge were removed annually from the domestic waste sludge drying beds.

Before construction of the industrial waste sludge drying beds in 1980, sludge from the industrial wastewater treatment operation was also discharged to the domestic waste sludge drying beds. The domestic waste sludge drying beds were permanently removed from service on June 10, 1987, and the remaining sludge was removed and taken to an offsite USEPA-permitted landfill for disposal. At present, the media within the domestic sludge drying beds consist of filter media (sand and gravel) along with fine grained native soil at the surface, which supports vegetation during the spring and summer months.

<u>2.2.3 Industrial Waste Sludge Drying Beds (PSC 43)</u> The industrial waste sludge drying beds (PSC-43) were constructed in 1980 to dewater industrial wastewater treatment sludge from electroplating operations. Each of the four beds is approximately 15 by 18 feet and enclosed with concrete retaining walls. The

bottoms of the beds are unlined. Filter media within the beds consist of, from the surface of the bed, a 12-inch sand layer, a 4-inch medium-grained gravel layer, and a minimum 6-inch coarse-grained gravel layer. A synthetic filter material separates the two gravel layers. The bottoms of each bed are sloped toward centralized perforated plastic leachate collection pipes that returned leachate to the headworks of the industrial WWTP. Approximately 41 cubic yards of dried sludge were excavated annually from the drying beds and disposed by land spreading at PSC 3. The industrial waste sludge drying beds were permanently removed from service in November 1988, and the remaining sludge was removed and taken to an offsite USEPA-permitted landfill for disposal in 1991.

2.3 PREVIOUS INVESTIGATIVE HISTORY. The previous investigative history of OU 2 is described in detail in Volume 6 of the NAS Jacksonville IR program plan (RI/FSWP) (ABB-ES, 1992). In summary, Preliminary Assessment and Site Inspection (PA/SI) activities were completed in the early to mid-1980's by Fred C. Hart & Associates and Geraghty & Miller, Inc. at PSC 2. One groundwater monitoring well was installed during the SI, which has since been abandoned at an unknown date. PSCs 41 and 43 have been investigated for groundwater compliance with Resource Conservation and Recovery Act (RCRA) standards since 1983. Though several groundwater monitoring wells were installed at PSCs 41 and 43, no soil or filter media samples were collected or analyzed during previous investigations at PSCs 2, 41, and 43. Information is available on groundwater quality at OU 2; however, groundwater is not the medium of concern for this Focused RI/FS and groundwater contamination at OU 2 will be evaluated at a later date.

3.0 FOCUSED REMEDIAL INVESTIGATION (RI) SCOPE AND FINDINGS

The Focused RI field activities consisted of sampling of vadose-zone soil (unsaturated surface soil) at PSC 2 and sampling of the filter media at PSCs 41 and 43. Some soil samples were also collected around the perimeter of PSCs 41 and 43. Additional field activities included the surveying of the sample locations and surface features within each PSC.

The following sections present the scope and results of the Focused RI. The scope of the Focused RI includes soil sampling and sample analyses and a topographic survey at each PSC. The results of the Focused RI present the findings of the onsite screening and offsite analyses.

3.1 SCOPE OF THE FOCUSED RI. The scope of the Focused RI was limited to collecting hand-augered soil samples from the surface to the water table (approximately 5 feet bls) and surveying of sample locations and selected structures at PSCs 2, 41, and 43. Selected samples were analyzed offsite at a USEPA-certified laboratory. Other samples were screened onsite.

The purpose of the Focused RI was to characterize the extent of contamination in the vadose zone at these PSCs to provide information necessary to complete a Focused FS. The Focused RI and associated Focused Risk Evaluation will help establish remedial action objectives for source control and compliance with closure requirements. The data generated during this field effort were not intended to fully characterize the nature and extent of all contamination at OU 2; these will be addressed at a later date within the overall OU 2 RI/FS.

3.1.1 Sample Collection and Analyses The following subsections describe the sample locations, sampling methods, and sampling analyses at each PSC. The analytical methods are described in Subsection 3.1.2. The instrumentation used for field screening is described in Appendix A.

3.1.1.1 Former Fire-fighting Training Area (PSC 2) A north-aligned grid with approximately 20-foot spacing was used to determine the soil sampling locations inside the pit at PSC 2 (RI/FSWP, ABB-ES, 1992). Twenty-nine samples were collected at the locations shown on Figure 3-1 from 0 to 1 foot bls and screened for total petroleum hydrocarbons (TPH), using an infrared spectroscopy unit (USEPA Modified Method 418.1) (see Appendix A). The results of this initial screening were mapped and an additional six samples were taken from a depth of 2 to 3 foot bls within the pit. Four of these samples were taken from evenly spaced locations (OU2-SB-8, OU2-SB-15, OU2-SB-19, and OU2-SB-27) around the edge of the pit, and two were taken from the middle of the pit (OU2-SB-16, and OU2-SB-17) (RI/FSWP, ABB-ES, 1992). At sample locations where TPH concentrations were found to be above 50 milligrams per kilogram (mg/kg) at the 2 to 3 foot bls depth, soil samples were collected from 4 to 5 foot bls and screened onsite for TPH. At locations where TPH concentrations of greater than 500 mg/kg were observed, five additional samples were collected from a depth of 0 to 1 foot bls and screened onsite for selected volatile organic compounds (VOCs) and selected inorganics. In addition, two samples were selected from a location where the TPH concentration was between 50 and 500 mg/kg and screened for selected VOCs and inorganics. The selected VOCs are part of a subset of the Contract Laboratory Program target compound list (CLP TCL) that contains the following compounds of interest commonly

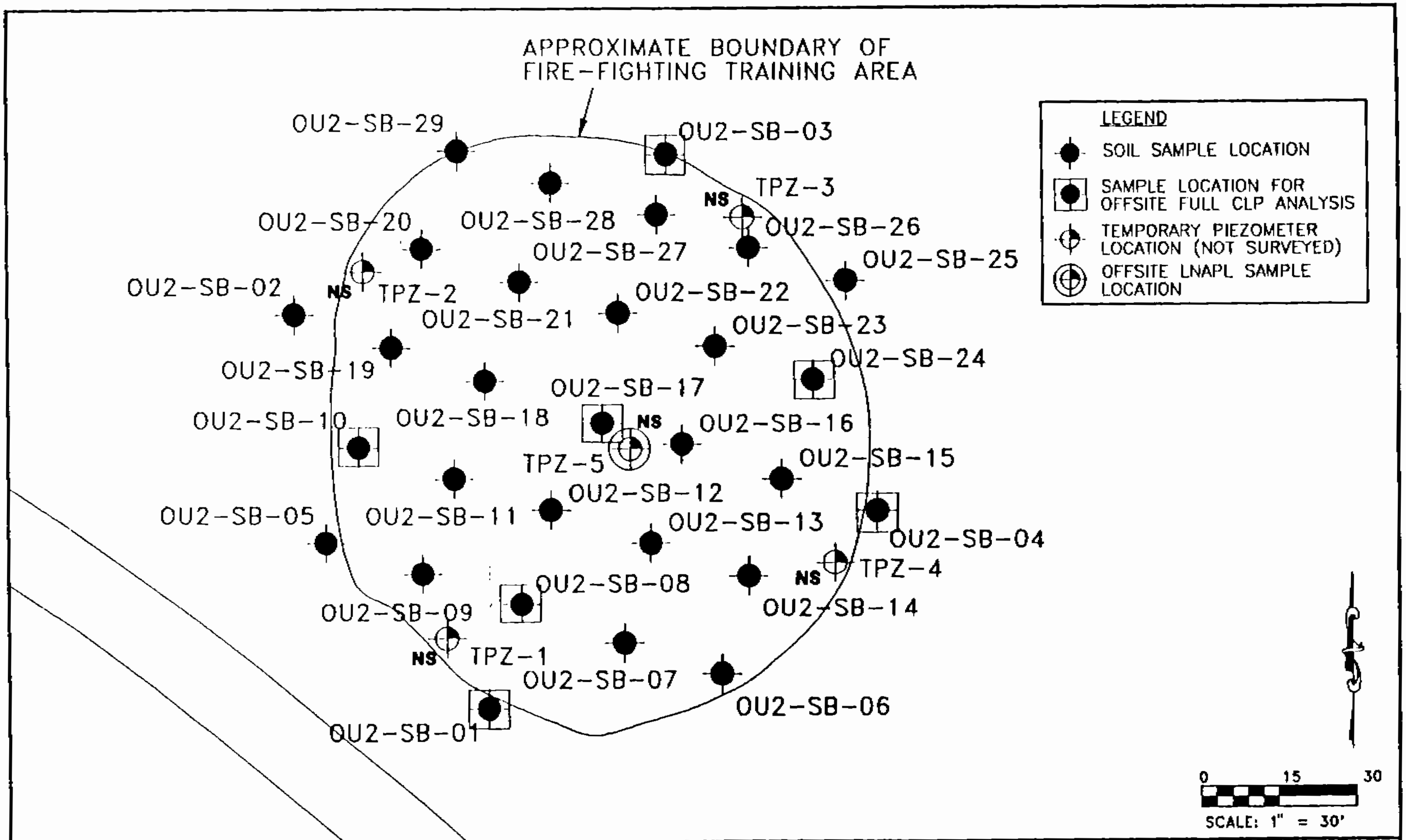

FIGURE 3-1
FIRE-FIGHTING TRAINING AREA, PSC 2, SOIL SAMPLING LOCATIONS

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associated with fuels; benzene, toluene, ethylbenzene, and xylene (BTEX). The 14 VOCs of this subset are based on the setup configuration of the field gas chromatograph (GC) and consist of the following compounds.

1,1,1-Trichloroethane	Toluene
1,1-Dichloroethane	Trichloroethene
Benzene	Vinyl chloride
Chlorobenzene	m/p-Xylene
Ethylbenzene	o-Xylene
Methylene chloride	trans-1,2-Dichloroethene
Tetrachloroethene	cis-1,2-Dichloroethene

The selected inorganics consisted of the following:

Arsenic	Cadmium
Chromium	Lead
Nickel	

These seven samples were also split for a full scan CLP TCL and target analyte list (TAL) analysis by an offsite laboratory. Of the samples sent to the offsite laboratory, one was selected from a greater than 500 mg/kg TPH location for British thermal unit (Btu) content and grain size analysis and one was selected from a 50 to 500 mg/kg TPH location for Btu content, total organic carbon (TOC), and grain size analysis.

Historical aerial photographs indicate possible fire-fighting training areas located east and west of the known site; therefore, the area around the former fire-fighting training pit was also investigated. The sampling methodology for the area around the pit was developed in accordance with the approved RI/FSWP (ABB-ES, 1992). Figure 3-2 shows the sample locations outside the pit.

A north-aligned grid with approximately 50 foot spacing was used to determine the soil sampling locations outside the pit at PSC 2. Initial sampling began at the nodes of the grid, and samples were taken in between the nodes based on onsite TPH screening results to further delineate potential source areas encountered. A total of 45 samples were taken around the pit from 0 to 1 foot bls and screened onsite for TPH.

As a result of this screening, no additional source areas were identified. Four samples (OU2-SB-43, OU2-SB-56, OU2-SB-61, and OU2-SB-63) were taken from 2 to 3 foot bls around the pit and screened onsite for TPH. Where concentrations greater that 50 mg/kg were detected in the 2 to 3 bls foot samples, the same locations were sampled from 4 to 5 foot and screened onsite for TPH.

Based on the field screening of TPH samples from a depth of 0 to 1 foot bls, six samples were selected and screened onsite for VOCs. To confirm analytical results of VOCs, these six samples were split for offsite laboratory confirmation (Figure 3-2). An additional three samples, from outside the pit area, were analyzed by an offsite laboratory for full TAL and TCL analyses.

Confirmatory analysis of the TPH screening was completed by an offsite laboratory. Approximately 10 percent of all the samples taken for onsite TPH screening both inside and outside of the pit were sent to an offsite laboratory for TPH analysis.

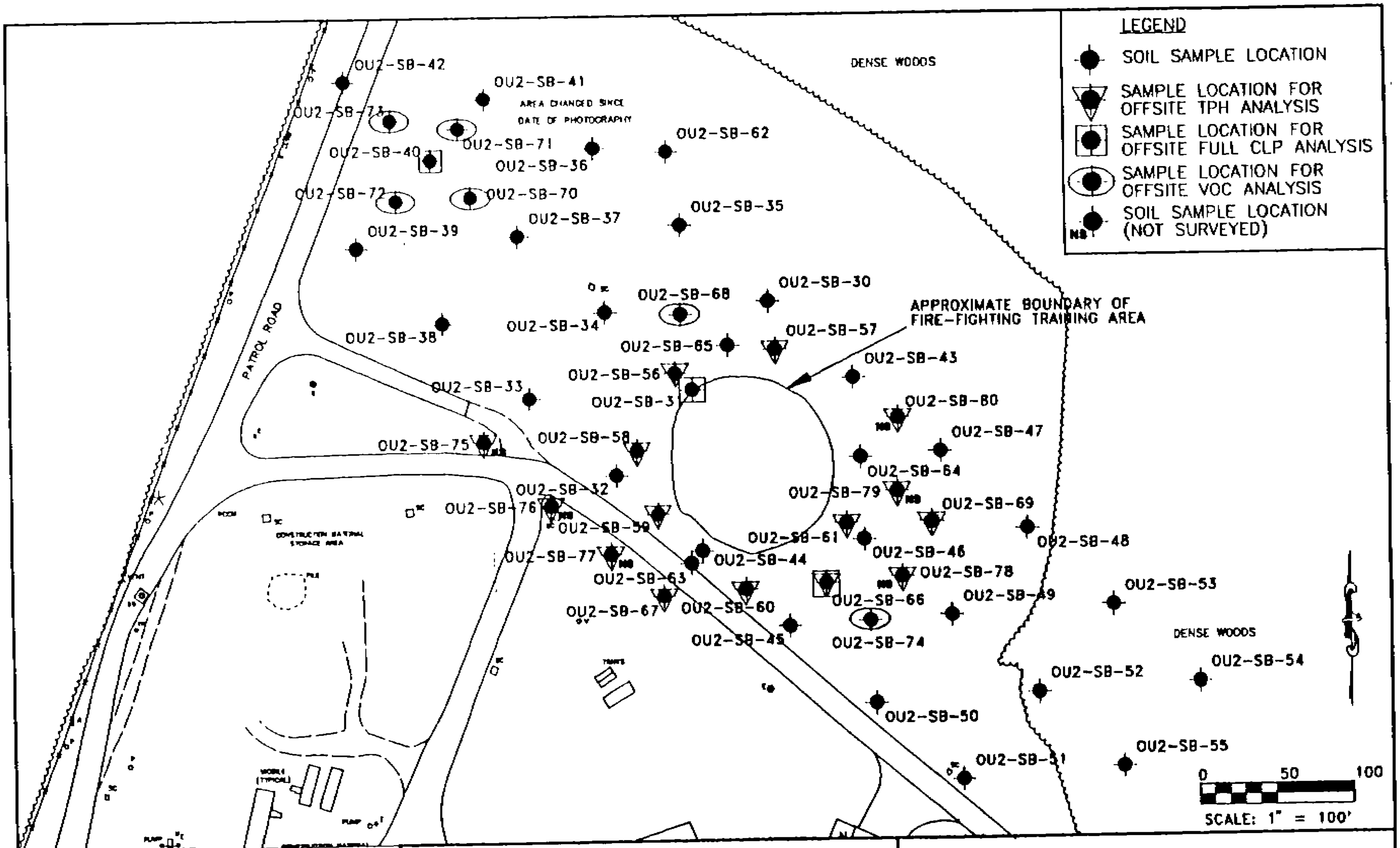

FIGURE 3-2
FIRE-FIGHTING TRAINING AREA, PSC 2, AND SURROUNDING AREA, SOIL SAMPLING LOCATIONS

FOCUSED RI/FS REPORT FOR OU2

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FTA/DRM/12-13-93

Nine samples were sent for off-site TPH confirmation and 18 additional samples, not screened onsite, were sent off-site for TPH analysis.

In addition to soil sampling activities at PSC 2, five temporary observation wells were installed with a hand auger within and around the perimeter of the fire-fighting training pit (Figure 3-1). They were installed to confirm the presence of free-phase light nonaqueous-phase liquid (LNAPL) at PSC 2, which was suspected because heavily contaminated soil was observed within the pit during field activities. Oil and water interface measurements were taken in each observation well a week after installation. TPZ-5 was found to contain 1.09 feet of LNAPL, and TPZ-4 contained 0.07 foot of LNAPL. A sample of LNAPL was collected from TPZ-5 and characterized by an offsite laboratory. The analyses performed are listed in Appendix A.

3.1.1.2 **Domestic Sludge Drying Beds (PSC 41)** The domestic sludge drying beds consist of five individual beds, each approximately 50 feet square. Three sampling locations were selected within each bed (for a total of 15 locations) and 1 sampling location was selected approximately 10 feet outside each perimeter wall (for a total of 12 locations). The approximate dimensions of the beds and sample locations are shown on Figure 3-3.

Samples were collected at three depths at each of the locations within the beds. The first sample, generally collected from 0 to 1 foot bls, consisted of the fine-grained fraction screened from the filter gravel. The second sample depth, generally collected from 1 to 2.5 feet bls, consisted of a composite of the native soil directly below the filter media. The third sample depth, generally collected from 3 to 4 feet bls, consisted of the deeper native soil. The water table was generally encountered at this depth. Samples were collected from two depths, generally 0 to 1 and 2 to 4 feet bls, at each of the locations outside the beds. All samples were screened for five inorganics (arsenic, cadmium, chromium, nickel, and lead) and VOCs in accordance with the RI/FSWP, Volume 6 (ABB-ES, 1992).

In addition to soil sampling activities, two concrete samples were collected from the walls surrounding the drying beds and analyzed for toxicity characteristic leaching procedure (TCLP) volatile compounds and inorganics. Locations of the concrete samples are shown on Figure 3-3.

3.1.1.3 **Industrial Sludge Drying Beds (PSC 43)** The industrial sludge drying beds consist of four individual beds, each approximately 15 feet by 18 feet in dimension. Two sampling locations were selected within each bed (for a total of 8 locations) and 1 sampling location was selected from approximately 10 feet outside each perimeter wall (for a total of 10 locations). The approximate dimensions of the beds and sample locations are shown on Figure 3-4.

At locations IDB-SB-001, IDB-SB-003, IDB-SB-005, and IDB-SB-007 (shown on Figure 3-4), a sample was collected from a 2-inch thick stained zone at the top of the fine crushed gravel layer. At locations IDB-SB-002, IDB-SB-004, IDB-SB-006, and IDB-SB-008, composite samples were collected at three depths, two from within the filter material and one from the underlying native soil. The specific depth intervals of each sample vary due to the structure of the beds. The remaining sample locations (IDB-SB-009 through IDB-SB-018) are located approximately 10 feet outside each perimeter wall. Samples were collected from two depths, 0 to 1 foot and between 2 to 5 feet bls, at each of these locations. All samples collected at PSC 43 were screened for five heavy metals and VOCs as discussed for PSC 41.

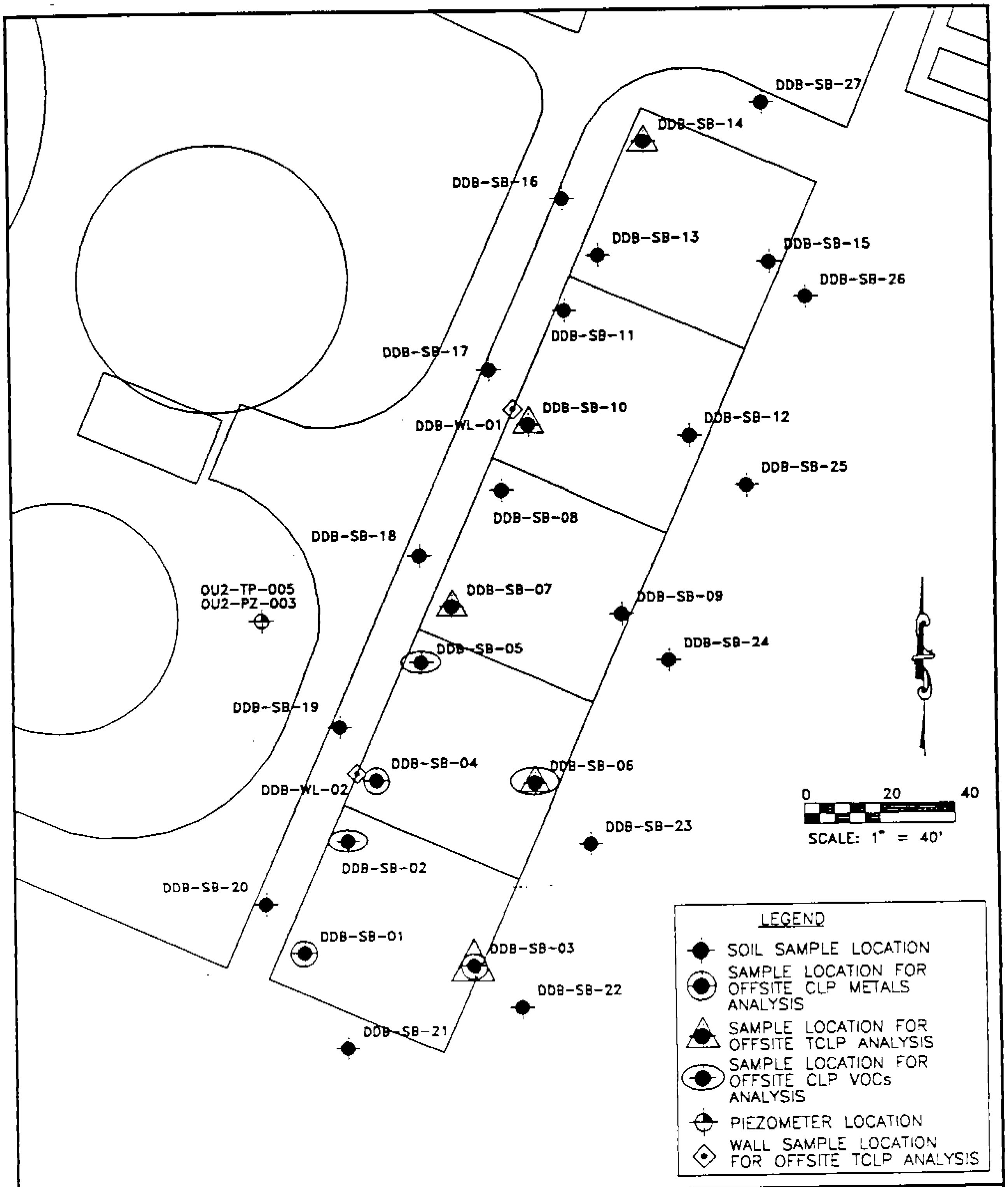

FIGURE 3-3
DOMESTIC SLUDGE DRYING BEDS, PSC 41, SOIL SAMPLING LOCATIONS

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DOMSLUDGE/DRM/11-6-93
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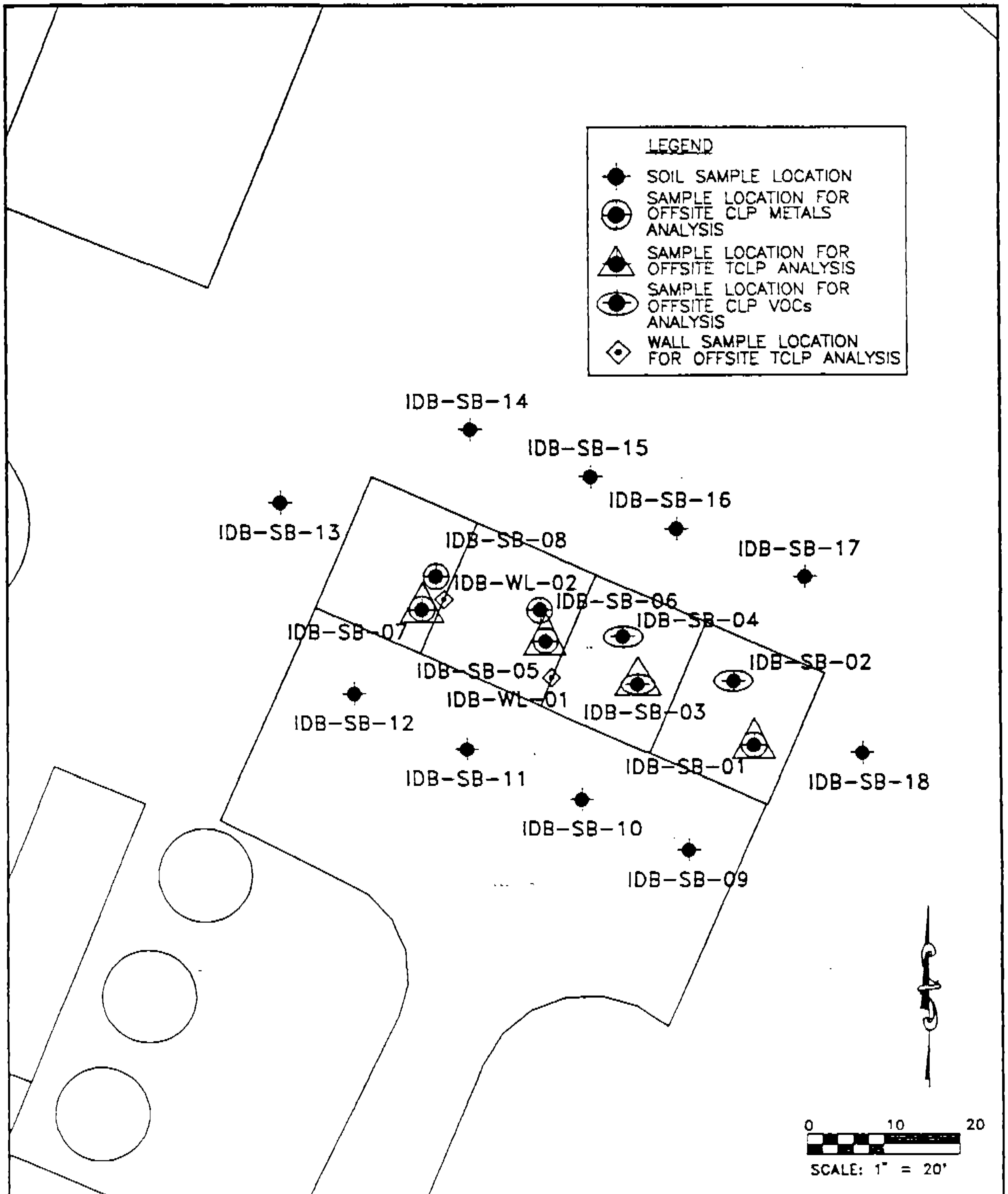

FIGURE 3-4
INDUSTRIAL SLUDGE DRYING BEDS, PSC 43, SOIL SAMPLING LOCATIONS

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JACKSONVILLE, FLORIDA

INDSLUDGE/DRM/11-6-93

In addition to soil sampling activities, two concrete samples were collected from the walls surrounding the drying beds and analyzed by TCLP for volatile organics and inorganics. Locations of the concrete samples are shown on Figure 3-4.

3.1.2 Topographic Survey Vertical and horizontal controls were established from existing survey monuments at the site. Location coordinates and elevations were established for each bed and sampling location by a Florida-registered professional surveyor. The horizontal coordinates for all sampling locations are to the nearest 0.1 foot and are referenced to the Florida East Zone Rectangular Coordinate System. Elevations are to the nearest 0.01 foot and referenced to the North American Datum of 1983 (NAD 83).

3.2 RI FINDINGS. The results of the offsite laboratory and field screening analyses are presented in the following subsections by PSC. The results of the offsite laboratory analyses for each PSC are summarized in Tables 3-1 through 3-6. The results of field screening analyses, including purgeable VOCs, inorganics, and TPH, are presented in tables contained in Appendix A. A comparison of the analytical results between the onsite and offsite laboratories is included in Appendix B. Analytical results for soil samples submitted for grain-size analyses, TOC, and heat of combustion, along with LNAPL characterization results, are presented in Appendix C.

3.2.1 Former Fire-fighting Training Area (PSC 2)

Volatile Organic Compounds The offsite analytical data (Table 3-1) indicates the presence of ethylbenzene, 4-methyl-2-pentanone, and 2-butanone at the center of PSC 2 (sample location OU 2-SB-17). These constituents are degradation products of hydrocarbon-based compounds related to fuel including jet and diesel fuel. Acetone was detected at concentrations ranging from 3 to 70 micrograms per kilogram (μg/kg). However, these low concentrations of acetone may be a result of field equipment or sample bottle decontamination and, therefore, are not attributable to historic burning at the facility. Total xylenes were also detected at 350 μg/kg at location SB-031 near the northwest edge of PSC 2.

The onsite field screening results (Appendix A) suggest the presence of high concentrations of BTEX compounds at the center of PSC 2 (sample location OU2-SB-17) and relatively smaller concentrations of VOCs, primarily BTEX compounds, near the edge of PSC 2 (locations OU2-SB-08, OU2-SB-10, OU2-SB-31, and OU2-SB-66). However, these higher concentrations suggested by the screening of 002-SB-17 samples were not well confirmed by the offsite analytical results, indicating that the screening data is conservative.

Semivolatile Organic Compounds (SVOCs). SVOCs detected consisted of polynuclear aromatic hydrocarbon compounds (PAHs) (Table 3-2). At the center of PSC 2 (location OU2-SB-017), 2-methylnaphthalene was detected at 11,000 μg/kg. This PAH compound was also detected near the northeastern edge of PSC 2 (location OU2-SB-31) at 9,400 μg/kg together with naphthalene at 4,100 μg/kg. Other PAHs detected at low concentrations are confined to one sample location in the eastern edge of PSC 2 (location OU2-SB-04) with estimated detections of dibenz(a,h)anthracene, chrysene, pyrene, benzo(g,h,i)perylene, benzo(k)fluoranthene, indeno(1,2,3-cd)pyrene, and benzo(b)fluoranthene in concentrations ranging from 73 to 260 μg/kg. These constituents also appear to be associated with degradation of hydrocarbon-based compounds related to fuel.

Table 3-1
Summary of Positive Detections in Soil Analytical Results, Target Compound List (TCL) Volatile Organics (Offsite)

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Identifier	Depth (feet)	Acetone	Ethylbenzene	2-Butanone	4-Methyl-2-pentanone	Xylene (total)
Former Fire-fighting Training Area (PSC 2)						
OU2SB00301	0 to 1	3 J	–	–	–	–
OU2SB01001	0 to 1	70	–	–	–	–
OU2SB01701	0 to 1	17 J	7 J	24 J	550 J	–
OU2SB02401	0 to 1	13 J	–	–	–	–
OU2SB03101	0 to 1	–	–	–	–	35 0
OU2SB04001	0 to 1	34 J	–	–	–	–
OU2SB06801	0 to 1	8 J	–	–	–	–
OU2SB07201	0 to 1	5 J	–	–	–	–
OU2SB07401	0 to 1	5 J	–	–	–	–
Domestic Waste Sludge Drying Beds (PSC 41)						
DDBSB00601	0 to 1	20	–	–	–	–
Industrial Waste Sludge Drying Beds (PSC 43)						
IDBSB00301	0 to 1	44	–	–	–	–
Background Concentrations		NA	NA	NA	NA	NA

Notes: Analytical results expressed in micrograms per kilogram (µg/kg) dry weight.
PSC = potential source of contamination.
J = reported value is an estimated quantity.
NA = not available.
TCL volatile organic compounds were also analyzed but were not detected in the following samples:
PSC 2: OU2SB00101, OU2SB00401, OU2SB00801, OU2SB06601, OU2SB07001, OU2SB07101, and OU2SB07301;
PSC 41: DDBSB00201, DDBSB00502, and DDBSB00602; and
PSC 43: IDBSB00201, IDBSB00202, IDBSB00203, IDBSB00401, IDBSB00402, and IDBSB00601.

Table 3-2
Summary of Positive Detections in Soil Analytical Results
Target Compound List (TCL) Semivolatile Organics (Offsite)

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Identifier	Depth (feet)	Dibenz(a,h)-anthracene	Chrysene	Pyrene	Benzo(g,h,i)-perylene	Benzo(k)fluoran-thene	Indeno(1,2,3cd)-pyrene	Benzo(a)-pyrene	Benzo(b)fluo-ranthene	2-Methyl-naphthalene	Naph-thalene
Former Fire-fighting Training Area (PSC 2)											
OU2SB00401	0 to 1	73 J	81 J	140 J	150 J	170 J	170 J	210 J	260 J	--	--
OU2SB01701	0 to 1	--	--	--	--	--	--	--	--	11,000 J	--
OU2SB03101	0 to 1	--	--	--	--	--	--	--	--	9,400	4,100
Background Concentration		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes: Analytical results expressed in micrograms per kilogram (μg/kg) dry weight.
PSC = potential source of contamination.
J = reported value is an estimated quantity.
NA = not available.
TCL semivolatile organic compounds were also analyzed but were not detected in the following samples:
PSC 2: OU2SB00101, OU2SB00301, OU2SB00801, OU2SB01001, OU2SB02401, OU2SB04001, and OU2SB06601.

Table 3-3
Summary of Positive Detections in Soil Analytical Results, Target Compound List (TCL) Pesticides and Polychlorinated Biphenyls (PCBs) (Offsite)

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Identifier	Depth (feet)	alpha-Chlordane		gamma-Chlordane		Dieldrin		4,4'-DDE	
Former Fire-fighting Training Area (PSC 2)									
OU2SB00101	0 to 1	2.9		3.6		–		–	
OU2SB00301	0 to 1	–		–		3.4	J	–	
OU2SB00401	0 to 1	2.1		2		1.6	J	1	J
OU2SB02401	0 to 1	1.2	J	0.89	J	2.3	J	–	
OU2SB03101	0 to 1	–		–		13		–	
OU2SB06601	0 to 1	0.68	J	0.56	J	3.9		–	
Background Concentration		NA		NA		NA		NA	

Notes: Analytical results expressed in micrograms per kilogram (µg/kg) dry weight.
DDE = dichlorodiphenyldichloroethene.
PSC = potential source of contamination.
J = value reported is an estimated quantity.
NA = not available.
TCL pesticide and PCB compounds were also analyzed but were not detected in the following samples:
PSC 2: OU2SB00801, OU2SB01001, OU2SB01701, and OU2SB04001.

Table 3-4
Summary of Positive Detections in Soil Analytical Results, Target Analyte List Inorganics (Offsite)

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Identifier	Depth (feet)	Aluminum	Arsenic	Barium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron
Former Fire-fighting Training Area (PSC 2)										
OU2SB00101	0 to 1	1,420 J	0.93 J	--	--	--	--	--	--	272 J
OU2SB00301	0 to 1	2,150 J	--	--	--	1,550	5.6	--	16.4	425 J
OU2SB00401	0 to 1	2,760 J	--	--	--	34,100	4.9	--	--	1,720 J
OU2SB00801	0 to 1	1,680 J	--	--	--	--	2.8	--	--	285 J
OU2SB01001	0 to 1	1,320 J	--	--	--	--	--	--	--	179 J
OU2SB01701	0 to 1	3,090 J	--	121	7.2	18,600	17.6	--	90.9	3,750 J
OU2SB02401	0 to 1	1,550 J	--	--	1.2	--	2.7	--	8.5	1,350 J
OU2SB03101	0 to 1	1,000 J	--	--	1.5	--	6.1	--	14.6	526 J
OU2SB04001	0 to 1	1,810 J	--	--	2.1	12,900	5.4	--	9.8	602 J
OU2SB06601	0 to 1	1,790 J	--	--	--	11,500	10.8	--	--	425 J
Domestic Waste Sludge Drying Beds (PSC 41)										
DDBSB00101	0 to 1	1,090	--	--	9.6	2,460	206	--	21.4	1,810 J
DDBSB00102	1.5 to 3	792	--	--	--	--	6.6	--	--	466 J
DDBSB00103	3 to 4	82.1	--	--	--	--	--	--	--	19.1 J
DDBSB00301	0 to 1	2,560	61.1 J	451	134	4,850	5,310	20.7	334	9,750 J
DDBSB00302	1.5 to 3	369	0.62 J	--	4	1,660	4.4	--	--	640 J
DDBSB00303	3 to 4	659	0.88 J	--	--	--	--	--	--	483 J
DDBSB00401	0 to 1	2,520	1.5 J	56.1	28.5	2,220	375	--	59.3	3,950 J
DDBSB00402	1 to 2.5	419	0.73 J	--	14	1,360	--	--	8.5	176 J
DDBSB00403	2.5 to 3.5	174	--	--	--	--	--	--	--	120 J
Industrial Waste Sludge Drying Beds (PSC 43)										
IDBSB00101	0 to 2	2,590	0.94 J	67.6	223	36,200	15,000	56.3	141	2,180 J
IDBSB00501	0 to 2	2,610	--	604	98.3	15,500	7,050	28.9	93	2,870 J
IDBSB00602	1 to 2	228	--	--	--	--	4.8	--	--	37.3 J
IDBSB00701	0 to 2	5,220	0.84 J	--	--	53,700	47,700	178	470	5,860 J
IDBSB00802	2 to 2.2	7,950	--	--	23	--	264	--	14.7	727 J
Background Concentrations		1,710	2.4	19.6	1.2	22,400	4.8	1.7	11.5	2,070

See notes at end of table.

Table 3-4 (Continued)
Summary of Positive Detections in Soil Analytical Results, Target Analyte List Inorganics (Offsite)

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Identifier	Depth (feet)	Lead	Magnesium	Manganese	Mercury	Nickel	Selenium	Silver	Zinc	Cyanide
Former Fire-fighting Training Area (PSC 2)										
OU2SB00101	0 to 1	10.4 J	--	--	--	--	--	--	5.2 J	--
OU2SB00301	0 to 1	33.1	--	5	--	--	--	--	34.6 J	--
OU2SB00401	0 to 1	6.5 J	--	5.7	0.1	--	--	--	4.9 J	--
OU2SB00801	0 to 1	10.2	--	4.8	--	--	--	--	4.5 J	--
OU2SB01001	0 to 1	2.8	--	--	--	--	--	--	--	--
OU2SB01701	0 to 1	133	--	24.3	--	--	--	--	260 J	--
OU2SB02401	0 to 1	47	--	8.9	--	--	--	--	37.3 J	--
OU2SB03101	0 to 1	30.8	--	7.7	--	--	--	--	26.3 J	--
OU2SB04001	0 to 1	28.2	--	8.8	--	--	--	--	41.3 J	--
OU2SB06601	0 to 1	4.5	--	4.7	--	--	--	--	6.6 J	--
Domestic Waste Sludge Drying Beds (PSC 41)										
DDBSB00101	0 to 1	23 J	--	36.2	--	20.7	--	5.4	54.3	--
DDBSB00102	1.5 to 3	8.5 J	--	16.6	--	--	--	--	9	--
DDBSB00103	3 to 4	4.5 J	--	--	--	--	--	--	--	--
DDBSB00301	0 to 1	252 J	227	252	12.2	110	1 J	110	454	--
DDBSB00302	1.5 to 3	4.2 J	--	69	--	18.7	--	--	20.2	--
DDBSB00303	3 to 4	2 J	--	--	--	--	--	--	--	--
DDBSB00401	0 to 1	58.1 J	181	176	0.3	73.7	--	10.1	222	--
DDBSB00402	1 to 2.5	4.4 J	--	524	--	52.8	--	--	59.3	--
DDBSB00403	2.5 to 3.5	2.3 J	--	--	--	--	--	--	--	--
Industrial Waste Sludge Drying Beds (PSC 43)										
IDBSB00101	[1]0 to 2	563 J	13,200	4,650	--	1,110	0.49 J	120	389	--
IDBSB00501	[1]0 to 2	444 J	4,850	1,660	--	518	0.43 J	42.2	292	--
IDBSB00602	1 to 2	2.1 J	--	8	--	--	--	--	--	--
IDBSB00701	[1]0 to 2	1,220 J	23,100	4,240	0.16	1,540	1 J	256	1,130	--
IDBSB00802	2 to 2.2	15.5 J	--	7.8	--	--	0.44 J	--	5.2	--
Background Concentrations		173	39. 8	0.16	14.7	86.9	1.2	221	78	NA

[1]Depth is inches, not feet.

Notes: Analytical results expressed in milligrams per kilogram (mg/kg) dry weight.
Beryllium, potassium, sodium, and vanadium were detected only in the background samples at concentrations 0.23, 0.2, 0.2, and 6.2, respectively.
PSC = potential source of contamination.
J = reported value is an estimated quantity.

Table 3-5
Summary of Positive Detections in Soil Analytical Results, Total Petroleum Hydrocarbons (Offsite)

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Identifier	Depth (feet)	TPH		Identifier	Depth (feet)	TPH
Former Fire-fighting Training Area (PSC 2)						
OU2SB05601	0 to 1	13.4		OU2SB07603	3 to 4	86
OU2SB05701	0 to 1	29.3		OU2SB07701	0 to 1	7.6
OU2SB05801	0 to 1	2.9	J	OU2SB07801	0 to 1	5.3
OU2SB06101	0 to 1	642		OU2SB07802	2 to 3	5.8
OU2SB06601	0 to 1	25.2		OU2SB07803	3 to 4	2.4
OU2SB06701	0 to 1	11		OU2SB07901	0 to 1	2.9
OU2SB06901	0 to 1	1.8		OU2SB07902	2 to 3	8.4
OU2SB07501	0 to 1	70.5		OU2SB07903	3 to 4	8.3
OU2SB07601	0 to 1	16.4		OU2SB08001	0 to 1	4.8
OU2SB07602	2 to 3	4.9		OU2SB08003	3 to 4	4.2

Notes: Analytical results expressed in milligrams per kilogram (mg/kg) dry weight.
PSC = potential source of contamination.
J = reported value is an estimated quantity.
Total petroleum hydrocarbons (TPH) were also analyzed but were not detected in the following samples:
PSC 2: OU2SB05901, OU2SB06001, OU2SB07502, OU2SB07503, OU2SB07702, OU2SB07703, and OU2SB08002.

Table 3-6
Summary of Positive Detections in Soil Analytical Results, Toxicity Characteristic Leaching Procedure, Inorganics

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Identifier	Depth (feet)	Arsenic	Barium	Cadmium	Chromium
Domestic Waste Sludge Drying Beds (PSC 41)					
DDBSB00301	0 to 1	0.02	0.79	0.24	0.06
DDBSB00601	0 to 1	–	0.76	0.15	0.03
DDBSB00701	0 to 1.5	–	0.83	0.20	0.03
DDBSB01001	0 to 1	–	1.10	0.18	0.04
DDBSB01301	0 to 1	–	0.60	0.13	0.03
DDBWL00101	[1]	–	–	0.08	–
DDBWL00201	[1]	–	–	0.03	0.06
Industrial Waste Sludge Drying Beds (PSC 43)					
IDBSB00101	[2]0 to 2	–	0.22	0.04	3.65
IDBSB00301	[2]0 to 2	–	0.21	0.02	2.76
IDBSB00501	[2]0 to 2	–	0.27	0.02	2.42
IDBSB00701	[2]0 to 2	–	–	0.05	1.30
IDBWL00101	[1]	–	0.28	0.03	–
IDBWL00201	[1]	–	0.26	–	–
CCWE[3]		NA	NA	0.066	5.2

[1] Depth not applicable for wall samples.
[2] Depth is in inches, not feet.
[3] Source: 40 Code of Federal Regulations (CFR), Part 268.41.

Notes: Analytical results expressed in milligrams per liter (mg/ℓ) (toxicity characteristic leaching procedure [TCLP] extract).
CCWE = constituent concentrations in waste extract treatment standards for F006.
SB = soil boring samples.
WL = cement wall samples.

Pesticides and Polychlorinated Biphenyls (PCBs). Pesticide and PCB constituents were detected near the edge of PSC 2 at sample locations OU2-SB-01, OU2-SB-03, OU2-SB-04, OU2-SB-24, OU2-SB-31, and OU2-SB-66 (Table 3-3). These compounds included alpha-chlordane, gamma-chlordane, and dieldrin at concentrations ranging from 0.56 to 13 μg/kg. In addition, 4,4'-dichlorodiphenyldichloroethene (DDE) was detected at location OU2-SB-04. The presence of these pesticides could be the result of general basewide use of the pesticides and may not be related to activities associated with PSC 2. PCBs were not detected in any of the soil samples collected from PSC 2.

Total Petroleum Hydrocarbons. Positive TPH detections range from 1.8 to 642 mg/kg (Table 3-5) at locations around the fire-fighting training area (Figure 3-2). These values confirm field screening results presented in Appendix A. The horizontal and vertical extent of TPH concentrations in and around PSC 2 are graphically shown in Figures 3-5 and 3-6. These figures were created by using the horizontal and vertical coordinates and TPH data implementing the Earth Vision 1.2 software program (Silicon Graphics™, Inc.). The TPH analytical database used both laboratory and field screening information. For soil samples with both field screening and laboratory analytical values, the higher-quality laboratory data were substituted for the screening data (approximately 10 percent of the data points). For modeling purposes, an interpolation technique was used to estimate data values reported below the TPH field analytical detection limits of approximately 50 mg/kg.

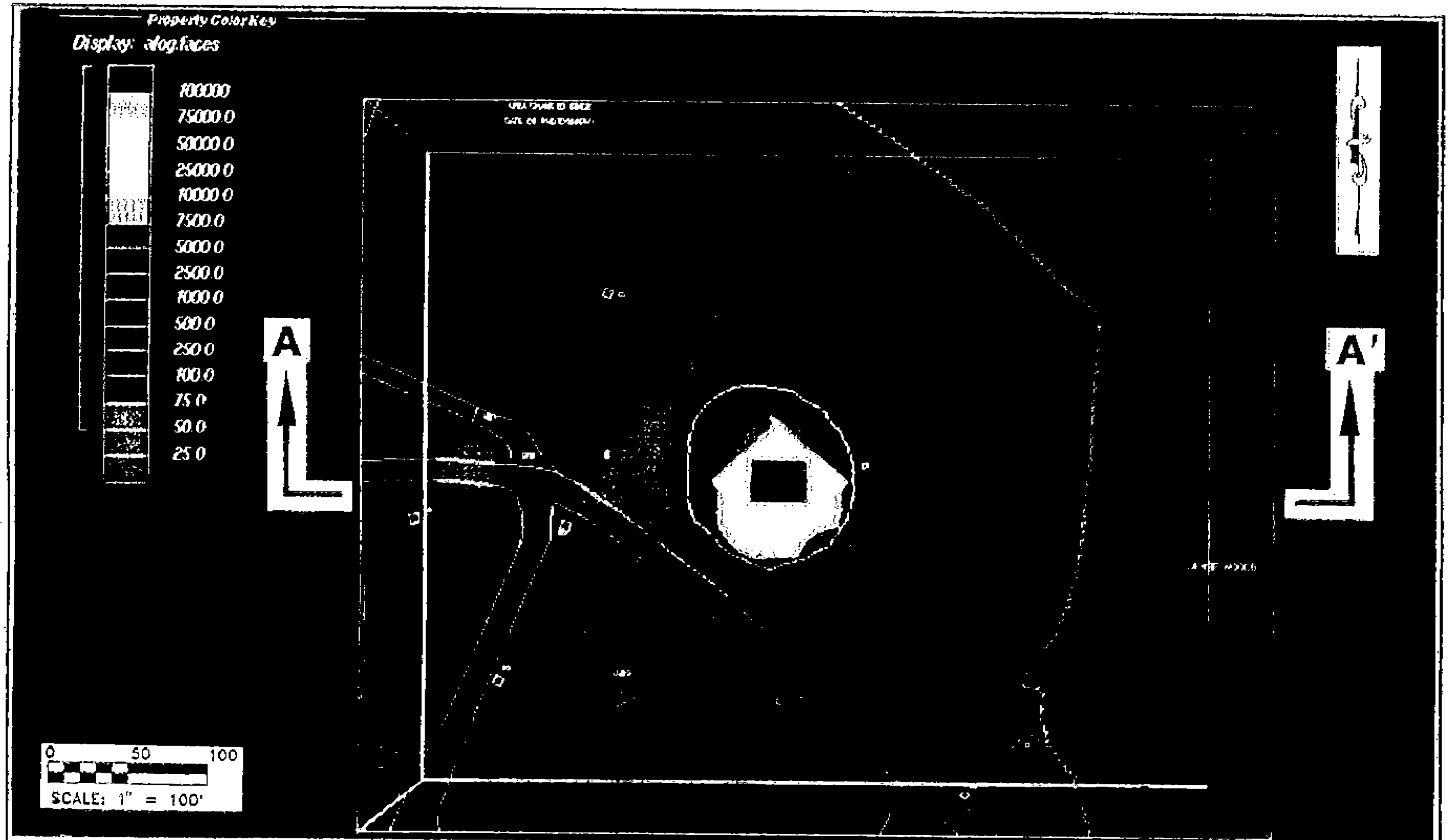
As shown in Figure 3-5, horizontal TPH distribution indicates an approximately circular zone of contamination with areas of highest concentrations in and around the center of the former fire-fighting training pit. Maximum TPH concentrations of 150,000 mg/kg were detected by field screening in samples from locations SB-17 and SB-15 near the center of the plume. TPH concentrations rapidly dissipate toward the edges of the pit. This plume of contamination extends vertically through the vadose zone to the groundwater interface.

Inorganics. Positive inorganic detections of the 10 samples submitted for laboratory analyses are summarized in Table 3-4. Of the 5 inorganics screened in the field, lead was detected at all 10 locations. Chromium ranged from 2.7 to 17.6 mg/kg, cadmium ranged from 1.2 to 7.2 mg/kg, and arsenic was detected from one sample at near background concentrations. There were no positive detections for nickel. The ranges of detected concentrations are shown on Table 3-4. Laboratory inorganic analytical results confirm the field screening data as discussed in Appendix B.

LNAPL Characterization. The results of LNAPL analyses are presented in Appendix C. Based on these results, the LNAPL present at PSC 2 is interpreted to be a petroleum product containing no PCBs or chlorides.

3.2.2 Domestic Waste Sludge Drying Beds (PSC 41)

Volatile Organic Compounds. Soil contamination by VOCs is not extensive at PSC 41. Acetone was the only VOC detected (at a concentration of 20 μg/kg) in one of the four soil samples submitted for TCL VOC analysis. Acetone is a common artifact of laboratory decontamination procedures.



Volume
92,000

NOTE: Volume in Cubic Feet

FIGURE 3-5
TPH ABOVE 50 mg/kg DETECTED
AT PSC 2, PLAN VIEW

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REPORT
FOR OU 2

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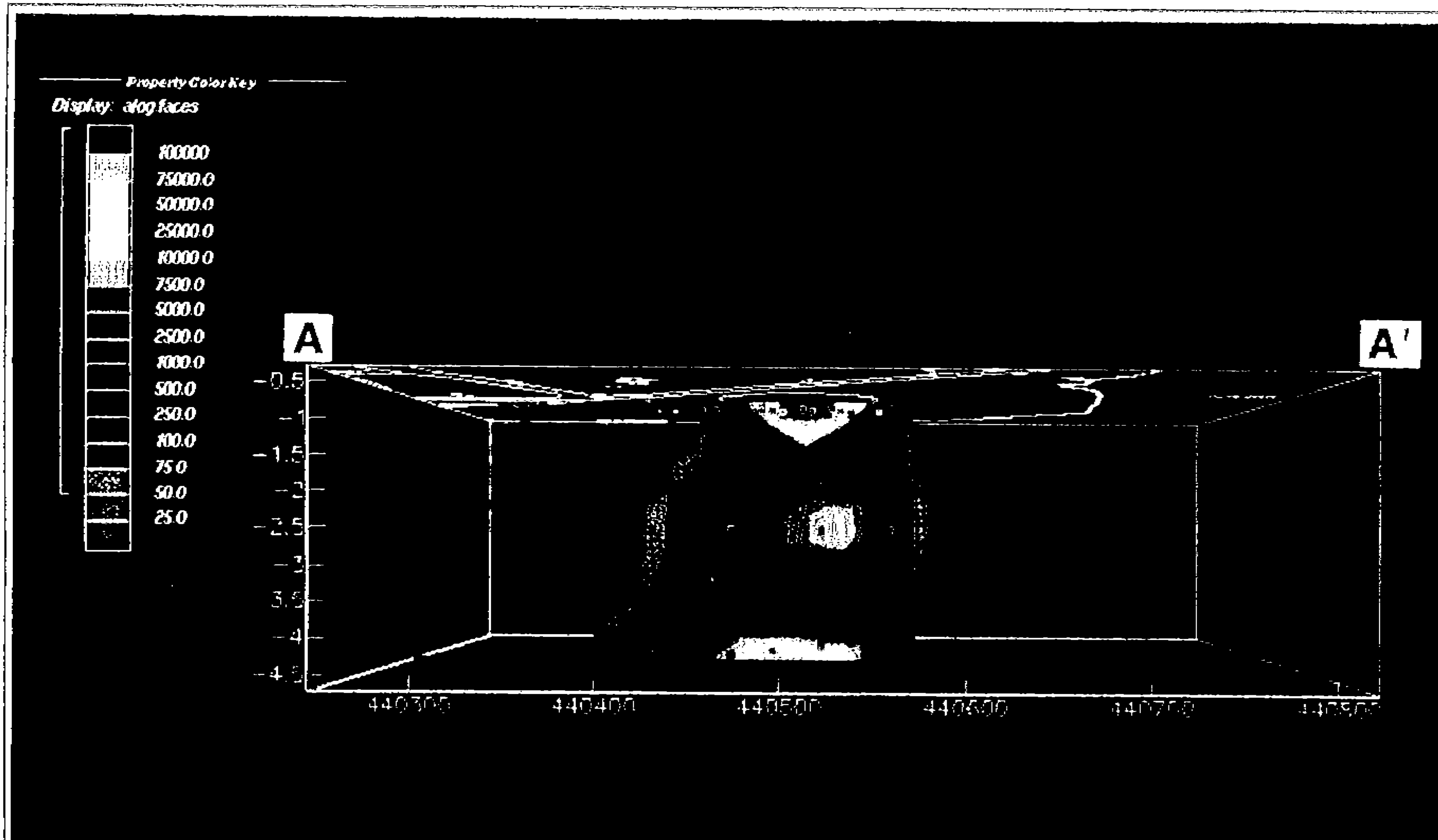
JACKSONVILLE, FLORIDA

7559-50 931216WEM



Volume
92,000

NOTE: Volume In Cubic Feet

FIGURE 3-6
TPH ABOVE 50 mg/kg DETECTED
AT PSC 2, CROSS SECTIONAL
VIEW

FOCUSED RI/FS
REPORT
FOR OU 2

NAS JACKSONVILLE,
JACKSONVILLE, FLORIDA

7559-50 931216WEM

The onsite screening data for purgeable VOCs (Appendix A) indicate low levels of VOC contamination in samples collected from greater than 2 feet bls. VOCs were not detected in any of the soil samples collected at the surface (0 to 1 foot bls). Trans-1,2-dichloroethene was detected at three locations greater than 2 feet bls (sample locations DDB-SB-24, DDB-SB-26, and DDB-SB-27). Xylenes were detected at location DDB-SB-05 (2.5 to 3.5 feet bls) and DDB-SB-09 (3.0 to 4.0 feet bls). Ethylbenzene was detected at location DDB-SB-05 (2.5 to 3.5 feet bls), and 1,1-dichloroethane at location DDB-SB-12 (3 to 4 feet bls).

TCLP Analyses. Results of TCLP extract analyses for soil and concrete block wall samples are presented in Table 3-6. The results were compared to the constituent concentrations in waste extract (CCWE) table 40 Code of Federal Regulations (CFR), Part 283.41 for evaluation of disposal options. Cadmium was the only constituent related to F006 and F019 wastes that exceeded the CCWE limits for land disposal.

Inorganics. Positive detections of inorganic analytes in nine soil samples submitted for laboratory analyses are summarized in Table 3-4. Twelve analytes were detected in soil samples from PSC 2, 17 at PSC 41, and 17 at PSC 43. Location DDB-SB-03 shows the highest concentrations of all detected inorganic analytes, except manganese. Of the five inorganics screened in the field, lead was detected in all nine samples with concentrations in the surface (0 to 1 foot bls) higher than in the subsurface. Arsenic, cadmium, nickel, and chromium were detected in five locations.

Field screening results for the five heavy metals (arsenic, cadmium, chromium, lead, and nickel) are presented in Appendix A along with graphical representation in Figures A-1 through A-5. Laboratory inorganic analytical results are in keeping with the field screening data as discussed in Appendix B. Figure A-1 shows the distribution of arsenic in the soil samples screened onsite. Thirty-six of 69 samples screened in the field showed detectable levels of arsenic, distributed as follows: 17 of 27 surface locations, 6 of 15 subsurface samples taken at 1 to 2.5 feet bls, and 13 of 27 subsurface samples taken at 3 to 4 bls. However, all but one (SB00301) of the detected samples ranged from 1/2 to 3 times background concentrations. Thirty-five of 69 samples screened in the field showed detectable levels of cadmium, most of which are in the subsurface (Figure A-2). Eleven of 15 samples taken between 1 to 2.5 feet and 22 of 27 samples taken between 3 to 4 feet had cadmium concentrations ranging from 4 to 134 mg/kg. In contrast, only one positive detection of cadmium is recorded in the 0 to 1-foot depth interval, indicating that cadmium has moved vertically downward. In contrast, chromium was detected in all 69 samples screened onsite with the highest concentrations found in the surface (Figure A-3). Concentrations of chromium ranged from 4.4 to 5.31 mg/kg. Lead concentrations were higher in the surface than in the subsurface depth intervals (Figure A-4). Lead was detected in 24 of 27 surface samples, 11 of 15 samples taken at the 1- to 2.5-foot depth interval, and 16 of 27 samples taken at the 3- to 4-foot depth interval. Concentrations of lead ranged from 2 to 252 mg/kg. However, only two surface locations (0 to 1 foot bls) were detected at levels above background (15.6 mg/kg). Nickel was detected in 22 of 27 surface samples, 12 of 15 soil samples taken at the 1- to 2.5-foot depth interval, and 14 of 27 samples taken at the 3- to 4-foot depth interval in a distribution pattern similar to arsenic (Figure A-5). Nickel concentrations ranged from 18.7 to 110 mg/kg with all of the sample concentrations above background values.

3.2.3 Industrial Waste Sludge Drying Beds (PSC 43)

Volatile Organic Compounds. As in PSC 41, soil contamination by VOCs is not extensive at PSC 43. Laboratory VOC analytical results (Table 3-1) show only one positive detection (acetone at a concentration of 44 $\mu g/kg$) out of seven samples submitted for TCL VOC analysis. As mentioned previously, this detectable concentration is probably attributable to laboratory decontamination artifacts. The onsite screening data for purgeable VOCs (Appendix A) also indicated low levels of VOC contamination. Xylenes and tetrachloroethene were detected at levels ranging from 1.9 to 27 micrograms per kilogram ($\mu g/kg$), but were all qualified blank or method spike cross contamination or recovery problems.

TCLP Analyses. Results of the TCLP extract analyses for four soil and two concrete wall samples taken from PSC 43 are presented in Table 3-6. Detectable levels of barium, cadmium, and chromium are present in the extract. These levels were compared to the CCWE table for evaluation of disposal options. However, none of the values exceeded the CCWE limits for land disposal.

Inorganics. Positive detections of inorganic analytes in five samples submitted for laboratory TAL inorganics analyses are summarized in Table 3-4. Of the five inorganics screened in the field, chromium (ranging from 4.8 to 47,700 mg/kg) and lead (ranging from 2.1 to 220 mg/kg) were detected in all five samples. Cadmium (ranging from 23 to 223 mg/kg) and nickel (ranging from 518 to 1110 mg/kg) were detected in three of five samples. Arsenic was detected in two of five samples.

Field screening results for the five heavy metals (arsenic, cadmium, chromium, lead, and nickel) are presented in Appendix A. Vertical contaminant distribution profiles within the four beds at PSC 43 are shown graphically in Figures A-6 through A-10. Although no arsenic contamination was detected in the upper 2-inch filter material layer, the highest concentrations of chromium, cadmium, lead, and nickel were detected in this thin surficial layer (concentrations ranging from 86 to 19,040 mg/kg). Also, chromium was detected in every sample from PSC 43 screened onsite.

4.0 FOCUSED RISK EVALUATION

The objective of the focused Risk Evaluation (FRE) for PSCs 2, 41, and 43 is to identify potential threats to human health and the environment associated with contamination in soil and filter media with the purpose of evaluating the need to perform interim remedial actions for source control.

Potential threats to human health are identified based on comparison of concentrations of site contaminants of concern detected in soils with Preliminary Remedial Goals (PRGs). PRGs for site contaminants of concern are established based on current USEPA guidance (USEPA, 1991a). Section 4.1 presents the FRE for human health.

Potential threats to the environment are identified for PSC 2 based on direct toxicity testing of surface soils. For PSCs 41 and 43, potential threats are discussed qualitatively. Section 4.2 presents the FRE for ecological receptors at PSCs 2, 41, and 43.

4.1 FOCUSED HUMAN HEALTH EVALUATION. The focused human health evaluation completed for PSCs 2, 41, and 43 at NAS Jacksonville follows relevant USEPA guidance for conducting risk assessments at CERCLA sites (USEPA, 1989a; 1991a) and USEPA Region IV guidance for CERCLA risk assessments (USEPA, 1991b; 1992a) as each applies to a focused effort intended to evaluate the need for potential interim remedial action.

The focused human health evaluation addresses potential exposure to soil at PSC 2 and filter media within the sludge drying beds at PSCs 41 and 43. The purpose of the focused evaluation is to assist in risk management recommendations and to identify immediate threats to human health. The evaluation is restricted to a brief tabular presentation of the contaminants of potential concern (CPC), toxicity information, and calculation of PRGs (USEPA, 1991a). The maximum detected concentrations of CPCs detected in soils from each of the PSCs are compared to the PRGs and FDEP Soil Target Levels (STLs) (FDEP, 1994) as a means to evaluate potential threat of the CPCs to human health. A complete assessment of potential risks associated with contamination at OU 2 will be performed at a later date.

Subsection 4.1.1 identifies the data and methods used to select CPCs and the resulting CPCs. The exposure evaluation and toxicity evaluation are described in Subsection 4.1.2 and Subsection 4.1.3, respectively. The information contained in these two subsections is used in the calculation of PRGs in Subsection 4.1.4. The PRGs are compared to maximum detected concentrations of CPCs in soils from each of the PSCs in Subsection 4.1.6. This comparison identifies the CPCs that may result in unacceptable risks for humans upon exposure.

4.1.1 Identification of Contaminants of Potential Concern (CPCs) This subsection describes the data used in the FRE, discusses the CPC selection process, and presents the result of the CPC selection process.

The results of the analyses of soil samples collected and analyzed by a CLP-certified laboratory are used as the primary data source for the human health evaluation (Tables 3-1 to 3-4). This data set meets USEPA Level 4 data quality requirements and is used as the source of information for the selection of CPCs and the determinations of the maximum concentration of each contaminant for comparison to PRGs.

Onsite Screening Data. Supplemental samples for metals and VOCs were screened onsite at OU 2. The samples meet USEPA Level 2 (screening data) data quality requirements. The metals data (for arsenic, cadmium, chromium, lead, and nickel) were used as supplemental data supporting the focused human health evaluation.

4.1.1.1 **Process for Selection of CPCs** Maximum detected concentrations of analytes in PSC 2 surface soil (0 to 1 foot bls) and surface (0 to 1 foot bls) and subsurface samples (0 to 5 feet bls) at PSC 41 and 43 were compared with NAS Jacksonville surface and subsurface soil background data collected in the vicinity of OU 1 (ABB-ES, 1992). The soil depth intervals were selected based on the exposure pathways necessary to determine recommended soil PRGs (USEPA, 1991a) (see Subsection 4.1.3.1). Analytes for which the maximum detected concentration of contaminants exceeded 2 times the arithmetic mean (with one-half the sample quantitation limit [SQL] averaged for non-detections) of background concentrations were retained as CPCs. Calcium, iron, and magnesium, which are considered essential nutrients, were excluded as CPCs for all PSCs evaluated.

4.1.1.2 **Summary of CPCs** Nine metals, 4 pesticides, 10 SVOCs, and 5 VOCs were identified as CPCs in PSC 2 surface soil. PSC 2 CPC selection is summarized in Appendix D-1. Fourteen metals and one VOC were selected as CPCs in both surface and subsurface soils at PSC 41. Fourteen metals and one VOC were selected as CPCs in both surface and subsurface soils at PSC 43. CPC selections are summarized in Appendix D-2 for PSC 2, Appendix D-3 for PSC 41, and Appendix D-4 and D-5 for PSC 43.

4.1.2 Exposure Evaluation This subsection identifies potential receptors and exposure pathways for soil and filter media at PSCs 2, 41, and 43.

Exposure pathways and scenarios for human receptors to soil contaminants at PSCs 2, 41, and 43 are presented in Table 4-1. A contaminant pathway model depicting potential transport of contamination from source to human receptors is presented on Figure 4-1. Based on available guidance for soil PRG calculations (USEPA, 1991a), two exposure scenarios were selected for potential exposure to soil: (1) residential and (2) commercial and industrial. Residents are assumed to be exposed to surface soil (0 to 1 foot bls) and commercial and industrial workers are assumed to be exposed to surface or subsurface soil (0 to 1 foot bls for PSC 2 and 0 to 5 feet bls for PSCs 41 and 43).

It is unlikely that the area composing PSCs 2, 41, and 43 would be associated with residential use in the future prior to a full RI/FS and final remedial action. Therefore, the PRGs based on the residential scenario for PSCs 2, 41, and 43 may be overly conservative. The residential PRGs will be used; however, the industrial PRGs are more realistic for the determination of potential risk at the PSCs for the interim remedial action.

4.1.3 Toxicity Evaluation This subsection reviews the toxicity information used to calculate the residential and industrial PRGs.

Table 4-1
Exposure Pathways and Scenarios

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Exposure Medium and Exposure Route	PSC 2 (Fire-fighting Training Area) Exposure Pathway		PSC 41 (Domestic Sludge Drying Beds) Exposure Pathways		PSC 43 (Industrial Sludge Drying Beds) Exposure Pathways	
	Commercial and Industrial Worker (adult)	Future Resident (adult and child)	Commercial and Industrial Worker (adult)	Future Resident (adult and child)	Commercial and Industrial Worker (adult)	Future Resident (adult and child)
Soil						
Incidental ingestion	X	X	X	X	X	X
Dermal contact	X	X	X	X	X	X
Air						
Inhalation (particles from soil)	X	NA	X	NA	X	NA
Inhalation (volatiles from soil)	X	NA	X	NA	X	NA

Note: NA = not applicable.

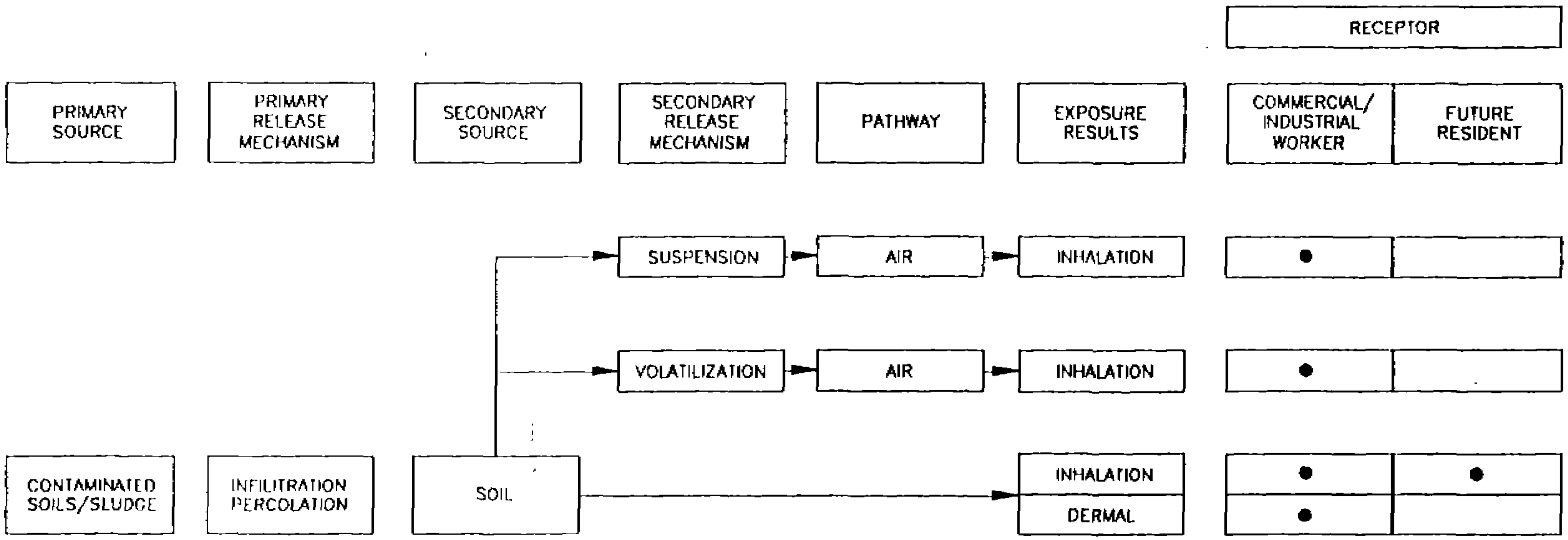


FIGURE 4-1
CONTAMINANT PATHWAY MODEL FOR PSCs 2, 41, AND 43

FOCUSED RI/FS REPORT FOR OU2

NAS JACKSONVILLE
JACKSONVILLE, FLORIDA

4.1.3.1 **Toxicity Information for Carcinogenic and Non-Carcinogenic Effects** Toxicity dose-response data in the form of reference doses (RfDs) for non-carcinogenic effects and slope factors for carcinogenic effects are presented in Appendix D. For the majority of CPCs, the toxicity data were obtained from the Integrated Risk Information System (IRIS) or Health Effects Assessment Summary Tables (HEAST).

4.1.3.2 **Toxicity Information for Which No U.S. Environmental Protection Agency (USEPA) Toxicity Values are Available** Toxicity information was not available for some contaminants. The Environmental Criteria Assessment Office (ECAO) was contacted for guidance in October 1993. General guidance included the use of oral RfD values as inhalation RfD values when inhalation RfD values were otherwise not available for use in industrial PRG calculations (see Appendix D). Guidance on specific CPCs included toxicity values for chromium, naphthalene, and 2-methylnaphthalene (see toxicity tables referenced in Subsection 4.1.4 for chemical specific ECAO guidance). USEPA Region IV was contacted by telephone and confirmed their acceptance of the ECAO guidance for the toxicity values to be used in this focused risk evaluation. In cases where toxicity values were not available in IRIS, HEAST, or from ECAO, the CPCs were not evaluated.

4.1.3.3 **Uncertainties Associated With Toxicity Evaluations** A general uncertainty exists with the use of all contaminant-specific toxicity values provided by ECAO. The toxicity values for naphthalene were used as surrogates for 2-methylnaphthalene because values were not available for 2-methylnaphthalene and an uncertainty exists with extrapolation of naphthalene toxicity values to 2-methylnaphthalene. The toxicity values for benzo(a)pyrene (BaP) were used as surrogate toxicity values for several other PAHs. Because BaP is generally regarded as the most potent PAH carcinogen, the use of BaP toxicity values for other PAHs represents an overly conservative approach. Where appropriate, the maximum concentration of each PAH was multiplied by the toxicity equivalence factor (TEF) to decrease the uncertainty of the use of the BaP toxicity information for the other, less potent PAHs detected at PSC 2 (USEPA, 1992a).

4.1.4 Preliminary Remedial Goals (PRGs) PRGs represent soil concentrations of CPCs that are not expected to pose an unacceptable risk to humans by the respective route of exposure. Comparison of PRG values to maximum detected concentrations of CPCs measured in soil and filter media at PSCs 2, 41, and 43 provides identification of CPCs that may pose an unacceptable risk. Residential and industrial PRGs were calculated for carcinogenic and non-carcinogenic effects (USEPA, 1991a) and are presented in Appendix D. The PRGs are based on a target cancer risk of 10^{-6} for carcinogens and a target hazard index of 1 for non-carcinogens. The exposure parameters used are the default values, which assume that a resident ingests 114 milligrams per kilogram of body weight per day (mg/kg-day) of soil, 350 days per year, for 30 years (non-carcinogens) or 70 years (carcinogens) and that an industrial or commercial worker inhales soil particulate and ingests 50 milligrams (mg) of soil per day, 250 days per year, for 25 years (USEPA, 1991a).

A PRG was not calculated for lead. A proposed soil cleanup standard for lead is available that recommends cleanup goals be set between 500 and 1,000 mg/kg (USEPA, 1989b). A concentration of 500 mg/kg of lead was used as the residential comparison value and 1,000 mg/kg of lead was used as the industrial PRG.

4.1.5 Risk Characterization CPCs in soil that may pose a potential risk to human health are identified in this subsection. The lesser of the calculated non-cancer and cancer PRGs are compared to maximum detected concentrations of each CPC. Also, the lesser of the published non-cancer and cancer FDEP STLs are compared to maximum detected concentrations of each CPC.

4.1.5.1 **PSC 2 PRG and State Target Level (STL) Comparison** The comparison of residential and industrial PRGs to the maximum detected concentration of CPCs in surface soil at PSC 2 is provided in Appendix D. The maximum detected concentrations of arsenic and BaP exceed their respective residential PRG values and maximum detected concentrations of arsenic, benzo(a)pyrene, and dieldrin exceed their respective residential STL values. Maximum detected concentrations of the CPCs in surface soil at PSC 2 did not exceed any respective industrial PRGs or the respective general worker FDEP STLs.

4.1.5.2 **PSC 41 PRG and STL Comparison** The comparison of residential and industrial PRGs and STLs to the maximum concentration of CPCs in soil and filter media at PSC 41 is provided in Appendix D. The maximum detected concentrations of arsenic and chromium exceed their respective residential PRGs and maximum detected concentrations of arsenic, chromium, and nickel exceed their respective residential STL values. Maximum detected concentrations of arsenic and chromium in soil and filter media exceeded their respective industrial PRGs. Maximum detected surface soil concentrations of arsenic, chromium, and nickel at PSC 2 exceed respective general worker FDEP STLs.

4.1.5.3 **PSC 43 PRG and STL Comparison** The comparison of residential and industrial PRGs and STLs to maximum concentrations of CPCs in surface soil and filter media at PSC 43 is provided in Appendix D. The maximum detected concentrations of arsenic, chromium, and lead exceed their respective residential PRGs and maximum detected concentrations of arsenic, chromium, copper, manganese, and nickel exceed their respective residential STL values. The maximum detected concentrations of chromium and lead exceed their respective industrial PRGs and maximum detected surface soil concentrations of chromium and nickel at PSC 2 exceed respective general worker FDEP STLs.

4.1.6 Summary. Table 4-2 summarizes the results of the PRG and STL comparisons to maximum detected concentrations of OU 2 CPCs. The comparison of maximum detected concentrations of CPCs in soil and filter media at PSCs 2, 41, and 43 to PRGs is not a quantitative estimate of the risks at each PSC. However, this qualitative approach adequately supports the objectives of the Focused RI/FS, which is to identify whether the CPCs in soil may pose an unacceptable risk for human health.

The results support implementation of interim remedial actions at PSCs 2, 41, and 43 as the maximum detected concentrations of some of the CPCs exceed either the respective residential or industrial PRGs. Exceedance of the PRG indicates that unacceptable risks for human health may be associated with exposure to the CPC.

Comparison of maximum detected concentrations of CPCs at PSCs 2, 41, and 43 to FDEP STLs was completed for this focused RI/FS. The FDEP STLs presented in Appendix D for the residential and industrial pathways are based on combined effects of ingestion, inhalation, and dermal contact. STLs were not specifically calculated for the exposure pathways present at OU 2 whereas PRGs were calculated based on site-specific factors. In certain cases, the FDEP STLs are also lower

Table 4-2
Comparison Result Summary for Residential and Industrial USEPA Preliminary Remedial Goals (PRGs)and Florida Soil Target Levels (STLs)

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Residential PRG Comparison Result Summary		
PSC 2	Exceedances of USEPA PRG Arsenic Benzo(a)pyrene	Exceedances of Florida STL Arsenic Dieldrin Benzo(a)pyrene
PSC 41	Exceedances of USEPA PRG Arsenic Chromium	Exceedances of Florida STL Arsenic Chromium Nickel
PSC 43	Exceedance of USEPA PRG Arsenic Chromium Lead	Exceedances of Florida STL Arsenic Chromium Copper Manganese Nickel
Industrial PRG Comparison Result Summary		
PSC 2	No exceedances of USEPA PRG	No Exceedances of Florida STL
PSC 41	Exceedance of USEPA PRG Arsenic Chromium	Exceedances of Florida STL Arsenic Chromium Nickel
PSC 43	Exceedance of USEPA PRG Chromium Lead	Exceedances of Florida STL Chromium Nickel

Notes: USEPA = U.S. Environmental Protection Agency.
PSC = potential source of contamination.

than the calculated background concentrations used for determining CPCs. Therefore, any interim remedial action for PSCs 2, 41, and 43 will be based on the comparison of CPCs to PRGs. FDEP STLs will be reconsidered during the risk assessment completed for the overall RI/FS for OU 2.

<u>4.2 FOCUSED ECOLOGICAL EVALUATION</u>. The purpose of the Focused Ecological Evaluation (FEE) is to qualitatively describe potential adverse effects to the environment associated with exposures to soil contaminants at PSCs 41, 43, and 2. The following subsections identify potential ecological receptors, potential routes of exposure for receptors, contaminants of concern in soil, and the ecotoxicity of the contaminants of concern. The potential risks for ecological receptors are described qualitatively in Subsection 4.2.4. The evaluation is intended only to identify if the media within the sludge drying beds (PSCs 41 and 43) or the surface soil at the fire-fighting training area (PSC 2) present a possible hazard to terrestrial wildlife. A residual Risk Assessment and Feasibility Study for OU 2 will be completed at a later date.

<u>4.2.1 Potential Ecological Receptors and Routes of Exposure</u> PSCs 41 and 43 are described in Subsections 2.2.2 and 2.2.3, respectively, and are abandoned sludge drying beds. PSC 2 is a former fire-fighting training area described in Subsection 2.2.1.

The domestic sludge drying beds (PSC 41) and industrial sludge drying beds (PSC 43) are concrete-walled square structures with gravel and sand bottoms that are surrounded by either concrete pavement or mowed grass. These areas offer limited habitat for terrestrial wildlife receptors (mammals, birds, or reptiles). The material within the drying beds may, however, be directly toxic to soil invertebrates or plants. Soil invertebrates may be exposed to contamination in soils via direct contact or ingestion; plants may be exposed by direct contact. Pine forests (planted pines) are present to the northeast and south (Figure 1-3) of the PSCs at a distance of approximately 100 to 250 feet with grassed areas in between. A dense scrub-shrub habitat is present to the east of PSC 41 at a distance of about 80 feet. These areas may offer habitat for wildlife. Wildlife inhabiting these areas may be transient visitors to the sludge drying beds where they could be exposed to contamination in soils by direct ingestion, dermal contact, or ingestion of contaminated food. Potential receptor species within the habitats surrounding the PSCs are listed in Appendix E.

PSC 2 is a former fire-fighting training area. Presently, the former burn area is void of vegetation and the surrounding area to the east and north consists of planted pine forests. PSCs 41 and 43 are to the southeast. Wildlife from the pine plantations may attempt to forage within the burn area and could be exposed to contamination by direct contact, direct ingestion, or ingestion of contaminated food. Soil dwelling invertebrates may be exposed by direct contact or direct ingestion. Terrestrial plants may be exposed by direct contact with soils (Table 4-3).

<u>4.2.2 Selection of CPCs</u> The CPCs for the ecological evaluation are selected based on comparison of the maximum detected concentrations with average background concentrations within NAS Jacksonville. The CPCs selected are the same as those selected for the human health evaluation for soils 0 to 1 foot bls at PSCs 2, 41, and 43 (see Appendix D for tables of CPCs).

Table 4-3
Potential Exposure Pathways for Ecological Receptors,
PSCs 2, 41, and 43

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Receptor	Direct Contact	Ingestion of Soils	Ingestion of Contaminated Food	Dermal Contact
Soil Invertebrates	PSC 2 PSC 41 PSC 43	PSC 2 PSC 41 PSC 43		
Plants	PSC 2 PSC 41 PSC 43			
Birds	PSC 2 PSC 41 PSC 43	PSC 2 PSC 41 PSC 43	PSC 2 PSC 41 PSC 43	PSC 2 PSC 41 PSC 43
Mammals	PSC 2 PSC 41 PSC 43	PSC 2 PSC 41 PSC 43	PSC 2 PSC 41 PSC 43	PSC 2 PSC 41 PSC 43
Reptiles	PSC 2 PSC 41 PSC 43	PSC 2 PSC 41 PSC 43	PSC 2 PSC 41 PSC 43	PSC 2 PSC 41 PSC 43

Note: PSC = potential source of contamination.

4.2.3 Ecotoxicity Evaluation Several heavy metals including chromium, nickel, lead, and zinc were detected at maximum concentrations over 1,000 mg/kg in material from the industrial drying beds (Table 3-4). Cadmium, copper, and silver were measured at maximum concentrations of more than 400 mg/kg. All of these heavy metals are potentially toxic to ecological receptors. A brief discussion of the potential toxicity of the heavy metal CPCs to terrestrial wildlife is provided in Appendix E. There are no listed State or Federal standards for concentrations of contaminants in soils that are protective of the environment.

The organisms most likely to be exposed to soil contamination at PSC 2 are soil dwelling invertebrates and plants. Imminent hazard for these organisms is assumed to be adverse effects on survival or reproduction. To determine the direct toxicity of contaminated soil at PSC 2 to soil invertebrates, toxicity testing with the earthworm, *Eisenia foetida*, was completed. The methods and results of the testing completed are described in Appendix E. Toxicity testing with earthworms provides a measure of the direct toxicity of the mixture of contaminants in soil to a soil dwelling organism. The response of the worms will be used to evaluate the necessary extent of soil removal.

A surface soil sample for the earthworm bioassay was collected from the most contaminated area (SB-17; Figure 3-1) based upon the onsite screening data. This soil sample was diluted with artificial soil at ratios of 1, 3, 10, 30, and 100 percent of test soil to control soil (by weight). The dilution was intended to provide a gradient of exposure concentrations that could be used to establish a dose-response relationship between the response of the earthworms and TPH. The results of the test are summarized in Table 4-4.

Linear interpolation was used to calculate the 7- and 14-day 50 percent lethal concentrations (LC50). The 7-day LC50 of this test soil was 54.8 percent (21,889 mg/kg TPH) with 95 percent confidence limits of 30 percent and 100 percent (11,300 and 42,400 mg/kg TPH). The 14-day LC50 of the test soils was 50.5 percent (19,999 mg/kg TPH) with 95 percent confidence limits of 30 percent and 100 percent (11,300 and 42,400 mg/kg TPH). The no-observed-effect concentration (NOEC) based upon a lack of mortality was 1 percent (533 mg/kg TPH). At the 1 percent exposure concentration, an adverse effect to reproduction was noted as a lack of cocoon formation. This effect was not observed in the control. Therefore, a NOEC for adverse effects to reproduction could be interpreted to be between 53 and 533 mg/kg TPH.

4.2.4 Ecological Risk Characterization Ecological risks associated with soil contamination are dependent upon the receptor species and exposure pathways. To determine quantitative concentrations of contaminants in soil that are protective of adverse effects to terrestrial wildlife, it is necessary to complete quantitative risk analyses for the most likely ecological receptors and exposure pathways. For PSCs 41 and 43, a quantitative determination of ecological risk and acceptable concentrations of CPCs in soil and filter media is unnecessary as the volume of material to be removed within the sludge drying beds will be determined by the closure requirements under RCRA. A qualitative appraisal of the metal content of the material within the drying beds suggests that it presents a possible hazard (Appendix E). Thus, the evaluation for ecological risk supports the implementation of an interim remedial action at PSCs 41 and 43.

Table 4-4
Results of Soil Toxicity Test at PSC 2

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Nominal Concentration (percent)	Cumulative Number Dead (percent mortality)[1]		Measured TPH Concentration (mg/kg)
Control	0 (0)	[2]0 (0)	53
1	0 (0)	0 (0)	533
3	1 (2.5)	1 (2.5)	1,035
10	0 (0)	[3]1 (2.5)	3,700
30	[4]0 (0)	[3,4]2 (5)	11,300
100	40 (100)	40 (100)	42,400

Source: From Toxikon, 1993, Appendix D.

[1] There were 40 earthworms exposed at each test treatment. The numbers represent the cumulative mortality for all replicates.
[2] One earthworm was observed to be lethargic in the C replicate.
[3] Earthworms trying to flee soil.
[4] Earthworms clumping together.

Notes: PSC = potential source of contamination.
TPH = total petroleum hydrocarbon.
mg/kg = milligrams per kilogram.

Based on the results of toxicity testing of surface soil from PSC 2, an interim remedial action at PSC 2 is necessary for the protection of ecological receptors (soil dwelling invertebrates). The testing results indicate that soil at PSC 2 with a TPH concentration greater than 533 mg/kg is lethal to earthworms. A concentration of TPH in soil at PSC 2 associated with no adverse effects to the earthworms is between 53 and 533 mg/kg. A conservative soil action level for an interim remedial action for the protection of soil infauna to direct toxic effects would be 53 mg/kg TPH.

5.0 IDENTIFICATION OF REMEDIAL ACTION OBJECTIVES (RAOs)

This chapter presents RAOs for source control at OU 2. The RAOs will provide the basis for selecting appropriate remedial technologies and developing remedial alternatives for PSCs 2, 41, and 43 within OU 2.

Section 5.1 presents summaries of location-, chemical-, and action-specific ARARs that were considered prior to defining the RAOs. Section 5.2 presents RAO considerations for source control at PSCs 2, 41, and 43. Section 5.3 presents the volumes of contaminated media of concern at each PSC.

5.1 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs). ARARs are Federal and State human health and environmental requirements used to: (1) evaluate the appropriate extent of site cleanup, (2) scope and formulate remedial action alternatives, and (3) control the implementation and operation of a selected remedial action. CERCLA and the NCP require that remedial actions comply with State ARARs that are: more stringent than Federal ARARs, legally enforceable, and consistently enforced statewide.

CERCLA, SARA, and the NCP require that ARARs be identified during the development of remedial alternatives. ARARs are used to determine the appropriate extent of site cleanup, identify sensitive land areas or land uses, develop remedial action alternatives, and direct site remediation. ARARs for PSCs 2, 41, and 43 are identified in this section. Potential ARARs in each category (i.e., location, chemical, and action specific) are described in detail in the handbook of ARARs for Navy sites within the State of Florida (ABB-ES, 1993).

5.1.1 Definition of ARARs The NCP defines two ARAR components: (1) applicable requirements, and (2) relevant and appropriate requirements.

> Applicable requirements are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under Federal or State environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, or other circumstance found at a CERCLA site. Only those State standards that are: (1) identified by the State in a timely manner, (2) consistently enforced, and (3) more stringent than Federal requirements, may be applicable.
>
> Relevant and appropriate requirements are those cleanup standards, standards of control, and other substantive requirements under Federal and State environmental and facility siting laws that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site. Only those State standards that are identified in a timely manner and are more stringent than Federal requirements may be relevant and appropriate.
>
> Other requirements to be considered are Federal and State nonpromulgated advisories or guidance that are not legally binding and do not have the status of potential ARARs. However, if there are no specific ARARs for a

chemical or site condition, or if ARARs are not deemed sufficiently protective, then guidance or advisory criteria should be identified and used for protection of human health and the environment.

Under the description of ARARs set forth in the NCP and SARA, State and Federal ARARs are categorized as location-specific, chemical-specific, and action-specific, and are discussed in the following paragraphs.

5.1.2 Location-Specific ARARs Location-specific ARARs govern natural site features (e.g., wetlands, floodplains, wilderness areas, and endangered species) and manmade features (e.g., places of historical or archeological significance). These ARARs place restrictions on concentrations of hazardous substances or the activities that can be conducted based solely on the site's particular characteristics or location.

Based on a review of OU 2 site features, the site features regulated by location-specific ARARs are floodplains and sensitive ecosystems. Table 5-1 presents the location-specific ARARs for OU 2.

5.1.3 Chemical-Specific ARARs Chemical-specific requirements are usually health- or risk-based standards that limit the concentration of a chemical found in or discharged to the environment. They govern the extent of site remediation by providing either actual cleanup levels or the basis for calculating such levels. Table 5-2 presents the chemical-specific ARARs for OU 2.

5.1.4 Action-Specific ARARs Action-specific ARARs are technology- or activity-based limitations controlling activities for remedial actions. Action-specific ARARs generally set performance or design standards, controls, or restrictions on particular types of activities. To develop technically feasible alternatives, applicable performance or design standards must be considered during the detailed analysis of remedial alternatives.

Certain action-specific ARARs include permit requirements; however, under CERCLA Section 121(e), permits are not required for remedial actions conducted entirely onsite at CERCLA sites. This permit exemption applies to all administrative requirements, including approval of or consultation with administrative bodies, documentation, recordkeeping, and enforcement. However, the substantive requirements of these ARARs must be attained.

Table 5-3 summarizes potential action-specific ARARs for PSCs 2, 41, and 43. Each alternative identified for the PSCs will be analyzed in Chapter 7.0 to evaluate compliance with action-specific ARARs.

5.2 REMEDIAL ACTION OBJECTIVES (RAOs). This section identifies and discusses the RAOs for source control and closure at OU 2. RAOs are media-specific goals established to protect human health and the environment. Response objectives are identified to protect human health and the environment, and are based on the CPCs, exposure route(s), and receptor(s). ARARs that establish cleanup standards are also used to develop response objectives. Following the development of RAOs, volumes of contaminated media are presented.

Table 5-1
Synopsis of Federal and State Location-Specific ARARs for OU 2

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Federal or State Standards and Requirements	Requirements Synopsis	Consideration in the Remedial Response Process
Endangered Species Act [50 CFR, Part 402]	This act requires action to avoid jeopardizing the continued existence of listed endangered or threatened species or modification of their habitat.	Investigation and/or remediation that may impact a rare species or habitat (e.g., gopher tortoise), requires notification to the agency and minimization of the adverse effects to such endangered species due to remedial activities.
Floodplain Management Executive Order No. 11968 [40 CFR, Part 6]	Requires Federal agencies to evaluate the potential effects of adverse impacts to floodplains associated with direct and indirect development of a floodplain.	Alternatives that involve modification or construction within a floodplain may not be selected unless a determination is made that no practicable alternative exists. If no practicable alternative exists, potential harm must be minimized and action taken to restore and preserve the natural and beneficial values of the floodplain.
RCRA, General Facility Standards [40 CFR, Subpart B, 264.10-264.18]	Section 264.18 establishes that a facility located in a 100-year floodplain must be designed, constructed, and maintained to prevent washout of any hazardous wastes by a 100-year flood.	May be relevant and appropriate if a treatment facility is established onsite for remediation of wastes from the domestic and industrial sludge drying beds.
National Environmental Policy Act (NEPA) [40 CFR, Part 6]	Requires an Environmental Impact Statement or a "functional equivalent" for Federal actions that may impact the human environment. Also requires that Federal agencies minimize the degradation, loss, or destruction of wetlands, and preserve and enhance natural and beneficial values of wetlands and floodplains under Executive Orders 11990 and 11988.	During the feasibility study process, identification and evaluation of alternatives involving excavation, transport, or backfilling, in or adjacent to a floodplain should address the alternative's impact on the floodplain as it relates to NEPA. According to the Federal Emergency Management Agency, floodplains are present at Operable Unit 2 at Naval Air Station Jacksonville.

Notes: ARARs = applicable or relevant and appropriate requirements.
CFR = Code of Federal Regulations.
RCRA = Resource Conservation and Recovery Act.

Table 5-2
Synopsis of Potential Federal and State Chemical-Specific ARARs

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Federal or State Standards and Requirements	Requirements Synopsis	Consideration in the Remedial Response Process
Occupational Safety and Health Act (OSHA), Occupational Health and Safety Regulations [29 CFR, Part 1910, Subpart Z]	Establishes permissible exposure limits for workplace exposure to a specific listing of chemicals.	Standards are applicable for worker exposure to OSHA hazardous chemicals during remedial activities.
Resource Conservation and Recovery Act (RCRA), Identification and Listing of Hazardous Waste [40 CFR, Part 261]	Defines those solid wastes subject to regulation as hazardous wastes under 40 CFR Parts 262-265.	These requirements define RCRA-regulated wastes, thereby delineating acceptable management approaches for listed and characteristically hazardous wastes that should be incorporated into the remedial response for the domestic and industrial sludge drying beds.

Notes: ARARs = applicable or relevant and appropriate requirements.
CFR = Code of Federal Regulations.

Table 5-3
Synopsis of Potential Federal and State Action-Specific ARARs

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Federal or State Standards and Requirements	Requirements Synopsis	Consideration in the Remedial Response Process
CAA, National Ambient Air Quality Standards (NAAQS) [40 CFR, Part 50]	Establishes primary (health-based) and secondary (welfare-based) standards for air quality for carbon monoxide, lead, nitrogen dioxide, particulate matter, ozone, and sulfur oxides.	Site remedial activities must comply with NAAQS. The most relevant pollutant standard is for particulate matter less than 10 microns in size (PM_{10}) as defined in 40 CFR, Section 50.6. The PM_{10} standard is based on the detrimental effects of particulate matter to the lungs of humans. The PM_{10} standard for a 24-hour period is 150 micrograms per cubic meter ($\mu g/m^3$) of air, not to be exceeded more than once a year. Remedial construction activities such as excavation will need to include controls to ensure compliance with the PM_{10} standard. The attainment and maintenance of primary and secondary NAAQS are required to protect human health and welfare (wildlife, climate, recreation, transportation, and economic values). These standards are applicable during remedial activities, such as soil excavation, that may result in exposure to hazardous chemicals through dust and vapors.
CAA, New Source Performance Standards (NSPS) [40 CFR, Part 60]	This regulation establishes new source performance standards (NSPS) for specified sources, including incinerators. This rule establishes a particulate emission standard of 0.08 grains per dry standard cubic foot corrected to 12 percent carbon dioxide for sources.	Because NSPS are source-specific requirements, they are not generally considered applicable to CERCLA cleanup actions. However, an NSPS may be applicable for an incinerator; or may be a relevant and appropriate requirement if the pollutant emitted and the technology employed during the cleanup action are sufficiently similar to the pollutant and source category regulated.
RCRA, Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal (TSD) Facilities [40 CFR, Part 264]	This rule establishes minimum national standards that define the acceptable management of hazardous wastes for owners and operators of facilities that treat, store, or dispose of hazardous wastes.	Remedial alternatives for PSC 43 that involve the management of RCRA wastes at an offsite treatment, storage, or disposal unit would need to meet the substantive requirements of this rule.
RCRA, Use and Management of Containers [40 CFR, Part 264, Subpart I]	Sets standards for the storage of containers of hazardous waste.	This rule would be an ARAR for remedial alternatives for PSCs 41 and 43 that involve the storage of containers of RCRA hazardous waste onsite. The staging of study-generated RCRA wastes should meet the intent of this regulation. These requirements are relevant and appropriate for containerized wastes at CERCLA sites.
RCRA, Incinerators [40 CFR, Subpart O, 264.340-264.599]	This regulation specifies the performance standards, operating requirements and monitoring, inspection, and closure guidelines for any incinerator that manages hazardous waste.	These requirements are applicable for remedial actions involving the offsite incineration of RCRA-regulated wastes.

See notes at end of table.

Table 5-3 (Continued)
Synopsis of Potential Federal and State Action-Specific ARARs

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Federal or State Standards and Requirements	Requirements Synopsis	Consideration in the Remedial Response Process
Chapter 17-775, FAC, Florida Soil Thermal Facilities Regulations	This rule establishes criteria for the thermal treatment of petroleum- or petroleum-product-contaminated soil. Guidelines for management and treatment of soil to levels that prevent future contamination of other soil, groundwater, and surface water are provided. Chapter 17-775.300, FAC, provides permitting requirements for soil thermal treatment facilities. This section states that soil must be screened or otherwise processed to prevent soil particles greater than 2 inches in diameter from entering the thermal treatment unit. This rule further outlines procedures for excavating, receiving, handling, and stockpiling contaminated soil prior to thermal treatment in both stationary and mobile facilities.	This requirement is not applicable to soil classified as hazardous. However, it may be a relevant and appropriate requirement for soil contaminated with constituents that are significantly similar to the organic and inorganic constituents regulated under this rule.
RCRA, Manifest System, Recordkeeping, and Reporting [40 CFR, Part 264, Subpart E]	This rule outlines procedures for manifesting hazardous waste for owners and operators of onsite and offsite facilities that treat, store, or dispose of hazardous waste.	These regulations apply if a remedial alternative involves the offsite treatment, storage, or disposal of hazardous waste, as for PSCs 41 and 43.
Hazardous Materials Transportation Act (49 CFR, Parts 171, 173, 178, and 179) and Hazardous Materials Transportation Regulations	These regulations outline procedures for the packaging, labeling, manifesting, and transporting of hazardous materials.	For remedial actions involving offsite disposal, hazardous materials would need to be packaged, manifested, and transported to a licensed offsite disposal facility in compliance with these regulations.
RCRA, Standards Applicable to Transporters of Hazardous Waste [40 CFR, Part 263 Subparts A - C, 263.10-263.31]	This rule establishes procedures for transporters of hazardous waste within the United States if the transportation requires a manifest under 40 CFR, Part 262.	If a remedial alternative involves offsite transportation of hazardous waste for treatment and/or disposal, these requirements must be attained.
RCRA, Standards Applicable to Generators of Hazardous Waste [40 CFR, Part 262, Subparts A - D, 262.10-262.44]	These rules establish standards for generators of hazardous wastes that address: accumulating waste, preparing hazardous waste for shipment, and preparing the uniform hazardous waste manifest. These requirements are integrated with U.S. Department of Transportation (USDOT) regulations.	If an alternative involves the offsite transportation of hazardous wastes, the material must be shipped in proper containers that are accurately marked and labeled, and the transporter must display proper placards. These rules specify that all hazardous waste shipments must be accompanied by an appropriate manifest.
RCRA, Hazardous Waste Management System [40 CFR, Part 260]	This rule sets forth procedures that the USEPA will use to make information available to the public and sets forth rules that TSD facilities must follow to assert claims of business confidentiality with respect to information submitted to the USEPA pursuant to 40 CFR, Parts 261-265.	Although this regulation does not stipulate substantive cleanup requirements, it details confidentially procedures for offsite TSD facilities.

See notes at end of table.

Table 5-3 (Continued)
Synopsis of Potential Federal and State Action-Specific ARARs

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Federal or State Standards and Requirements	Requirements Synopsis	Consideration in the Remedial Response Process
RCRA, Identification and Listing of Hazardous Waste [40 CFR, Part 261, 261.1-261.33]	This rule defines those solid wastes that are subject to regulation as hazardous wastes under 40 CFR, Parts 262-265. The applicability of RCRA regulations to wastes found at a site is dependent on the solid waste meeting one of the following criteria: (1) the wastes are generated through a RCRA-listed source process, (2) the wastes are RCRA-listed wastes from a non-specific source, or (3) the waste is characteristically hazardous due to ignitability, corrositivity, reactivity, or toxicity.	Soil and filter media excavated from PSCs 41 and 43 are RCRA-listed wastes. All soil and containers will be managed in accordance with this regulation.
RCRA, Land Disposal Restrictions (LDRs) for Newly Listed Wastes and Hazardous Debris [40 CFR, Parts 148, 260, 261, 262, 264, 265, 270, and 271]	This rule sets forth five options for management of hazardous debris: (1) treat the debris to performance standards established in this rule through one of 17 approved technologies, (2) obtain a ruling from USEPA that the debris no longer contains hazardous debris, (3) treat the debris using a technology approved through an "equivalent technology demonstration," (4) treat the debris to existing LDR standards for wastes contaminating the debris and continue to manage under RCRA Subtitle C, or (5) dispose of debris in an RCRA Subtitle C landfill under the generic extension of the capacity variance for hazardous debris, which expired on May 8, 1994.	Debris at Operable Unit 2 (i.e., filter media) would be classified as hazardous debris if it is contaminated with RCRA-listed waste that has LDR standards or with waste that exhibits a toxic characteristic. Under CERCLA, removal of contaminants from debris by decontamination and replacing the debris within an Area of Concern (AOC) is permitted. As long as movement of waste is conducted within the AOC and outside of a separate RCRA unit, placement of wastes has not occurred and, therefore, LDRs are not triggered. However, if the debris is determined to be hazardous, and placement is determined to occur, the debris would be treated to existing LDR standards for wastes contaminating the debris and managed under RCRA Subtitle C.
RCRA, LDRs [40 CFR, Part 268]	This rule establishes restrictions for the land disposal of untreated hazardous wastes and provides treatment standards for these land-banned wastes. Under this rule, treatment standards have been established for most listed hazardous wastes.	Treated and untreated waste at OU 2 will need to meet these requirements prior to disposal in a regulated landfill.
RCRA, Corrective Action Management Units; Corrective Action Provisions Under Subtitle C [40 CFR, Parts 260, 264, 265, 268, 270, and 271]	This rule establishes corrective action management units (CAMU) and temporary units (TU) as two options for corrective actions at permitted RCRA facilities.	The substantive requirements of this rule are potential ARARs at OU 2 because hazardous wastes would be stored onsite for any remedial alternatives at PSCs 41, and 43.
RCRA, Contingency Plan and Emergency Procedures [40 CFR, Subpart D, 264.30-264.37]	This regulation outlines the requirements for procedures to be followed in the event of an emergency such as an explosion, fire, or other emergency event.	These requirements are relevant and appropriate for remedial actions involving the management of hazardous waste.

See notes at end of table.

Table 5-3 (Continued)
Synopsis of Potential Federal and State Action-Specific ARARs

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Federal or State Standards and Requirements	Requirements Synopsis	Consideration in the Remedial Response Process
Occupational Safety and Health Act (OSHA), General Industry Standards [29 CFR, Part 1910]	This act requires establishment of programs to assure worker health and safety at hazardous waste sites, including employee training requirements.	Under 40 CFR, Part 300.38, requirements apply to all response activities under the NCP. During remedial action at the site, these regulations must be maintained.
OSHA, Recordkeeping, Reporting, and Related Regulations [29 CFR, Part 1904]	Provides recordkeeping and reporting requirements applicable to remedial activities.	These requirements apply to all site contractors and subcontractors and must be followed during all site work. During remedial action at the site, these regulations must be maintained.
OSHA, Health and Safety Standards [29 CFR, Part 1926]	Specifies the type of safety training, equipment, and procedures to be used during site investigation and remediation.	All phases of the remedial response project should be executed in compliance with this regulation. During remedial action at the site, these regulations must be maintained.
RCRA, General Facility Standards [40 CFR, Subpart B, 264.10-264.18]	Sets the general facility requirements including general waste analyses, security measures, inspections, and training requirements.	Because the remedial action planned for OU 2 involves the management of RCRA wastes at an offsite TSD facility, these requirements are applicable.
RCRA, Preparedness and Prevention [40 CFR, Part 264, Subpart C]	This regulation outlines requirements for safety equipment and spill control for hazardous waste facilities. Facilities must be designed, maintained, constructed, and operated to minimize the possibility of an unplanned release that could threaten human health or the environment.	Safety and communication equipment should be incorporated into all aspects of the remedial process and local authorities should be familiarized with site operations.
Chapter 17-4, FAC, Florida Rules on Permits, May 1991	Establishes procedures for obtaining permits for sources of pollution.	The substantive permitting requirements of this rule must be met during the remedial action at OU 2.
Chapter 17-736, FAC, Florida Rules on Hazardous Waste Warning Signs, July 1991	Requires warning signs at National Priority List and FDEP (formerly FDER) identified hazardous waste sites to inform the public of the presence of potentially harmful conditions.	Because Naval Air Station Jacksonville is currently listed on the NPL, this requirement is applicable.
Chapter 17-730, FAC, Florida Hazardous Waste Rules, August 1990	Adopts by reference appropriate sections of 40 CFR and established minor additions to these regulations concerning the generation, storage, treatment, transportation, and disposal of hazardous waste.	The substantive permitting requirements for hazardous waste must be met where applicable for CERCLA remedial actions. Actions at RCRA permitted units (PSCs 41 and 43) are subject to substantive requirements.
Chapter 17-770, FAC, Florida Petroleum Contaminated Site Cleanup Criteria, February 1990	Establishes a cleanup process to be followed at all petroleum contaminated sites	Relevant and appropriate requirement for petroleum contaminated sites (PSC 2).

See notes at end of table.

Table 5-3 (Continued)
Synopsis of Potential Federal and State Action-Specific ARARs

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Federal or State Standards and Requirements	Requirements Synopsis	Consideration in the Remedial Response Process
Chapter 17-775, FAC, Florida Soil Thermal Treatment	Establishes criteria for the thermal treatment of petroleum- or petroleum-product-contaminated soil. The rule further outlines procedures for excavating, receiving, handling, and stockpiling contaminated soil prior to thermal treatment in both stationary and mobile facilities.	Relevant and appropriate requirement for remediation of petroleum contaminated sites (PSC 2).
RCRA, Solid Waste Land Disposal Requirements [40 CFR, Part 258]	This rule sets forth requirements for disposal of waste within a solid waste landfill. It sets forth construction and monitoring requirements of Subtitle D landfills.	This rule stipulates that no free liquids, no hazardous wastes, and no reactive wastes may be deposited within a Subtitle D landfill.

Notes: ARARs = applicable or relevant and appropriate requirements.
CAA = Clean Air Act.
CFR = Code of Federal Regulations.
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act.
RCRA = Resource Conservation and Recovery Act.
PSC = potential source of contamination.
FAC = Florida Administrative Code.
USEPA = U.S. Environmental Protection Agency.
NCP = National Oil and Hazardous Substances Contingency Plan.
FDEP = Florida Department of Environmental Protection.
FDER = Florida Department of Environmental Regulation.

Although this report does not address possible groundwater contamination at OU 2, the RAOs identified for source control are anticipated to be consistent with future groundwater remedies to mitigate releases of hazardous substances from site soil to groundwater. Upon completion of the RI at OU 2, the need for remedial action to address groundwater contamination will be evaluated. This Focused FS report addresses source control actions only.

As discussed in Chapter 4.0, PSCs 41 and 43 were grouped together for this study because of their physical proximity and their similar construction, past operation, and CPCs.

The RAOs for source control at PSC 2, the former fire-fighting training area, are discussed in Subsection 5.2.1. RAOs for PSCs 41 and 43, the domestic and industrial sludge drying beds, respectively, are discussed in Subsection 5.2.2.

<u>5.2.1 RAOs for PSC 2</u> Data gathered during the Focused RI indicate that there is LNAPL and associated petroleum-hydrocarbon contamination in the soil at PSC 2 due to past fire-fighting training activities. As indicated in Section 4.2, petroleum-hydrocarbon contamination is posing a risk to ecological receptors. Also, soil and LNAPL contamination are acting as sources of groundwater contamination at the site. Therefore, the following remedial action objectives are proposed for PSC 2 site soil:

- remove free-phase LNAPL from the subsurface soil at PSC 2 to the extent practicable in accordance with Chapter 17-770.300, Florida Administrative Code (FAC); and

- reduce petroleum contamination in the vadose zone soils (approximately 0 to 5 feet bls) at PSC 2 in accordance with Chapters 17-770 and 17-775, FAC, to: (1) reduce a source of contamination to groundwater, and (2) reduce current and future exposure to soil contaminants by humans and ecological receptors.

These objectives would be accomplished at PSC 2 by incorporating remedial technologies involving removal, treatment, and/or disposal of contaminated media at PSC 2. The estimated volumes of contaminated soil and LNAPL to be addressed during remedial action at PSC 2 are presented in Subsections 5.3.1 and 5.3.2.

<u>5.2.2 RAOs for PSCs 41 and 43</u> Data gathered during the Focused RI field investigation indicate that elevated levels of inorganic CPCs are present in the soil and filter media at both the domestic and industrial sludge drying beds. The following remedial action objective is proposed for soil and filter media at PSCs 41 and 43:

- complete closure under RCRA to: (1) reduce source contaminants to groundwater, and (2) reduce current and future exposure to human and wildlife ecological receptors.

This objective would be accomplished at PSCs 41 and 43 by incorporating remedial technologies involving removal, treatment, and/or disposal of contaminated media. The estimated volumes of contaminated soil, filter media, and debris to be addressed during remedial actions at PSCs 41 and 43 are presented in Subsections 5.3.3 and 5.3.4.

5.3 IDENTIFICATION OF VOLUME OF MEDIA OF CONCERN. The volume and types of contaminated media at OU 2 guide alternative development, screening, and analysis. Defining quantities of contaminated media requires consideration of site-specific conditions, soil action levels set forth by ARARs and the risk evaluation, and engineering judgment.

The volumes of contaminated media at PSC 2 are presented in Subsections 5.3.1 and 5.3.2; volumes estimated for PSCs 41 and 43 are presented in Subsections 5.3.3 and 5.3.4.

5.3.1 Contaminated Soil at PSC 2 The estimated volume of contaminated soil at PSC 2 was based on cleanup levels of TPH concentrations greater than 50 mg/kg in accordance with Chapter 17-775, FAC. Figures 3-5 and 3-6 present a depiction of TPH contamination at 50 mg/kg and greater at PSC 2. Based on this depiction, a volume of approximately 92,000 cubic feet (3,400 cubic yards [yd^3]) of TPH contaminated soil was estimated for OU 2.

5.3.2 Light Nonaqueous-Phase Liquid (LNAPL) at PSC 2 As previously discussed in Chapter 3.0, LNAPL was observed in two temporary observation wells installed during the Focused RI. TPZ-5, which is located at the approximate center of the fire-fighting training pit, contained 1.09 feet of free-phase LNAPL. TPZ-4, located on the eastern edge of the pit, contained 0.07 foot of LNAPL. No baildown tests were completed to measure the encountered thickness of LNAPL in the strata at PSC 2; however, based on a literature review, the LNAPL thickness was estimated to be one-fourth of the thickness measured at TPZ-5 (See Appendix F, page F-3, for references.).

An area of the most highly contaminated soil (20,000 mg/kg TPH and above at multiple depths) was approximated based on field observations. The volume of potentially recoverable LNAPL was then calculated to be 1,600 gallons based on the estimated area, estimated thickness, and soil porosity values. Calculations to support this estimate are provided in Appendix F.

5.3.3 Contaminated Filter Media at PSCs 41 and 43 Filter media present at the sludge drying beds include native soil (at the domestic sludge drying beds only), filter sand, medium-sized gravel (nominal diameter of 0.75 inch), and coarse gravel (nominal diameter of 1.5 inches). The volume of each medium was estimated based on the lengths and widths of the drying beds and on record drawings of cross sections of the beds that show the as-built thicknesses of each medium. It is estimated that 1,620 yd^3 of native soil, 320 yd^3 of filter sand, 130 yd^3 of medium-sized gravel, and 380 yd^3 of coarse gravel are contaminated. Calculations to support these estimates are provided in Appendix F.

5.3.4 Contaminated Debris at PSCs 41 and 43 Debris present at the sludge drying beds includes concrete and cinder block. Much of the debris present is above grade and assumed to be nonhazardous. However, the concrete footings of the walls surrounding the domestic and industrial sludge drying beds would require management as hazardous wastes due to contact with the sludge from the industrial process. It is estimated that 114 tons of debris would require management as hazardous waste and that 274 tons would require management as solid waste. Volume and weight estimates were based on dimensions shown on record drawings. Calculations to support this volume are provided in Appendix F.

6.0 DEVELOPMENT OF REMEDIAL ALTERNATIVES

The purpose of this chapter is to identify and screen appropriate source control technologies (Section 6.1) for assembly into remedial alternatives that address contamination at PSCs 2, 41, and 43 (Section 6.2).

The development of remedial alternatives for CERCLA sites consists of identifying applicable technologies and developing those technologies into alternatives. SARA emphasizes the use of treatment technologies that reduce toxicity, mobility, or volume as a principal element rather than alternatives that prevent exposure. The NCP requires a range of alternatives be presented to the maximum practicable extent. This range includes alternatives from the following categories:

- removal,
- treatment, and
- disposal.

These technologies are consistent with source control.

6.1 IDENTIFICATION AND SCREENING OF REMEDIAL TECHNOLOGIES.

Source control technologies for PSCs 2, 41, and 43 were identified based on a review of current literature, vendor information, and experience in developing remedial alternatives for similar sites with similar contaminants. Technologies were also identified based on site- and waste-specific characteristics.

Once technologies are identified and developed, the screening process reduces the number of potentially applicable technologies by evaluating the advantages and disadvantages of each with respect to cost, effectiveness, and implementability.

As previously discussed, the purpose of this Focused FS is to address petroleum-contaminated soil at PSC 2 under Chapters 17-770 and 17-775, FAC, and contaminated filter media within the sludge drying beds at PSCs 41 and 43 for compliance with closure requirements. The need for addressing other contaminated media that may be present at OU 2 (i.e., additional contaminated soil at PSCs 41 and 43 and groundwater at the site) will be evaluated in the overall FS for OU 2. Because this report is focused in nature, remedial actions and technologies consistent with removal, treatment, and disposal of soil, debris, and filter media were emphasized in the screening process. Technologies deemed ineffective or inconsistent with the Focused FS approach were eliminated from further consideration.

Tables 6-1 and 6-2 present the technology identification and screening for PSC 2 and PSCs 41 and 43, respectively. The technologies remaining after screening are assembled into remedial alternatives in Section 6.2.

6.2 IDENTIFICATION AND DEVELOPMENT OF REMEDIAL ALTERNATIVES.

Remedial technologies that passed the technology screening phase were assembled into alternatives that meet the RAOs discussed in Section 5.2. A limited number of alternatives were developed for this Focused FS because of the focused nature of the study.

Table 6-1
Identification and Screening of Remedial Action Technologies for PSC 2

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Technology	Description of Technology	Advantages	Disadvantages	Status
In situ Treatment				
Soil Vapor Extraction	A vacuum is applied to wells or French drains at the site to extract vapor containing VOCs from the void space in the in situ soil. The vapor is recovered at the land surface and either treated or released to the atmosphere.	· Technology would be easy to construct due to flat terrain at PSC 2. · Shallow water table and sandy soil present at PSC 2 are amenable to this type of treatment.	· LNAPL would not be addressed by this technology. · Concentrations of contaminants may be too high for this treatment technology. · Not a reliable technology for remediation of high molecular weight semivolatile compounds present at PSC 2. · Vacuum extraction points may interfere with future investigations and remedial actions at PSC 2. · Installation and O&M costs may be excessive.	Eliminated. LNAPL and semivolatile compound contamination would not be adequately addressed.
Bioventing	A nutrient source is combined with the in situ soil to support the growth of microorganisms that can degrade organic contaminants.	· Spacious, flat terrain is available for implementation of this technology. · Sandy soil present at PSC 2 is amenable to this type of treatment. · Technology is effective for destruction of light-molecular weight compounds present at PSC 2. · Technology eliminates removal, transportation, and disposal costs for soil.	· Contaminant concentrations may be high enough to be toxic to microorganisms. · Technology is not as effective for remediation of high molecular weight compounds that are present at PSC 2. · Several years may be required for complete treatment of contaminated soil. · Bioventing points may interfere with future investigations and remedial actions at PSC 2. · O&M costs would be high due to long treatment timeframe.	Eliminated. Effectiveness of technology for remediation of high molecular weight compounds is questionable and remedial timeframe is too long.

See notes at end of table.

Table 6-1 (Continued)
Identification and Screening of Remedial Action Technologies for PSC 2

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Technology	Description of Technology	Advantages	Disadvantages	Status
Excavation and *Ex situ* Treatment				
Low Temperature Thermal Treatment	Soil is excavated and treated in a low-temperature thermal treatment unit that volatilizes organic contaminants and destroys them in a secondary combustion chamber or condenses them into a liquid stream.	· Treatment can be performed onsite or offsite. · Thermal treatment is a proven technology for removal of VOCs from soil. · Space is available for laydown of mobile treatment equipment onsite. · Sandy soil present at PSC 2 is amenable to this type of treatment. · Treated soil may be redeposited onsite, eliminating transportation and disposal costs.	· Technology is not as effective for removal of SVOCs from soil. · Capital and O&M costs may be high. · Volume of soil to be treated may not be high enough to make onsite treatment cost effective. · Substantive requirements of RCRA permits for onsite treatment would need to be met.	Retained. Both onsite and offsite thermal treatment options will be evaluated.
Incineration	Soil is excavated and treated in a direct-fired incinerator unit. Incineration temperature is high enough to destroy organic contaminants in soil. An ash byproduct is produced.	· Treatment can be performed onsite or offsite. · Incineration is a proven technology for removal of organic contaminants from soil. · Space is available for laydown of mobile treatment equipment onsite. · Sandy soil present at PSC 2 is amenable to this type of treatment.	· If soil is treated offsite, transportation and treatment costs are high. · If soil is treated onsite, capital and O&M costs are high. · Substantive requirements of RCRA permits for onsite treatment would need to be met. · Technology is poorly perceived by the public. · Ash byproduct would require appropriate management.	Eliminated. Costs are excessive and technology is not well perceived by the public.

See notes at end of table.

Table 6-1 (Continued)
Identification and Screening of Remedial Action Technologies for PSC 2

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Technology	Description of Technology	Advantages	Disadvantages	Status
Bioremediation (Landfarming)	Excavated soil is combined with a fertilizer and nutrient source to support the growth of microorganisms that can degrade organic contaminants. The mixture is placed in piles that are periodically overturned or otherwise aerated to control temperature; other adjustments to soil conditions may also be necessary to achieve optimum conditions to accelerate degradation.	· Space is available onsite for implementation of this technology. · Standard, readily available farm equipment can be used to treat soil. · Onsite bioremediation eliminates the need for offsite transportation and disposal of contaminated soil. · Treatment is effective for light molecular weight organic compounds present at PSC 2.	· Several years may be required for complete treatment of contaminated soil. · Addition of fertilizer and a nutrient source to the soil increases the overall volume of contaminated media at PSC 2. · Air emissions (gas and particulates) from compost piles would need to be controlled. · Technology is not as effective for high molecular weight organic contaminants present at PSC 2.	Eliminated. Remedial timeframe is too long.
Onsite Backfilling of Treated Soil	Treated soil is redeposited and compacted in place in excavated areas at PSC 2.	· Eliminates offsite transportation and disposal costs for soil. · Long-term liability associated with landfilled wastes is eliminated.	· Soil would require rehydration before backfilling. · Additional clean backfill may still be required if soil volume is reduced significantly during treatment.	Retained for further analysis. Can be used in combination with onsite treatment technologies for contaminated soil.
Offsite Treatment and Disposal of Soil	Soil is placed in an engineered, permitted offsite secure landfill for ultimate disposal.	· Mobility of soil contaminants would be reduced because soil would be treated prior to disposal, and landfills are designed to control leaching and runoff. · Relatively little mobilization effort required compared to onsite treatment and disposal scenarios. · Experienced transportation and disposal vendors are available locally.	· Transportation, treatment, and disposal costs are high. · Long-term liability is associated with offsite landfilling of wastes.	Retained. Can be used in combination with treatment technologies.

Notes: VOC = volatile organic compound.
PSC = potential source of contamination.
LNAPL = light nonaqueous-phase liquid.
O&M = operation and maintenance.
SVOC = semivolatile organic compound.
RCRA = Resource Conservation and Recovery Act.

Table 6-2
Identification and Screening of Remedial Action Technologies for PSCs 41 and 43

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Technology	Description of Technology	Advantages	Disadvantages	Screening Status
Containment				
Soil Cover	A layer of uncontaminated native soil is placed over the contaminated filter media within the sludge drying beds to minimize direct contact and ingestion hazards associated with contaminated filter media.	· Would reduce potential exposure to filter media contaminants. · Capital costs are relatively low. · Vegetative cover would reduce water infiltration, which is a mechanism to transport filter media contaminants into groundwater at PSCs 41 and 43.	· Closure requirements may not be met. · Thickness of cover may not be sufficient to minimize risks to ecological receptors posed by filter media contaminants.	Eliminated. Not consistent with closure requirements, would not accomplish a source removal, and ecological risks may not be adequately addressed by this technology.
Capping	A low permeability cover (e.g., clay and soil, asphalt, or clay and synthetic membrane covered with soil) is constructed over the sludge drying beds to provide a barrier to water infiltration and to prevent direct contact exposure.	· Would eliminate direct contact exposure to filter media contaminants. · Water infiltration would be reduced, which is a mechanism for transport of filter media contaminants into groundwater.	· Construction of cap limits future land use for PSCs 41 and 43. • An RCRA cap would be difficult and expensive to construct in this area.	Eliminated. Future land use is restricted by this containment technology and not economically feasible to implement.
In situ Treatment				
Stabilization	In situ soil is injected with a setting agent (e.g., cement, fly ash, and lime) to produce a hardened, solidified mass in which filter media contaminants become entrapped.	· Stabilization is a reliable technology for remediation of inorganic contamination within filter media. · In situ treatment eliminates offsite transportation and disposal costs for contaminated filter media.	· Shallow water table and subsurface debris within filter media may cause interference with or reversibility of treatment. · Surface debris would still require removal to lay out the site for implementation of the alternative. · Effective diameter of filter media particles varies, which may interfere with In situ treatment.	Eliminated. Effectiveness of technology with respect to existing site conditions is questionable.

See notes at end of table.

Table 6-2 (Continued)
Identification and Screening of Remedial Action Technologies for PSCs 41 and 43

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Technology	Description of Technology	Advantages	Disadvantages	Screening Status
Excavation and Ex situ Treatment				
Stabilization	Soil is excavated and mixed with a setting agent (e.g., cement, fly ash, and lime) to produce a stabilized product in which filter media contaminants become entrapped.	· Stabilization is a proven technology for remediation of inorganic contaminants. · Stabilized product would be suitable backfill material, eliminating offsite transportation and disposal costs for treated filter media. · Space is available onsite for laydown of stabilization equipment.	· Volume of contaminated media is increased by 20 to 30 percent because of the addition of setting agents. · Use of this technology may require separation of subsurface debris from finer filter media, which could be labor intensive. · Relatively small size of site may not make this technology cost effective for onsite treatment.	Retained for further analysis. Technology may be implemented onsite or offsite.
Vitrification	Excavated soil is melted at high temperatures using a plasma arc torch; the end product after cooling is a vitrified mass in which inorganic contaminants are entrapped. Combustion products and particulates are collected for offgas treatment.	· Inorganic contaminants present at PSCs 41 and 43 would be adequately addressed by this technology.	· Capital costs are high and power requirements are large. · Technology may not be cost effective because of the relatively small volume of filter media requiring treatment.	Eliminated. Costs are excessive.

See notes at end of table.

Table 6-2 (Continued)
Identification and Screening of Remedial Action Technologies for PSCs 41 and 43

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Technology	Description of Technology	Advantages	Disadvantages	Screening Status
Soil Washing	Excavated soil is screened and combined with water and/or chemicals (e.g. surfactants, solvents, acids, bases, and chelants) to produce a slurry. The slurry is fed to a multi-stage washing circuit that enhances physical and chemical separation of contaminants from the filter media matrix. Treated filter media and a concentrated liquid effluent are produced following the washing process.	· Treatment process can be designed specifically for filter media contaminants present at PSCs 41 and 43. · Space is available for laydown of equipment onsite.	· Capital and O&M costs would be high. · Technology may not be cost effective due to relatively small volume of contaminated filter media to be treated. · Treatment process design and implementation would be complex. · Would require treatability study to demonstrate the efficacy of treatment. · Treated filter media may require dewatering, which is time consuming and costly. · Aqueous or concentrated liquid waste streams would require appropriate management.	Eliminated. Costs are excessive and cost effectiveness is questionable.
Abrasive Blasting of Contaminated Debris	Contaminated debris would be excavated and treated via abrasive blasting with clean sand.	· Technology would reduce toxicity of debris. · Abrasive blasting would treat both porous and nonporous debris to performance standards. · Abrasive blasting equipment is generally available.	· Abrasive blasting would generate contaminated solid residuals requiring appropriate management. · Depending on the quantity of debris to be treated, it may be more cost effective to manage debris under RCRA Subtitle C without treatment. · Treatment requires separation of debris from finer filter media, which could be labor intensive.	Eliminated. Preliminary cost calculations show that it is more cost effective to manage debris under RCRA Subtitle C rather than to treat it to performance standards via this technology and subsequently manage under RCRA Subtitle D.

See notes at end of table.

Table 6-2 (Continued)
Identification and Screening of Remedial Action Technologies for PSCs 41 and 43

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Technology	Description of Technology	Advantages	Disadvantages	Screening Status
Disposal				
Onsite Backfilling	Treated filter media are backfilled within the excavated areas at PSCs 41 and 43.	· Eliminates offsite transportation and disposal costs for soil. · Long-term liability associated with landfilled wastes is eliminated.	· Treated filter media may need to be supplemented with clean backfill to achieve similar engineering properties as remaining in situ soil.	Retained for further analysis.
Offsite Disposal (RCRA Subtitle C)	Filter media and debris are placed in an offsite RCRA-permitted Subtitle C facility for disposal.	· Mobility of soil contaminants would be reduced because landfills are designed to control leaching and runoff. · Relatively little mobilization effort required compared to onsite treatment and disposal scenarios. · Experienced transportation and disposal vendors are available locally. · ARARs for filter media and untreated hazardous debris disposal would be met.	· Transportation and disposal costs are high. · Long-term liability is associated with offsite landfilling of wastes.	Retained. Could be used alone or in combination with other technologies. Waste generated by remedial activities at PSCs 41 and 43 would meet disposal requirements of an RCRA Subtitle C disposal facility.
Offsite Disposal (RCRA Subtitle D)	Filter media and debris are placed in an offsite RCRA-permitted Subtitle D facility for disposal.	· Mobility of soil contaminants would be reduced because landfills are designed to control leaching and runoff. · Relatively little mobilization effort required compared to onsite treatment and disposal scenarios. · Experienced transportation and disposal vendors are available locally. · ARARs for disposal of nonhazardous debris would be met.	· Transportation and disposal costs are high. · Long-term liability is associated with offsite landfilling of wastes. · ARARs for some of the untreated filter media and untreated hazardous debris disposal may not be met.	Retained. May be the most cost-effective option for disposal of nonhazardous debris and other solid wastes generated by remedial activities at PSCs 41 and 43 that meets disposal requirements for offsite disposal in an RCRA Subtitle D landfill.

Notes: PSC = potential source of contamination.
RI/FS = Remedial Investigation and Feasibility Study.
O&M = operation and maintenance.
RCRA = Resource Conservation and Recovery Act.
ARAR = applicable or relevant and appropriate requirement.

Based on the applicable technologies identified in the preceding section, two remedial alternatives were developed for PSC 2 (Table 6-3) and three were developed for PSCs 41 and 43 (Table 6-4). As previously discussed, a no-action alternative was not developed because it is inconsistent with the goals of source control and closure of this Focused FS report. The developed alternatives for PSC 2 and PSCs 41 and 43 are described on Tables 6-5 and 6-6, respectively. All developed alternatives were carried over into the detailed analysis (Chapter 7.0).

Table 6-3
Identification of Remedial Alternatives for PSC 2

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Alternative	Passive LNAPL Recovery	Excavation	Onsite Thermal Treatment of Soil	Offsite Thermal Treatment of Soil	Onsite Redeposition of Soil	Offsite Disposal of LNAPL	Offsite Disposal of Soil
1	X	X		X		X	X
2	X	X	X		X	X	

Notes: PSC = potential source of contamination.
RI/FS = Remedial Investigation and Feasibility Study.
LNAPL = light nonaqueous-phase liquid.

Table 6-4
Identification of Remedial Alternatives for PSCs 41 and 43

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Alternative	Excavation	Onsite Stabilization of Filter Media and Hazardous Debris	Offsite Stabilization of Filter Media and Hazardous Debris	Onsite Redeposition of Treated Media	Offsite Disposal of Filter Media	Offsite Disposal of Hazardous and Nonhazardous Debris
3	X				X	X
4	X		X		X	X
5	X	X		X		X

Notes: PSC = potential source of contamination.
RI/FS = Remedial Investigation and Feasibility Study.

Table 6-5
Development of Remedial Alternatives for PSC 2

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Alternative	Description of Key Components
Alternative 1: Passive LNAPL recovery and excavation, offsite thermal treatment of contaminated soil, and offsite disposal of treated soil and recovered LNAPL	Site clearing and layout for implementation of the alternative. Excavation of an interceptor trench for passive LNAPL recovery. Excavation of contaminated soil. Sampling and analyses of soil within open excavations to demonstrate efficacy of contaminant removal. Transportation of soil to an offsite thermal treatment facility. Offsite transportation and disposal of recovered LNAPL. Demobilization and site restoration.
Alternative 2: Passive LNAPL recovery and excavation, onsite thermal treatment of contaminated soil, onsite redeposition of treated soil, and offsite disposal of recovered LNAPL	Site clearing and layout for implementation of the alternative. Mobilization of onsite thermal treatment unit. Excavation of an interceptor trench for passive LNAPL recovery. Excavation and onsite thermal treatment of contaminated soil. Sampling and analysis of soil within open excavations to demonstrate efficacy of contaminant removal. Sampling and analysis of treated soil to demonstrate efficacy of thermal treatment. Onsite redeposition and backfilling of treated soil. Offsite transportation and disposal of recovered LNAPL. Demobilization and site restoration.

Notes: PSC = potential source of contamination.
RI/FS = Remedial Investigation and Feasibility Study.
LNAPL = light nonaqueous-phase liquid.

Table 6-6
Development of Remedial Alternatives for PSCs 41 and 43

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Alternative	Description of Key Components
Alternative 3: Excavation and offsite disposal of contaminated filter media and hazardous and nonhazardous debris	Site clearing and layout for implementation of the alternative. Removal of surface (i.e., nonhazardous) debris from sludge drying beds and immediate surrounding areas. Excavation of contaminated filter media and subsurface (i.e., hazardous) debris from sludge drying beds. Sampling and analysis of soil within open excavations to demonstrate contaminant removal. Sampling and analysis of excavated filter media to make a final determination of the need for treatment prior to disposal. Transportation and offsite disposal of contaminated filter media, and hazardous and nonhazardous debris (if analysis of excavated soil shows that treatment is not necessary). Demobilization and site restoration.
Alternative 4: Excavation, offsite treatment of contaminated filter media, and offsite disposal of treated filter media and hazardous and nonhazardous debris	Site clearing and layout for implementation of the alternative. Removal of surface (i.e., nonhazardous) debris from sludge drying beds and immediate surrounding areas. Excavation of contaminated filter media and subsurface (i.e., hazardous) debris from sludge drying beds. Sampling and analysis of filter media within open excavations to demonstrate efficacy of contaminant removal. Sampling and analysis of excavated filter media to make a final determination of the need for treatment prior to disposal. Transportation and offsite treatment and disposal of filter media and hazardous debris (if analysis of excavated soil shows that treatment is necessary). Transportation and offsite disposal of nonhazardous debris. Demobilization and site restoration.
Alternative 5: Excavation, onsite treatment of contaminated filter media, onsite redeposition of treated filter media, and offsite disposal of hazardous and nonhazardous debris	Site clearing and layout for implementation of the alternative. Mobilization of onsite stabilization equipment. Removal of surface (i.e., nonhazardous) debris from sludge drying beds and immediate surrounding areas. Excavation of contaminated filter media and subsurface (i.e., hazardous) debris from sludge drying beds. Onsite treatment of filter media and hazardous debris via stabilization. Sampling and analysis of filter media within open excavations to demonstrate contaminant removal. Sampling and analysis of treated media to demonstrate stabilization. Onsite redeposition and backfill of stabilized media. Transportation and offsite disposal of nonhazardous debris. Demobilization and site restoration.

Notes: PSC = potential source of contamination. RI/FS = Remedial Investigation and Feasibility Study.

7.0 DETAILED ANALYSES OF ALTERNATIVES

The remedial alternatives for addressing contamination at PSCs 2, 41, and 43 are described in detail in this chapter.

They are then examined with respect to the requirements stipulated in CERCLA, and factors described in the *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA* (USEPA, 1988). The nine technical criteria from the guidance document are:

- overall protection of human health and the environment;
- compliance with ARARs;
- long-term effectiveness and permanence;
- reduction of mobility, toxicity, or volume;
- short-term effectiveness;
- implementability;
- cost;
- State acceptance; and
- community acceptance.

Typically, the State acceptance criterion is not addressed until comments on the RI/FS have been received from the State. Similarly, community acceptance is addressed upon receipt of public comments on the Proposed Plan (USEPA, 1988). The responsiveness summary and the IROD will address the eighth and ninth criteria. This Focused FS uses the first seven criteria in the alternatives evaluation process.

CERCLA Section 121(c) requires that any site where a remedial action that results in hazardous substances, pollutants, or contaminants remaining onsite is implemented must be reviewed at least every 5 years. This requirement will be addressed during the overall FS for OU 2 at NAS Jacksonville.

Following the detailed analysis of each technology comprising the alternatives, the information was summarized for each alternative. This summary, presented in Chapter 8.0, enables comparative analyses of the remedial alternatives.

Section 7.1 presents the detailed analyses of alternatives developed for PSC 2. Section 7.2 presents the detailed analyses of the alternatives developed for PSCs 41 and 43.

7.1 DETAILED ANALYSES FOR PSC 2. As described in Chapter 6.0, two remedial alternatives were identified and developed for PSC 2, the Former Fire-fighting Training Area. The alternatives listed below are discussed in the following subsections.

- **Alternative 1:** Passive LNAPL recovery and excavation, offsite thermal treatment of contaminated soil, and offsite disposal of treated soil and recovered LNAPL.

- **Alternative 2:** Passive LNAPL recovery and excavation, onsite thermal treatment of contaminated soil, onsite reposition of treated soil, and offsite disposal of recovered LNAPL.

7.1.1 Alternative 1: Passive LNAPL Recovery and Excavation, Offsite Thermal Treatment of Contaminated Soil, and Offsite Disposal of Treated Soil and Recovered LNAPL

7.1.1.1 Description This alternative would consist of excavating an interceptor trench for passive LNAPL recovery. Once LNAPL was recovered, then excavation of contaminated soil would follow. Soil would be transported to an offsite, low-temperature thermal treatment facility and would be disposed after treatment. Recovered LNAPL would be transported to an offsite permitted facility for disposal.

A process flow diagram for this alternative is provided on Figure 7-1. A proposed site layout for this alternative is depicted on Figure 7-2. Major activities associated with this alternative include:

- site preparation and passive LNAPL recovery,
- excavation of contaminated soil,
- offsite treatment and disposal of contaminated soil
- offsite disposal of recovered LNAPL, and
- site restoration.

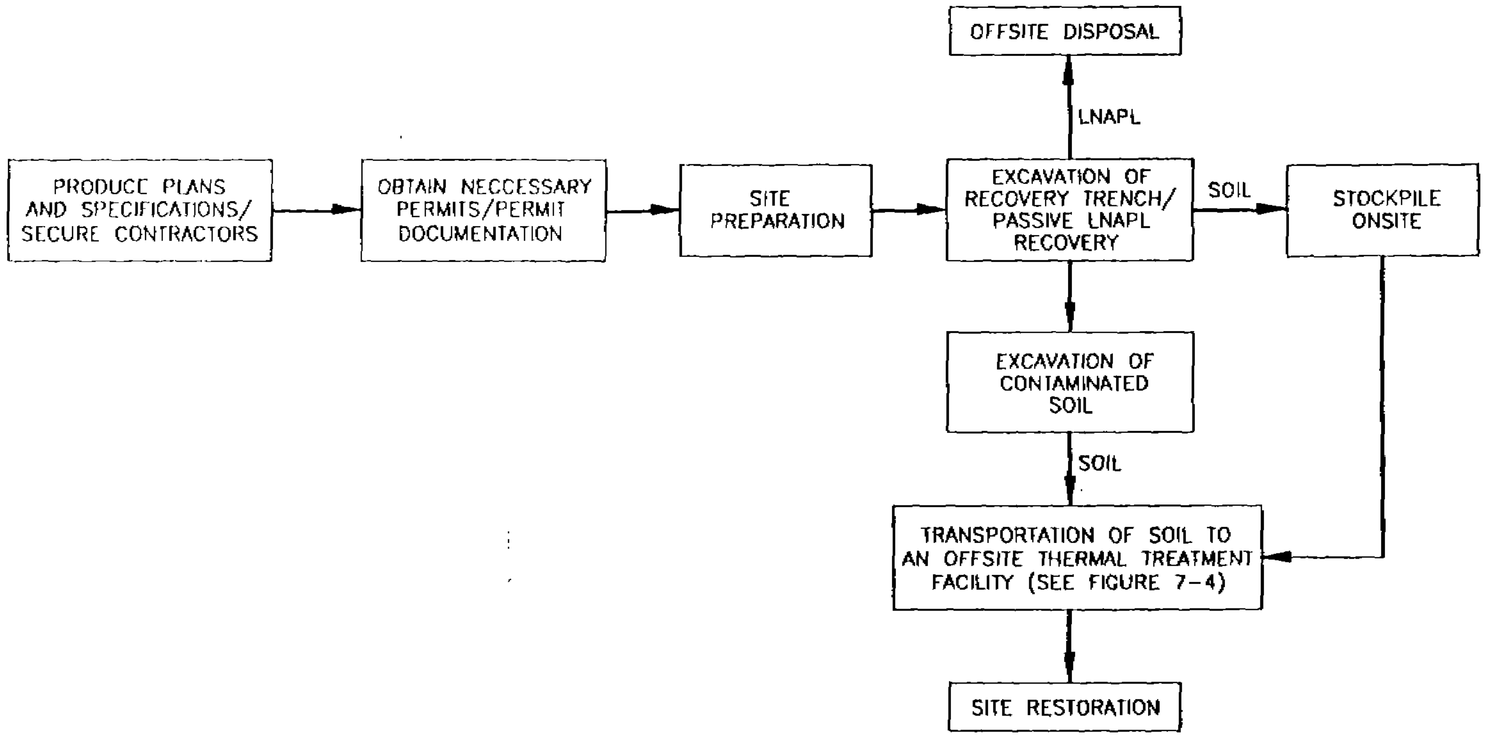
These activities are described and discussed in the following paragraphs.

Site Preparation and Passive LNAPL Recovery. Site preparation would include all activities necessary prior to the excavation of contaminated soil at PSC 2. These activities are:

- collection and documentation of necessary base-related permits prior to the onset of intrusive work at PSC 2,
- location and staking of underground utilities,
- construction and placement of temporary fencing and warning signs to limit access to excavation activities,
- set up of a temporary decontamination area and mobilization of necessary equipment,
- excavation of an LNAPL recovery trench, and
- sampling of LNAPL and contaminated soil for characterization (if necessary).

Permits are typically waived for remedial activities carried out at CERCLA sites; however, the intent of work permits must be attained. All underground utilities in the vicinity of PSC 2 will be located and staked prior to intrusive work.

Although PSC 2 is already a limited access site due to its location on Patrol Road near the flight line, temporary fencing and warning signs would be placed around the work area for security and human safety. An access gate would be rolled back during working hours to provide entry and exit of vehicles and equipment needed throughout implementation of this alternative.



NOTE:

LNAPL = LIGHT NONAQUEOUS-PHASE LIQUID

FIGURE 7-1
PROCESS FLOW DIAGRAM FOR ALTERNATIVE 1

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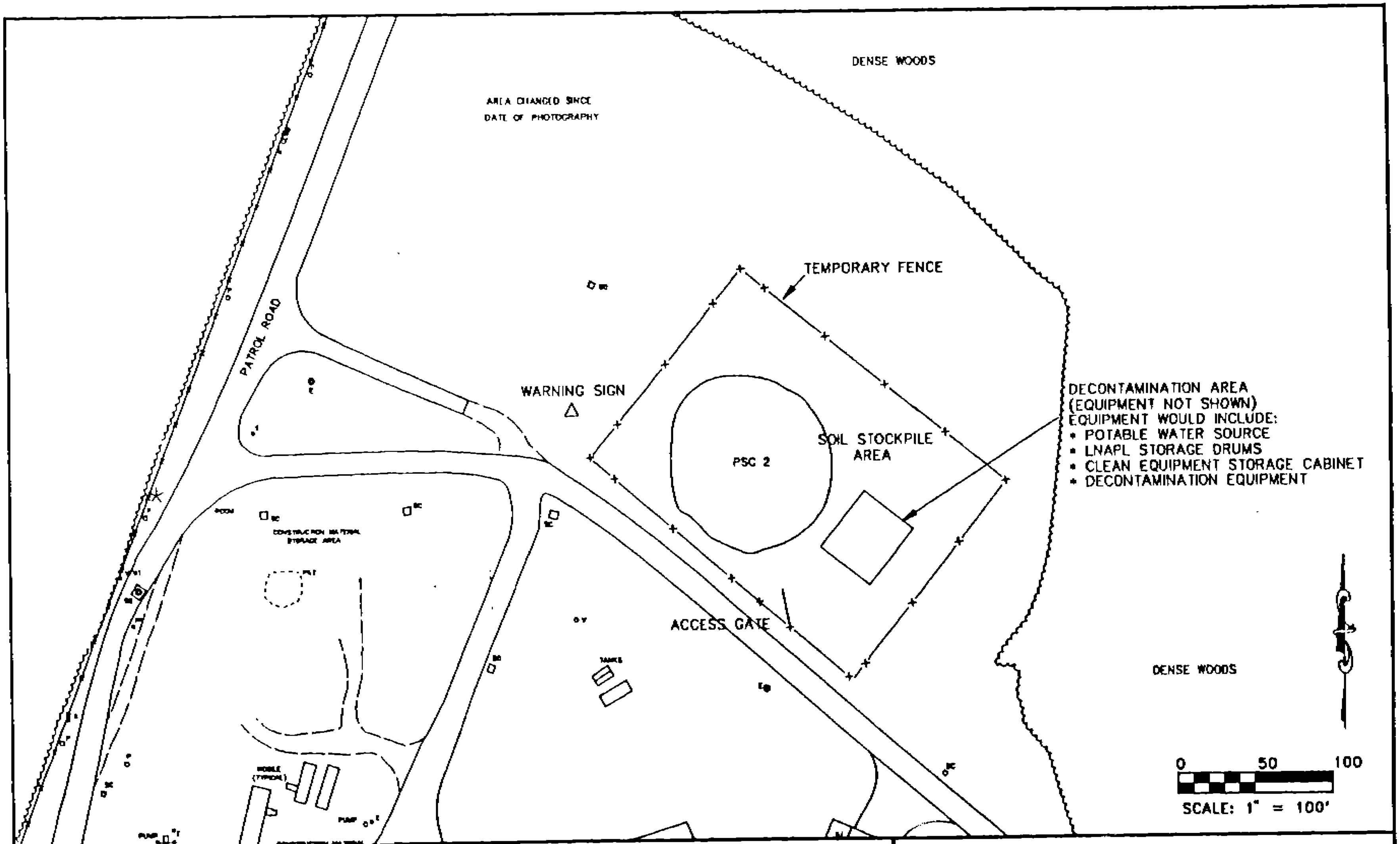

FIGURE 7-2
PROPOSED SITE LAYOUT FOR ALTERNATIVE 1

FOCUSED RI/FS REPORT FOR OU2

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JACKSONVILLE, FLORIDA

FTA/DRM/8-2-94

A temporary decontamination area consisting of a decontamination water source, a catch basin for collection of generated water, a steam cleaner, and a holding area for clean equipment would be constructed at the site. The catch basin may consist of a simple bermed waterproof tarpaulin. Water generated from the decontamination process would be temporarily stored onsite in a tanker prior to offsite disposal.

As a final step in the site preparation process, a simple recovery trench would be excavated within the former fire-fighting training pit. The trench would be placed strategically within the pit based on observations of LNAPL occurrence within temporary monitoring wells installed within the pit. The trench's size, location, and geometry would be chosen to maximize the effectiveness of passive LNAPL recovery at PSC 2.

Soil excavated from the trench would be stockpiled onsite until the remaining contaminated soil is excavated. Recovered LNAPL would be skimmed from the trench and temporarily stored onsite. Techniques would be implemented to minimize collection of incidentally recovered water while skimming LNAPL; however, generated water would likewise be stored onsite temporarily prior to offsite disposal.

Passive LNAPL recovery will be considered complete at the determination of an onsite technical representative. Criteria for determination of the completion point will be chosen at a later date; however, for the purposes of this Focused FS, it is estimated that all recoverable LNAPL would be collected and containerized onsite within 2 weeks (subject to site conditions).

If necessary, representative samples of contaminated soil and LNAPL would be collected during site preparation activities and analyzed for characterization prior to disposal. Data collected during the Focused RI will be used to the extent practicable for characterization to minimize sample collection and analytical costs. It should be noted that disposal vendors generally require that a sample be collected and analyzed to determine whether or not the wastes can be accepted by their facilities. For the purposes of this Focused FS, it is assumed that the contaminated soil at PSC 2 is a petroleum-contaminated waste, <u>not</u> a hazardous waste. Petroleum-contaminated wastes are excluded from RCRA waste management regulations and fall, instead, under State jurisdiction (Chapters 17-770 and 17-775, FAC).

<u>Excavation of Contaminated Soil</u>. Excavation of contaminated soil would begin upon completion of site preparation and passive LNAPL recovery. A backhoe would be used to remove site soil, which would be transported to an offsite disposal facility. Because excavation is limited to the vadose-zone soil at PSC 2, no dewatering of soil would be required. Excavation would continue until one of two situations occurs:

1. analyses of soil samples collected from the excavated areas indicate that the remaining *in situ* soil at PSC 2 contains total volatile organic aromatics (VOAs) of less than 100 ug/kg, and TPH concentrations are less than 50 mg/kg (in accordance with Chapter 17-775, FAC), or

2. a total of 3,400 yd^3 of soil has been removed from PSC 2.

Any remaining *in situ* soil at PSC 2 containing TPH below 50 mg/kg would be addressed in the overall FS for OU 2.

Offsite Treatment and Disposal of Contaminated Soil and Recovered LNAPL. As previously discussed, recovered LNAPL and excavated soil would be stored temporarily onsite. Once LNAPL recovery was complete, LNAPL would be transported to a waste oil disposer. Excavated soil would be transported to an offsite State-permitted, low-temperature thermal treatment facility prior to disposal. A process-flow diagram for a typical thermal treatment facility is shown on Figure 7-3.

Thermal treatment could be described as soil heating or thermal aeration. Soil is directly or indirectly heated in a materials dryer that volatilizes organic contaminants from the soil matrix. These contaminants are collected and destroyed in an afterburner or condensed into a liquid stream. Low-temperature thermal treatment has been used successfully for a wide variety of VOC-contaminated soil, including soil contaminated with petroleum product constituents.

Thermal treatment has been applied using a number of different approaches including rotary kiln dryers, indirect fired dryers, and heated auger. Several types of stationary facilities are available within the State of Florida and the facility chosen to accept contaminated soil from PSC 2 for treatment would be selected based on reputation, cost, and available capacity at the time of remedial action implementation. The basic components of the thermal treatment process are described and discussed in the following paragraphs.

Pretreatment. Prior to treatment, soil would be transported from PSC 2 to the selected offsite treatment facility and stockpiled there. The soil would likely be screened to remove large stones, roots, and debris prior to treatment; this debris would be managed appropriately by the operators of the stationary facility.

Primary Treatment. Contaminated soil would be fed into a hopper that meters soil into the primary treatment chamber. Typical feed rates for stationary thermal treatment facilities are 60 to 200 tons per hour. As previously discussed, this chamber could be a rotary kiln dryer, an indirectly fired dryer, or a heated auger. In all of these cases, the goal is to heat the soil to a temperature high enough to volatilize organic contaminants of concern from the soil matrix, but low enough to prevent combustion. Typical operating temperatures for thermal treatment are between 250 and 600 degrees Fahrenheit (°F). The system would be fired with natural gas or oil. After passing through the primary treatment chamber, soil would be discharged via a conveyor to a treated soil stockpile. Treated soil may be sprayed with water to control dust emissions.

Air Pollution Control Equipment. Volatile contaminants, combustion gases, water vapor, and particulates in the gas stream exiting the primary treatment chamber pass through a particulate removal system (e.g., a high-efficiency cyclone or baghouse) prior to removal or destruction of volatilized organic contaminants. This system reduces particulate emissions to acceptable regulatory levels. Particulates removed from the gas stream are circulated back to the treated soil stockpile.

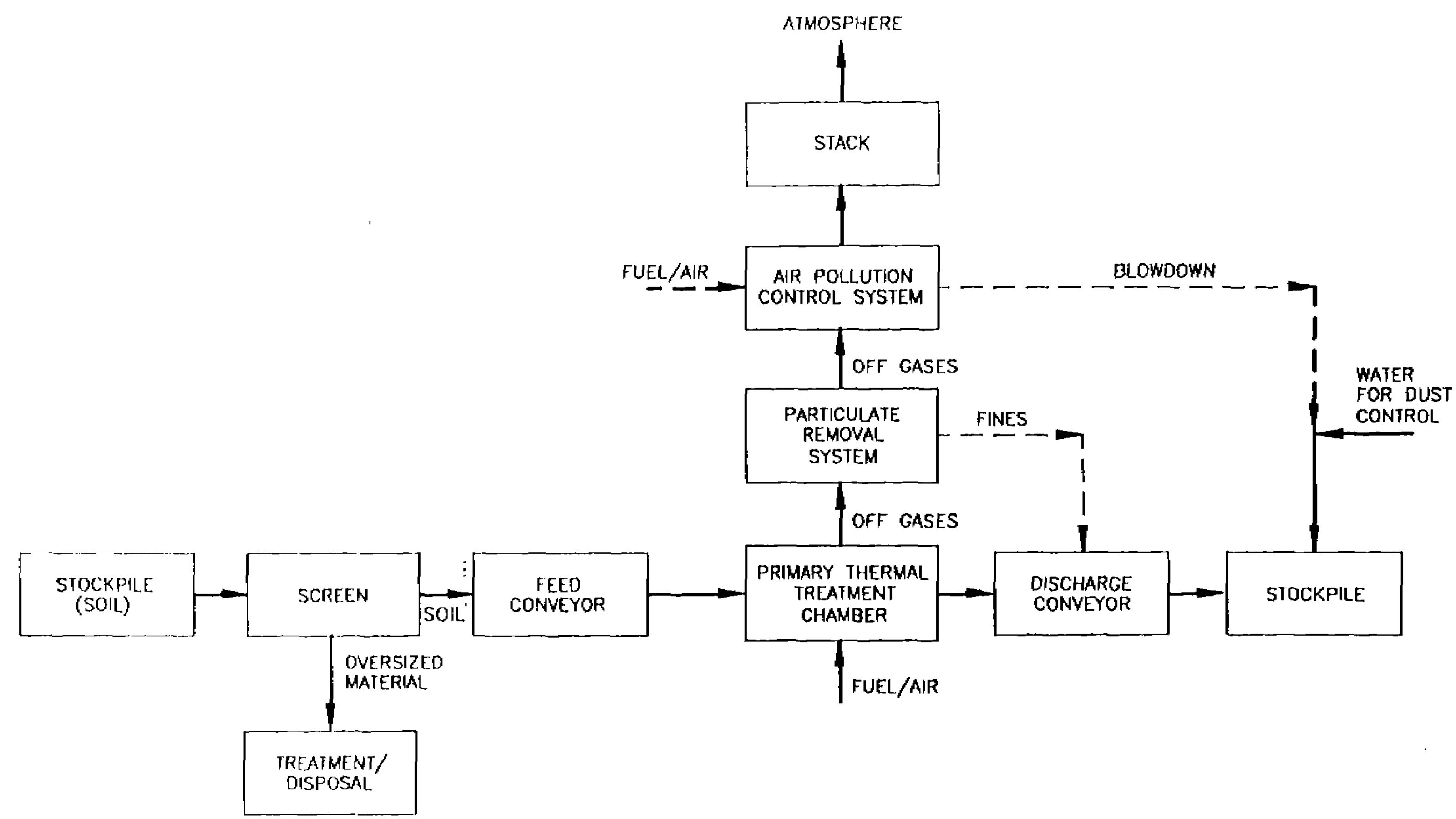

FIGURE 7-3
PROCESS FLOW DIAGRAM FOR A TYPICAL THERMAL TREATMENT UNIT

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Secondary Treatment Chamber. Volatilized organic contaminants and combustion gases would pass from the air pollution control equipment into a secondary chamber. This chamber could be an afterburner fired with natural gas or oil and heated to 1,800 to 2,400 °F. Organics would be reduced to carbon dioxide and water in this chamber. Some secondary chambers use granular activated carbon (GAC) units instead of afterburners to trap VOCs in the gas stream. Prior to carbon adsorption, the gases may pass through a scrubber for cooling and removal of acidic gases. VOCs in the gas stream would be adsorbed to the GAC before gases are discharged to the atmosphere. Spent carbon would be regenerated at regular time intervals by the facility operators.

Once the soil is treated to existing State standards, it would be transported to a permitted disposal facility. Typically, the treatment facility would be responsible for disposal of the treated soil, and disposal costs would be included as a portion of the processing fee for treatment.

If possible, transportation and disposal of contaminated soil would be ongoing and concurrent with soil excavation.

Site Restoration. Once LNAPL recovery, excavation, and disposal activities were complete at PSC 2, site restoration would begin. Site restoration activities would include:

- backfilling, grading, and vegetation of PSC 2;
- transportation and offsite disposal of water generated during decontamination; and
- removal of the temporary fence, warning signs, and other equipment used during removal activities and cleanup of the decontamination area.

Open excavations would be backfilled with clean fill upon completion of removal activities. Backfill would be staged in a clean area as shown on Figure 7-2, and would be delivered to PSC 2 according to demand. Common backfill material would be used because only soil in the vadose-zone would be excavated.

Decontamination water would be temporarily stored in drums or a tanker during remedial activities at PSC 2. Upon completion of these activities, the water would be sampled for characterization, and transported offsite for disposal in accordance with appropriate State and Federal regulations.

The decontamination water source, temporary fencing, warning signs, and other equipment would be demobilized and removed from the site upon completion of remedial activities. As a final step in site restoration, the excavated and backfilled areas would be seeded.

7.1.1.2 Technical Criteria Evaluation

Overall Protection of Human Health and the Environment. This alternative would provide protection of human health and the environment because LNAPL and contaminated soil above the specified action level would be removed from the site. Implementation of this alternative would also reduce a source of groundwater contamination at PSC 2 and reduce exposure to humans.

Soil containing concentrations of no more than 50 mg/kg of TPH are protective of groundwater and surrounding soil, and should not have a direct toxic effect on soil infauna, as empirical data show on NOEC of TPH of 53 mg/kg (see Section 4.2).

Compliance with ARARs. It is expected that site activities would comply with the ARARs summarized in Section 5.1. This alternative is expected to remove LNAPL from PSC 2 to the extent practicable in accordance with Chapter 17-770 and 17-775, FAC. In addition, all generated wastes produced during remedial activities would be managed and disposed in accordance with appropriate Federal and State regulations. Soil would be treated offsite to existing State ARARs for thermal treatment.

Long-term Effectiveness and Permanence. This alternative is expected to permanently remove LNAPL and contaminated soil currently acting as a source of groundwater contamination to the specified action level. Concentrations below 50 mg/kg remaining in the *in situ* soil at PSC 2 will be addressed during the overall FS for OU 2. In addition to permanent removal of LNAPL and soil with TPH greater than 50 mg/kg from PSC 2 during implementation of this alternative, volatile contaminants would be removed permanently from the soil matrix during offsite treatment.

Reduction in Mobility, Toxicity, or Volume. This alternative would reduce the toxicity, mobility, and volume of the free-phase LNAPL and soil contaminants at PSC 2 because they would be removed from the site to the specified action levels.

Disposal of LNAPL will reduce its mobility because disposal facilities for waste oils are designed to contain liquid contaminants; however, unless treated by the disposal facility, the toxicity and volume of LNAPL would not be affected by disposal. The toxicity of the excavated soil would decrease as a result of treatment; the volume of soil may also decrease slightly during the thermal treatment process. Treated soil would be disposed at an RCRA-permitted disposal facility. Landfills are designed to control leaching and runoff of contaminants; therefore, disposal in a landfill would reduce the mobility of any remaining soil contaminants.

Short-term Effectiveness. Removal of LNAPL and contaminated soil from PSC 2 would minimize potential future exposure of human and ecological receptors to contaminants in these media and would immediately reduce a source of groundwater contamination.

OU 2 is generally a limited access area; however, access to PSC 2 would be limited further during site preparation, excavation, and restorative activities. Air monitoring would be required during all excavation activities and, if necessary, dust control would be implemented. All activities would be conducted in the appropriate level of personal protection equipment (PPE) required.

Implementability. This remedial alternative is based on well-established engineering practices, and is expected to be relatively simple to execute. The equipment and services necessary for LNAPL recovery, excavation, treatment, and disposal are readily available from local vendors.

Air monitoring would be implemented during all phases of the remedial activities scheduled for PSC 2. All necessary permits would be obtained prior to excavation activities for the site.

Approximately 2 weeks would be necessary for site preparation and LNAPL recovery activities (subject to site conditions). Upon completion of site preparation and LNAPL recovery activities, approximately 2 weeks would be necessary for excavation and transportation of the contaminated soil to an offsite stationary thermal treatment facility. Finally, 1 week would be necessary for site closeout activities following offsite transportation of excavated soil and recovered LNAPL.

Cost. Table 7-1 presents the summary of the cost estimates for this alternative. Costs are based on an 5-week project lifespan. Total cost, including contingency, was estimated to be $697,000. Capital costs were estimated to be $492,000. No present-worth analyses were included in the cost estimate due to the short project lifespan. Prices were rounded to the nearest $1,000.

7.1.2 Alternative 2: Passive LNAPL Recovery and Excavation of Contaminated Soil, Onsite Thermal Treatment of Contaminated Soil, Onsite Redeposition of Treated Soil, and Offsite Disposal of Recovered LNAPL

7.1.2.1 **Description** This alternative would consist of excavation of a simple interceptor trench for LNAPL recovery followed by excavation of contaminated soil. Soil would be treated onsite using a mobile low-temperature thermal treatment unit and would be redeposited into excavated areas at PSC 2 following treatment. Recovered LNAPL would be transported to an offsite permitted facility for disposal.

A process-flow diagram for this alternative is presented on Figure 7-4. The proposed site layout for this alternative is depicted on Figure 7-5. Major activities associated with this alternative include:

- site preparation and passive LNAPL recovery,
- excavation of contaminated soil,
- onsite thermal treatment of contaminated soil,
- onsite redeposition of treated soil,
- offsite disposal of recovered LNAPL, and
- site restoration.

This alternative would be implemented similarly to Alternative 1, with the following exceptions:

- site preparation and passive LNAPL recovery,
- onsite thermal treatment of contaminated soil,
- onsite redeposition of treated soil, and
- site restoration.

These exceptions are described and discussed in the following paragraphs.

Site Preparation and Passive LNAPL Recovery. Site preparation and passive LNAPL recovery would be implemented as described for Alternative 1. However, some additional site preparation activities would be necessary to implement onsite thermal treatment at PSC 2. These additional activities include:

- securing permit(s) for onsite thermal treatment (if necessary), and

- construction of a 60-foot by 80-foot concrete pad for staging of the mobile thermal treatment unit.

Table 7-1
Summary of Cost Estimate for Alternative 1

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

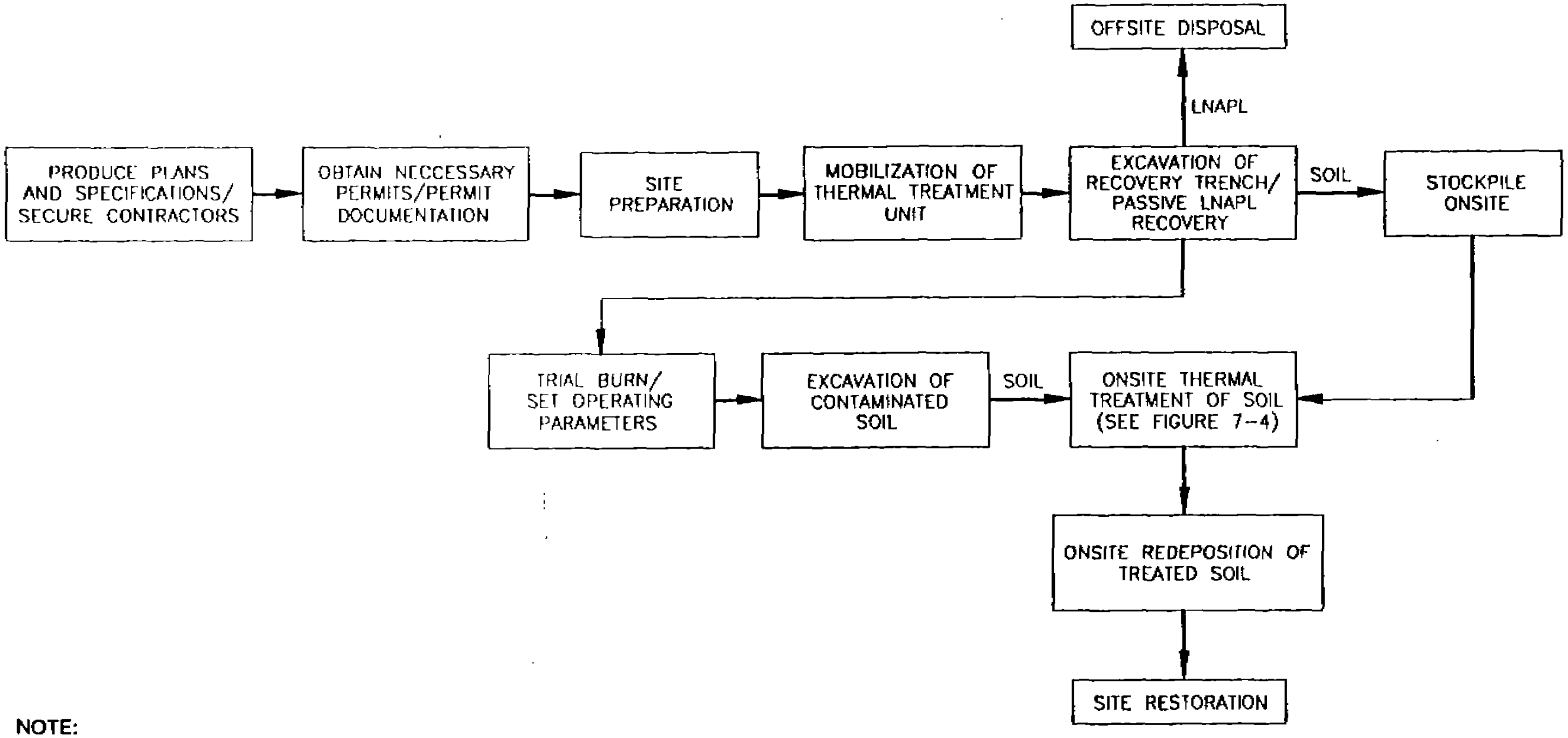
			Amount
Capital Costs			
	Direct		
		Site preparation	$14,000
		Excavation of soil	$41,000
		Disposal of LNAPL	$5,000
		Offsite treatment and disposal of soil	$322,000
		Sampling and analysis	$59,000
		Backfill of excavation	$41,000
		Restoration activities	$10,000
	Total Direct Cost		$492,000
	Indirect		
		Health and safety (5 percent of direct cost)	$25,000
		Legal, administrative, and permitting (10 percent of direct cost)	$50,000
	Total Indirect Cost		$75,000
Total Capital Cost			$567,000
Operation and Maintenance (O&M) Costs			
	Manhours for oversight		$14,000
Total O&M Cost			$14,000
Subtotal, Capital and O&M Costs			$581,000
		Contingency (20 percent of subtotal)	$116,000
TOTAL COST OF Alternative 1			$697,000

Notes: Prices are rounded to the nearest $1,000 for this estimate.

Health and safety cost assumes that site operations would be carried out in Level D personal protection equipment.

No present-worth analysis was completed because of the brief project duration.

Note: LNAPL = light non-aqueous phase liquid.



NOTE:

LNAPL = LIGHT NONAQUEOUS-PHASE LIQUID

FIGURE 7-4
PROCESS FLOW DIAGRAM FOR ALTERNATIVE 2

FOCUSED RI/FS REPORT FOR OU2

NAS JACKSONVILLE
JACKSONVILLE, FLORIDA

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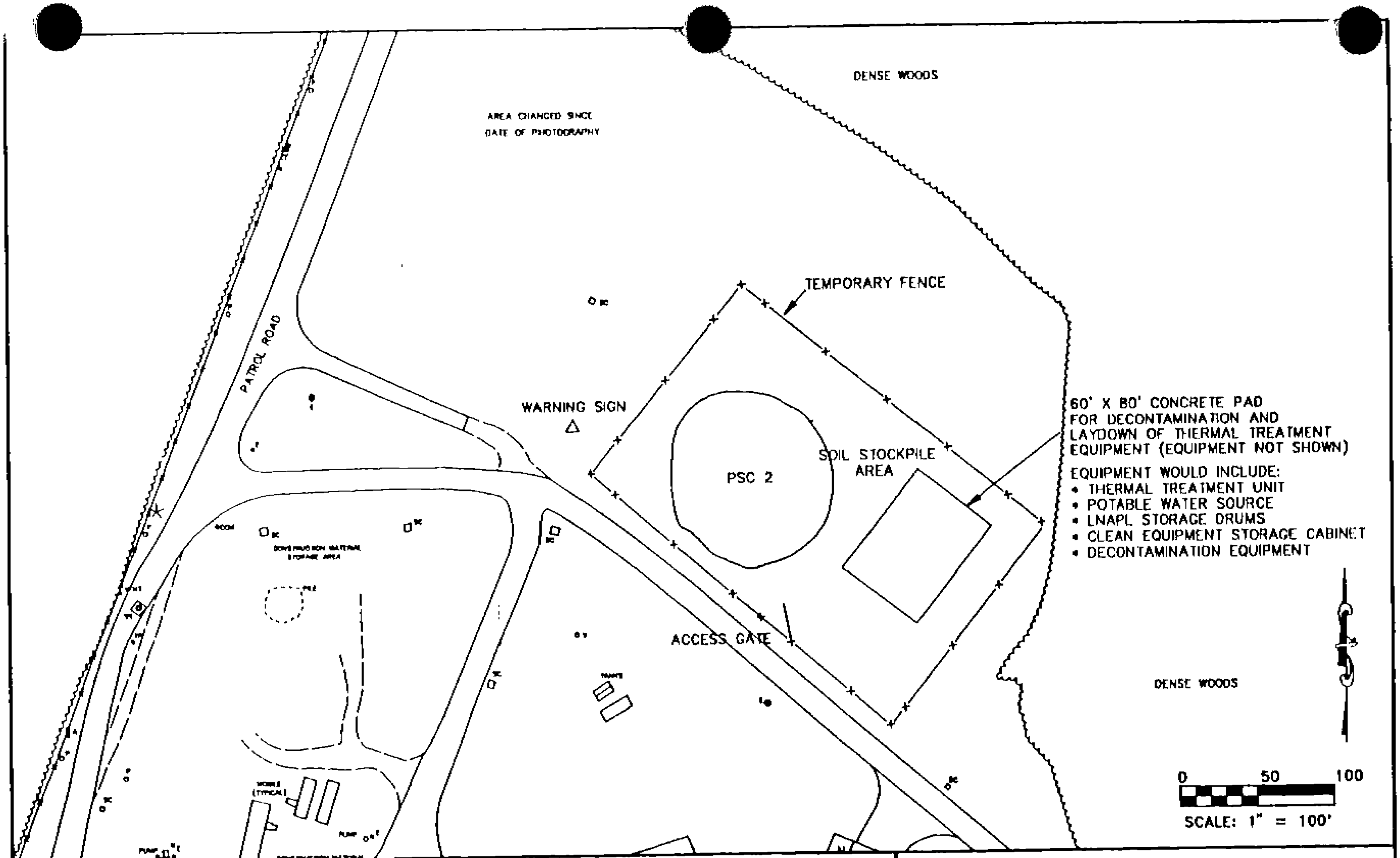

FIGURE 7-5
PROPOSED SITE LAYOUT FOR ALTERNATIVE 2

FOCUSED RI/FS REPORT FOR OU2

NAS JACKSONVILLE
JACKSONVILLE, FLORIDA

FTA/DRM/8-2-94

Onsite Thermal Treatment of Contaminated Soil. As discussed in the description of Alternative 1, contaminated soil would be treated using low-temperature thermal treatment. Unlike Alternative 1, treatment would take place onsite in a mobile facility rather than offsite in a stationary facility.

The thermal treatment processes and equipment are the same for both stationary and mobile facilities. However, some of the pretreatment and support requirements are different for onsite thermal treatment. These exceptions are described and discussed in the following paragraphs.

> **Pretreatment.** Soil would be excavated and stockpiled on the concrete staging pad. The excavation rate would be controlled to match processing rates, resulting in a small stockpile area. Typical feed rates for mobile thermal treatment units are 5 to 20 tons per hour. Soil in the stockpile area would be covered temporarily to prevent dust emissions and rainwater infiltration and percolation through contaminated soil. Large stones, roots, and other material classified as debris would be removed from the stockpile and managed appropriately.
>
> **Utilities.** The mobile thermal treatment unit would require an electric power source, a potable water source, and fuel to fire the unit (typically provided by the vendor).
>
> **Support Equipment.** Mobile thermal treatment equipment is typically transported to a site on one or more flatbed trucks and would be staged on the constructed concrete pad. In addition to the treatment system itself, support equipment may include, but is not limited to, an operations trailer, a personnel trailer, and an onsite laboratory trailer.

Onsite Redeposition of Treated Soil. Treated soil would be stockpiled on the concrete staging pad. Samples of the treated soil would be collected and analyzed at an offsite laboratory to demonstrate compliance with existing State ARARs for thermal treatment of petroleum-contaminated soil. Once demonstration of compliance has been achieved, the soil would be used as backfill material in the excavated areas at PSC 2. Prior to backfilling, the soil would be rehydrated to a moisture content approximately equal to that existing in the *in situ* soil at PSC 2. If the volume of treated soil is insufficient for backfill and compaction in place of excavated areas, it would be supplemented with clean backfill obtained from an offsite source.

Site Restoration. Site restoration for this alternative would be implemented similarly to that described for Alternative 1, except that treated soil would be used as backfill material in excavated areas. Additional restorative activities for this alternative are demobilization of the thermal treatment equipment, removal of the concrete staging pad, and revegetation. The concrete would be disposed at a permitted solid-waste landfill facility.

7.1.2.2 **Technical Criteria Evaluation** The technical criteria evaluation for this alternative is similar to those for Alternative 1 with a few exceptions, which are described in the following paragraphs.

Compliance with ARARs. It is expected that site activities would comply with the ARARs summarized in Section 5.1. This alternative is expected to remove LNAPL from PSC 2 to the extent practicable in accordance with Chapter 17-770, FAC. In addition, all generated wastes produced during remedial activities would be managed and disposed in accordance with appropriate Federal and State regulations. Soil would be treated onsite to existing State ARARs for thermal treatment, and permit requirements for onsite thermal treatment and other remedial activities at PSC 2 would be met.

Reduction in Mobility, Toxicity, or Volume. This alternative would reduce the mobility and volume of the free-phase LNAPL and soil contaminants at PSC 2 because they would be removed from the site to the specified action levels.

Disposal of LNAPL will reduce its mobility because disposal facilities for waste oils are designed to contain liquid contaminants; however, unless treated by the disposal facility, the toxicity and volume of LNAPL would not be affected by disposal. The toxicity of the excavated soil would decrease as a result of onsite treatment; the volume of soil may also decrease slightly during the thermal treatment process. Treated soil would be redeposited onsite, and the excavated areas reseeded. Although vegetative cover reduces runoff and rainwater infiltration at the site, it would not significantly reduce mobility of any remaining soil contaminants. As previously discussed, however, soil contaminants would be removed permanently by treatment to ARARs.

Implementability. This remedial alternative is based on well-established engineering practices, and is expected to be relatively simple to execute. The equipment and services necessary for LNAPL recovery, excavation, onsite treatment, and disposal are available from local vendors.

Air monitoring would be implemented during all phases of the remedial activities scheduled for PSC 2. All necessary permits and documentation would be obtained prior to implementing remedial activities for the site.

Approximately 2 weeks would be necessary for site preparation, mobilization of the thermal treatment unit, and LNAPL recovery activities. Upon completion of these activities, approximately 3 weeks would be necessary for excavation, treatment, and redeposition of site soils, in addition to disposal of recovered LNAPL. Finally, 1 week would be necessary for site closeout activities.

Cost. Table 7-2 presents the summary of the cost estimates for this alternative. Costs are based on an 6-week project lifespan. Total cost, including contingency, was estimated to be $614,000. Capital costs were estimated to be $491,000. No present-worth analyses were included in the cost estimate due to the short project lifespan. Prices were rounded to the nearest $1,000.

7.2 DETAILED ANALYSES FOR PSCs 41 AND 43. As described in Chapter 6.0, three remedial alternatives were identified and developed for PSCs 41 and 43, the domestic and industrial sludge drying beds, respectively. The alternatives listed below are discussed in the following subsections:

- Alternative 3: Excavation and offsite disposal of contaminated filter media and hazardous and nonhazardous debris;

- Alternative 4: Excavation, offsite treatment of contaminated filter media, offsite disposal of treated filter media, and offsite disposal of hazardous and nonhazardous debris; and

Table 7-2
Summary of Cost Estimate for Alternative 2

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

			Amount
Capital Costs			
	Direct		
		Site preparation	$20,000
		Mobilization of thermal treatment unit and proof of performance test	$15,000
		Excavation, treatment, and backfill of soil	$253.000
		Sampling and analysis	$105,000
		Disposal of LNAPL	$5,000
		Restoration activities	$29,000
	Total Direct Cost		$427,000
	Indirect		
		Health and safety (5 percent of direct cost)	$21,000
		Legal, administrative, and permitting (10 percent of direct cost)	$43,000
	Total Indirect Cost		$64,000
Total Capital Cost			$491,000
Operation and Maintenance (O&M) Costs			
	Manhours for oversight		$21,000
Total O&M Cost			$21,000
Subtotal, Capital and O&M Costs			$512,000
		Contingency (20 percent of subtotal)	$102,000
Total Cost of Alternative 2			$614,000

Notes: Prices are rounded to the nearest $1,000 for this estimate.

Health and safety cost assumes that site operations would be carried out in Level D personal protection equipment.

No present-worth analysis was completed because of the brief project duration.

Note: LNAPL = light non-aqueous phase liquid.

- **Alternative 5**: Excavation, onsite treatment of contaminated filter media, onsite redeposition of treated filter media, and offsite disposal of hazardous and nonhazardous debris.

<u>**7.2.1 Alternative 3: Excavation and Offsite Disposal of Contaminated Filter Media and Hazardous and Nonhazardous Debris**</u>

7.2.1.1 **Description** This alternative would consist of excavation of hazardous and nonhazardous debris and filter media (including soil from the domestic sludge drying beds) from PSCs 41 and 43, followed by offsite transportation and disposal to appropriately permitted disposal facilities. In this alternative it is expected that all materials will not require treatment, even though sampling conducted in the Focused RI indicated that some material may require treatment to meet Federal requirements prior to offsite disposal. However, depending on the excavation methodology used, it is very possible that soil samples collected after excavation prior to disposal would indicate that treatment would not be required for offsite disposal.

A process-flow diagram for this alternative is provided on Figure 7-6. The proposed site layout for this alternative is depicted on Figure 7-7. Major activities associated with this alternative include:

- site preparation (including removal of surface [i.e. nonhazardous] debris),
- excavation of contaminated filter media and subsurface (i.e. hazardous) debris,
- offsite disposal of contaminated filter media (including soil) and hazardous and nonhazardous debris, and
- site restoration.

<u>Site Preparation</u>. Site preparation would include all activities necessary prior to the excavation of contaminated debris and filter media at PSCs 41 and 43. These activities would include:

- collection and documentation of necessary base-related permits prior to the onset of intrusive work at both PSCs 41 and 43,
- locating and staking of underground utilities,
- construction and placement of temporary fencing and warning signs to limit access to excavation activities,
- set up of a temporary decontamination area and mobilization of necessary equipment,
- removal of surface (nonhazardous) debris, and
- sampling of media for characterization (if necessary).

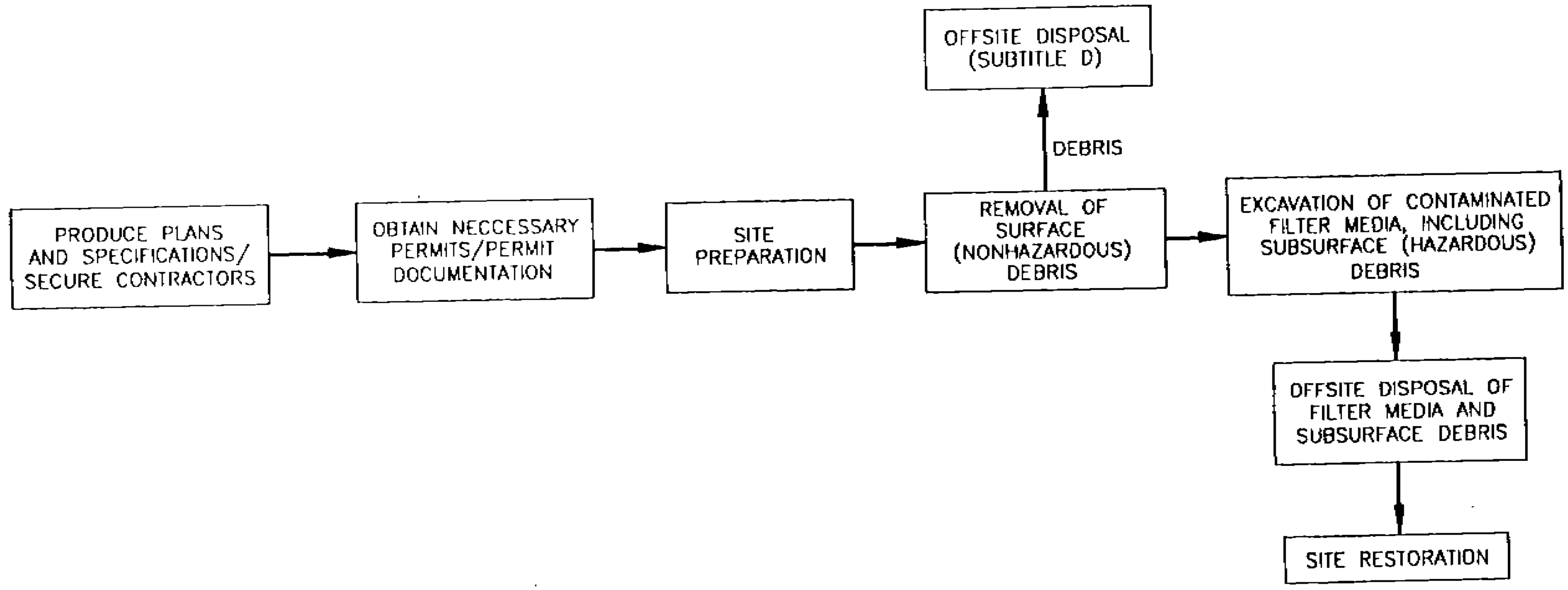

FIGURE 7-6
PROCESS FLOW DIAGRAM FOR ALTERNATIVE 3

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NAS JACKSONVILLE
JACKSONVILLE, FLORIDA

41-43SC1/DRM/11-2-93

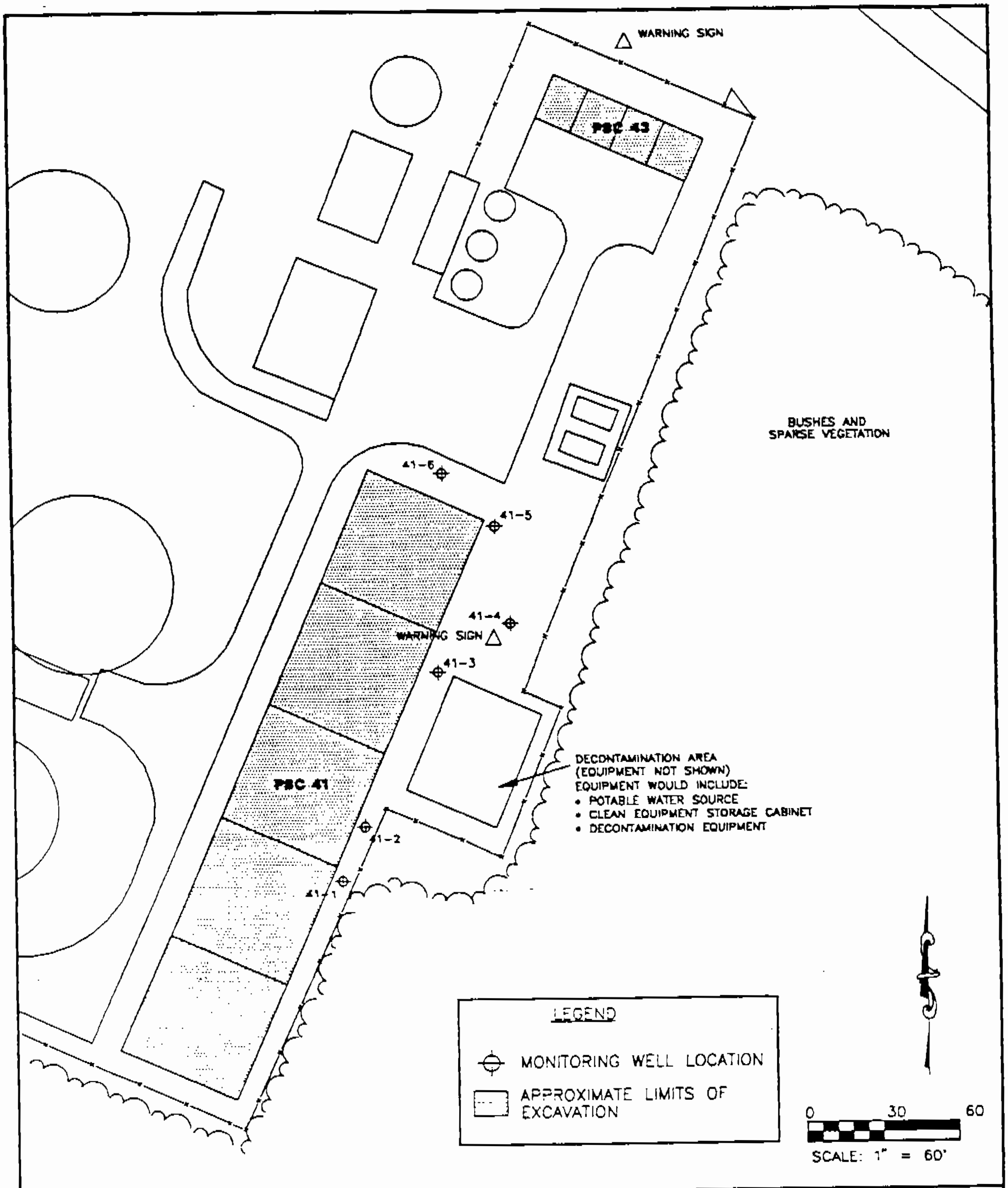

FIGURE 7-7
PROPOSED SITE LAYOUT FOR ALTERNATIVES 3 AND 4

FOCUSED RI/FS REPORT FOR OU2

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JACKSONVILLE, FLORIDA

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Permits are typically waived for remedial activities carried out at CERCLA sites; however, the intent of work permits must be attained. All underground utilities at the site will be located and staked prior to intrusive work.

Although PSCs 41 and 43 are already limited access sites due to their location on Patrol Road near the flight line, temporary fencing and warning signs would be placed around the work area for security and human safety. The access gate in the fencing would be sufficiently large enough for the equipment needed during excavation.

A temporary decontamination area consisting of a decontamination water source, a catch basin for collection of generated water, a steam cleaner, and a holding area for clean equipment would be constructed at the site. The catch basin may consist of a simple bermed waterproof tarpaulin. Water generated from the decontamination process would be temporarily stored onsite in drums or a tanker prior to offsite disposal.

Above-grade debris, including the concrete walls surrounding the sludge drying beds and other appurtenances that did not come into contact with sludge bed wastes, would be removed, decontaminated with potable water, and placed in rolloff bins for temporary storage prior to offsite disposal. Samples of the concrete walls surrounding the sludge drying beds at PSCs 41 and 43 were collected and analyzed for TCLP parameters during the Focused RI field effort. Results of these analyses were below TCLP standards; thus, for the purposes of this Focused FS, it is assumed that this material is nonhazardous and it would be disposed as solid waste.

Excavation of Contaminated Debris, Soil, and Filter Media. Excavation of contaminated debris and filter media would begin upon completion of site preparation and removal of surface debris. Heavy equipment would be used to remove the subsurface debris and filter media. The contaminated material would be placed directly into rolloff bins for subsequent transportation to an offsite RCRA Subtitle C hazardous waste disposal facility. The volume of subsurface debris and filter media would be limited by the geometry of construction of the domestic and industrial sludge drying beds as depicted on NAS Jacksonville record drawings and field observation.

Offsite Disposal of Hazardous Debris and Filter Media. Excavated debris and filter media would be transported to an offsite RCRA Subtitle C landfill for disposal. This alternative assumes that all the materials will not require treatment even though sampling conducted in the Focused RI indicated that some material may require treatment to meet Federal requirements prior to offsite disposal. Depending on the excavation methodology used, it is very possible that soil samples collected after excavation would indicate that treatment would not be required prior to offsite disposal. The waste would still be managed as a RCRA hazardous waste and will be taken to an RCRA Subtitle C disposal facility. This alternative also provides a range of costs when compared to Alternative 5. If feasible, transportation and disposal of contaminated material would be ongoing and concurrent with excavation.

Site Restoration. Once excavation of contaminated media is complete, site restoration would begin. Restoration would be temporary because more investigative activities are scheduled for PSCs 41 and 43 following the proposed interim remedial action. Site restoration activities would include:

- backfilling, grading, and seeding of PSCs 41 and 43;

- transporting and disposing of water generated during decontamination offsite; and

- removing and cleaning up the decontamination area, temporary fence, warning signs, and other equipment used during removal activities.

Open excavations would be backfilled with clean fill obtained from an offsite source upon completion of removal activities. Backfill would be staged in a clear area and would be delivered to PSCs 41 and 43 according to demand.

Decontamination water would be temporarily stored in a tanker during site activities. Upon completion of remedial activities, the water would be sampled for characterization, and transported offsite for treatment and disposal in accordance with appropriate Federal and State regulations.

The decontamination water source, temporary fencing, warning signs, and other equipment will be removed from the site upon completion of remedial activities at PSCs 41 and 43.

7.2.1.2 Technical Criteria Evaluation

Overall Protection of Human Health and the Environment. This alternative would provide protection of human health and the environment because the contaminated debris and filter media would be removed from the site. This action would also reduce a potential source of groundwater contamination at PSCs 41 and 43.

It is expected that removal of debris and filter media at PSCs 41 and 43 would reduce future risks associated with exposure to humans and wildlife by reducing concentrations of inorganic contaminants that exceed residential PRGs at the sites, as discussed in Section 4.1. Removal of heavy metals is also expected to be protective of future ecological receptors as discussed in Section 4.2.

Compliance with ARARs. All generated wastes produced during site activities would be managed and disposed in accordance with RCRA and other appropriate Federal and State regulations.

Long-term Effectiveness and Permanence. This alternative is expected to permanently remove contaminated debris and filter media present within the domestic and industrial sludge drying beds, which are currently acting as direct contact hazards and as potential sources of groundwater contamination.

Reduction in Mobility, Toxicity, or Volume. This alternative would reduce the mobility and volume of contaminated media at PSCs 41 and 43 because it would be removed from the sites.

Excavated listed waste that are considered hazardous (i.e., subsurface debris and contaminated filter media), but do not require treatment, would be disposed in an RCRA Subtitle C landfill. Disposal in a landfill designed to control leaching and runoff would reduce the mobility of the contaminants in the disposed materials. However, the overall toxicity and volume of contaminated media would not be reduced because treatment is not used.

Short-term Effectiveness. Removal of contaminated media from PSCs 41 and 43 would minimize potential future exposure of human and ecological receptors to contaminants in these media, and would immediately reduce potential sources of groundwater contamination.

OU 2 is generally a limited access area; however, access to PSCs 41 and 43 would be further limited during site preparation, excavation, and restorative activities. Air monitoring would be required during remedial activities and, if necessary, dust control would be implemented. All activities would be conducted in the appropriate level of PPE required.

Implementability. This remedial alternative is based on well-established engineering practices and equipment. Equipment and services necessary for the excavation and disposal of the debris and filter media are available from local vendors.

Approximately 2 weeks would be necessary for site preparation and removal of surface debris. Upon completion of site preparation activities, approximately 2 weeks would be necessary for excavation of subsurface debris and filter media and disposal of all excavated material to appropriate disposal facilities. One week would be necessary for completion of restorative activities at PSCs 41 and 43.

Cost. Table 7-3 presents the summary of the cost estimates for this alternative. This alternative provides a range of costs when compared to Alternative 4. Costs are based on a 5-week project lifespan. Total cost, including contingency, was estimated to be $2,064,000. Capital costs were estimated to be $1,706,000. No present-worth analyses were included in the cost estimate due to the short project lifespan. Prices were rounded to the nearest $1,000.

7.2.2 Alternative 4: Excavation, Offsite Treatment and Disposal of Filter Media and Hazardous Debris, and Offsite Disposal of Nonhazardous Debris.

7.2.2.1 Description This alternative would consist of excavation of hazardous and nonhazardous debris and filter media from PSCs 41 and 43, followed by offsite treatment and disposal of filter media and hazardous debris, and offsite disposal of all debris. The sampling conducted in the Focused RI indicated that hazardous debris and filter media may require treatment to meet Federal requirements.

A process flow diagram for this alternative is presented on Figure 7-8. The site layout for this alternative is identical to that for Alternative 3 and is depicted on Figure 7-7. Major activities associated with this alternative include:

- site preparation (including removal of surface, i.e., nonhazardous, debris),
- excavation of contaminated filter media and subsurface (i.e., hazardous) debris,
- offsite treatment and disposal of contaminated filter media and hazardous debris,

Table 7-3
Summary of Cost Estimate for Alternative 3

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Capital Costs			Amount
	Direct		
		Site preparation	$19,000
		Excavation of filter media and subsurface debris	$29,000
		Disposal of surface debris	$10,000
		Disposal of filter media and subsurface debris	$1,351,000
		Sampling and analysis	$36,000
		Backfill of excavations	$29,000
		Restoration activities	$10,000
	Total Direct Cost		$1,484,000
	Indirect		
		Health and safety (5 percent of direct cost)	$74,000
		Legal, administrative, and permitting (10 percent of direct cost)	$148,000
	Total Indirect Cost		$222,000
Total Capital Cost			$1,706,000
Operation and Maintenance (O&M) Costs			
	Manhours for oversight		$14,000
Total O&M Cost			$14,000
Subtotal, Capital and O&M Costs			$1,720,000
		Contingency (20 percent of subtotal)	$344,000
Total Cost of Alternative 3			$2,064,000

Notes: Prices are rounded to the nearest $1,000 for this estimate.

Health and safety cost assumes that site operations would be carried out in Level D personal protection equipment.

No present-worth analysis was completed because of the brief project duration.

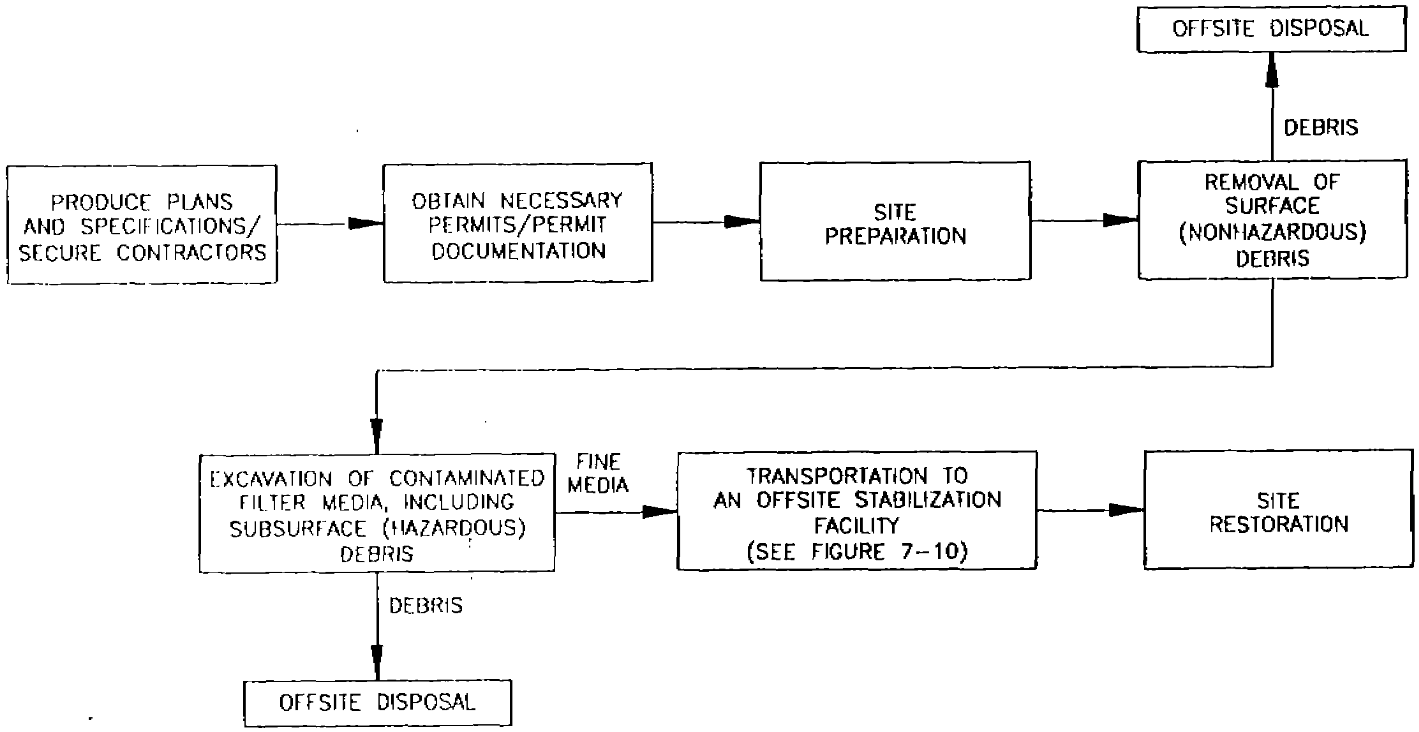

FIGURE 7-8
PROCESS FLOW DIAGRAM FOR ALTERNATIVE 4

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**NAS JACKSONVILLE
JACKSONVILLE, FLORIDA**

41-43SC3/DRM/6-29-94

- offsite disposal of nonhazardous debris, and

- site restoration.

This alternative is similar to Alternative 3 except that it is assumed that the filter media and hazardous debris would require treatment to standards for F009 and F016 wastes prior to disposal. Thus, a detailed description of this alternative is not necessary. The only activity that differs from those outlined for Alternative 3 is described in the following paragraphs.

Offsite Treatment and Disposal of Contaminated Filter Media and Hazardous Debris. After sampling and analysis is completed on the excavated material to verify the need for treatment, the filter media excavated from the sludge drying beds would be transported offsite to an RCRA-permitted treatment, storage, and disposal (TSD) facility that can treat inorganic wastes to regulatory treatment requirements. These treatment requirements are based on data from stabilization, a process that immobilizes filter media contaminants in a low-permeability matrix via the addition of setting agents. A process flow diagram for a typical stabilization unit is depicted on Figure 7-9 and the process is discussed in the following paragraphs.

> **Pretreatment.** Wastes would be transported to the TSD facility and stockpiled near the stabilization unit. Typical processing rates for these facilities range from 50 to 250 tons per hour. Wastes may be covered to prevent dust emissions and/or rainwater infiltration. Prior to treatment, wastes would be passed through a screen that separates oversized material (typically with a nominal diameter of 4 to 6 inches) from the finer material. Typically, the oversized material (i.e., debris) would be crushed to the appropriate size and added to the waste stream.
>
> **Primary treatment.** Once screened, wastes would be transported to the primary mixing chamber via conveyor belt. Water and stabilization agents, which may include Portland cement, fly ash, lime, pozzolans, and proprietary additives, would be added to and mixed with the waste in the appropriate volumetric ratios. Treatability tests help to determine the correct "formula" for the waste to be treated. Once mixed, treated wastes would be transported to a holding area for final curing and testing prior to ultimate disposal.
>
> **Utilities.** Stabilization units require a potable water source along with electricity and fuel, all available at TSD facilities.

The filter media and hazardous debris would be treated using stabilization at the TSD facility and disposed appropriately following treatment. The treated waste can range from a clay-like friable material suitable for backfill to a more rigid mass of concrete-like material. In either case, the stabilization process would immobilize contaminants in the waste stream.

7.2.2.2 **Technical Criteria Evaluation** The technical criteria evaluation for this alternative is identical to that for Alternative 3 with a few exceptions, which are described below.

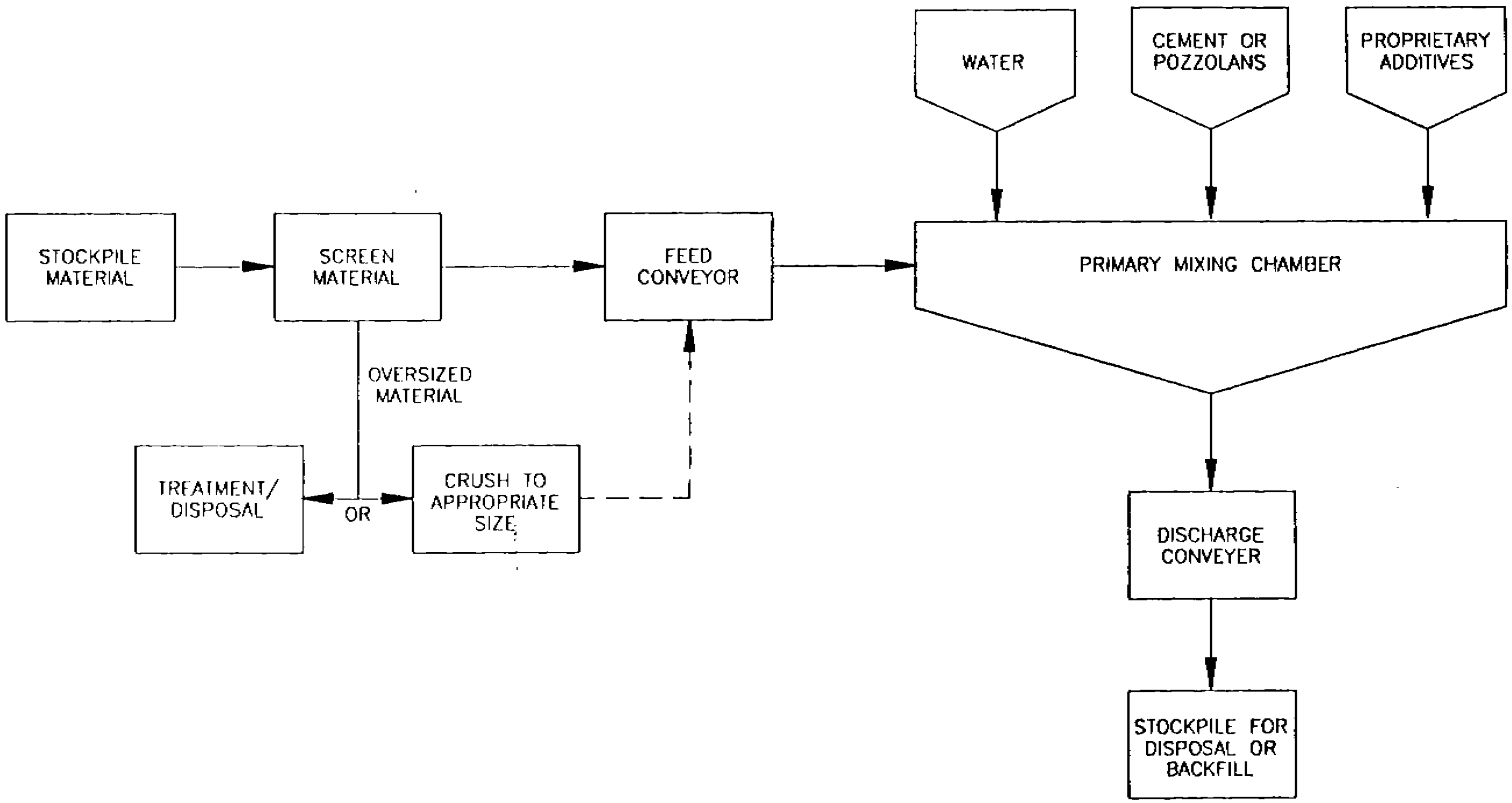

FIGURE 7-9
PROCESS FLOW DIAGRAM FOR A TYPICAL STABILIZATION UNIT

FOCUSED RI/FS REPORT FOR OU2

NAS JACKSONVILLE JACKSONVILLE, FLORIDA

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Compliance with ARARs. It is expected that site activities would comply with the ARARs summarized in Section 5.1. Treatment of filter media to regulatory standards will meet RCRA and other Federal and State hazardous waste management requirements.

Reduction in Mobility, Toxicity, or Volume. This alternative would reduce the mobility and volume of contaminated media at PSCs 41 and 43 because they would be removed from the sites.

Excavated filter media would be treated and disposed according to RCRA and other applicable Federal and State requirements. Treatment of contaminated filter media would reduce the mobility of filter media contaminants in the environment because they would be entrapped in a solid or semi-solid treated matrix. The toxicity of the contaminants would not be affected because the treatment for inorganic wastes does not render waste constituents nonhazardous via chemical reaction. The volume of contaminated media would increase because of the addition of setting agents necessary for treatment.

Cost. Table 7-4 presents the summary of the cost estimate for this alternative. Costs are based on a 5-week project lifespan. The total cost of Alternative 4, including contingency, was estimated to be $2,220,000. Capital costs were estimated at $1,836,000. No present-worth analyses were completed due to the brief project duration. Prices were rounded to the nearest $1,000.

7.2.3 Alternative 5: Excavation, Onsite Treatment of Filter Media and Hazardous Debris, Onsite Redeposition of Treated Wastes, and Offsite Disposal of Nonhazardous Debris

7.2.3.1 Description This alternative would consist of excavation of hazardous and nonhazardous debris and filter media (including soil) from PSCs 41 and 43, followed by onsite treatment of filter media and hazardous debris via stabilization. Treated wastes would be subsequently backfilled into excavated areas at PSCs 41 and 43. Nonhazardous debris would be transported offsite to a solid waste disposal facility.

A process-flow diagram for this alternative is presented on Figure 7-10. The proposed site layout for this alternative is depicted on Figure 7-11. Major activities associated with this alternative include:

- site preparation (including removal of surface [i.e., nonhazardous] debris),
- excavation of contaminated filter media and subsurface (i.e., hazardous) debris,
- onsite stabilization of filter media and hazardous debris,
- onsite redeposition of stabilized wastes,
- offsite disposal of nonhazardous debris, and
- site restoration.

Table 7-4
Summary of Cost Estimate for Alternative 4

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

	Amount
<u>**Capital Costs**</u>	
Direct	
Site preparation	$19,000
Excavation of filter media and hazardous debris	$29,000
Disposal of surface debris	$10,000
Treatment and disposal of filter media and hazardous debris	$1,463,000
Sampling and analysis	$36,000
Backfill of excavations	$29,000
Restoration activities	$10,000
Total Direct Cost	$1,596,000
Indirect	
Health and safety (5 percent of direct cost)	$80,000
Legal, administrative, and permitting (10 percent of direct cost)	$160,000
Total Indirect Cost	$240,000
<u>**Total Capital Cost**</u>	$1,836,000
<u>**Operation and Maintenance (O&M) Costs**</u>	
Manhours for oversight	$14,000
<u>**Total O&M Cost**</u>	$14,000
<u>**Subtotal, Capital and O&M Costs**</u>	$1,850,000
Contingency (20 percent of subtotal)	$370,000
<u>**Total Cost of Alternative 4**</u>	$2,220,000

Notes: Prices are rounded to the nearest $1,000 for this estimate.

Health and safety cost assumes that site operations would be carried out in Level D personal protection equipment.

No present-worth analysis was completed because of the brief project duration.

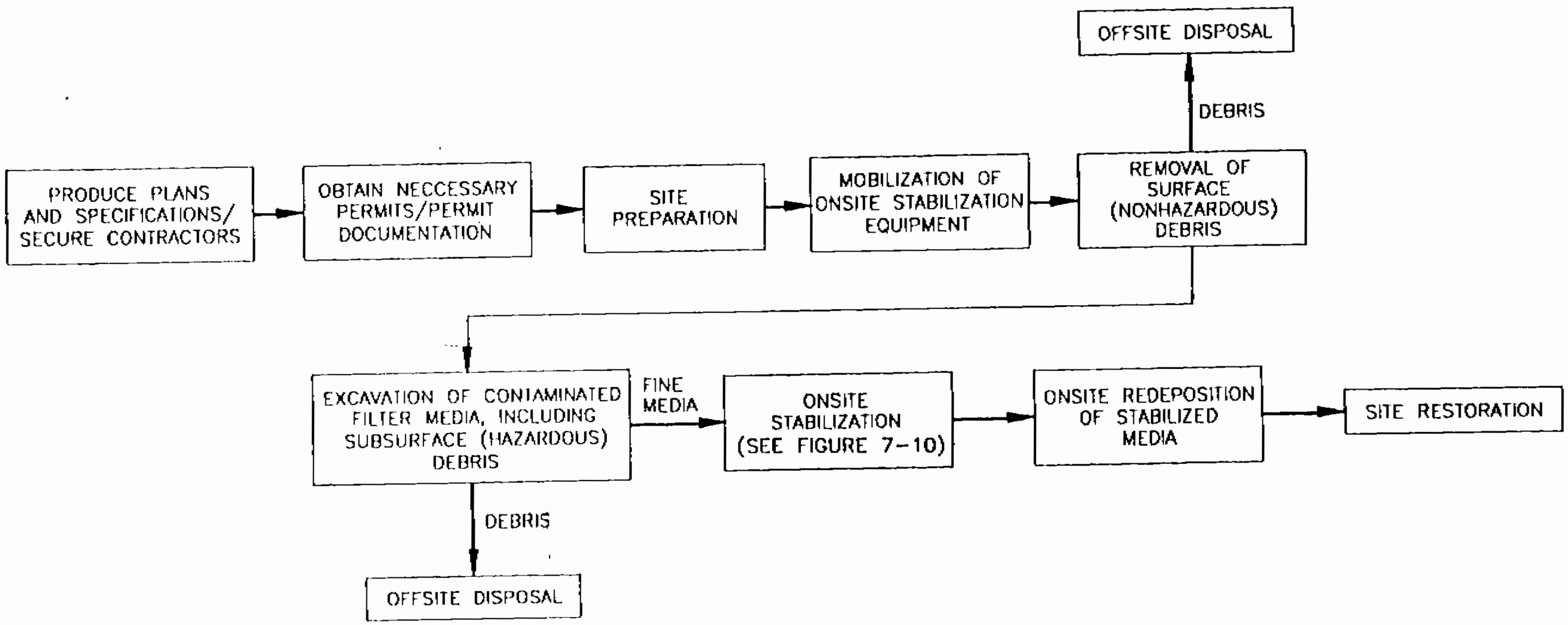

FIGURE 7-10
PROCESS FLOW DIAGRAM FOR ALTERNATIVE 5

FOCUSED RI/FS REPORT FOR OU2

NAS JACKSONVILLE
JACKSONVILLE, FLORIDA

41-43SC2/DRM/11-2-93

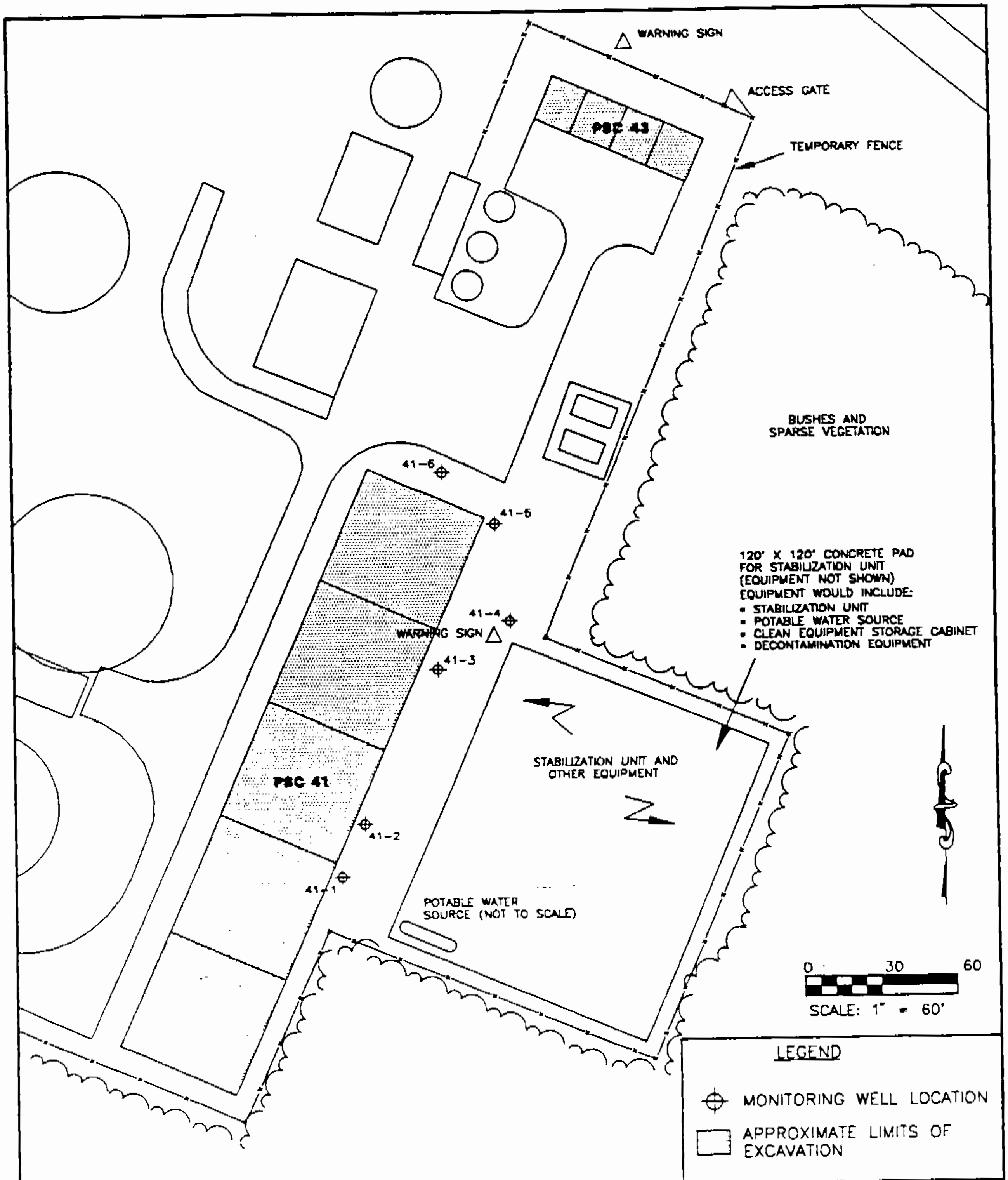

FIGURE 7-11
PROPOSED SITE LAYOUT FOR ALTERNATIVE 5

FOCUSED RI/FS REPORT FOR OU2

NAS JACKSONVILLE
JACKSONVILLE, FLORIDA

SLUDGE/DRM/8-2-94
FocRIFS.OU2
MVL.08.94

This alternative would be implemented similarly to Alternatives 3 and 4, with the following exceptions:

- site preparation,
- onsite stabilization of filter media and hazardous debris,
- onsite redeposition of stabilized wastes, and
- site restoration.

These activities are described in the following paragraphs.

Site Preparation. Site preparation would be similar to that described for Alternatives 3 and 4. However, some additional site preparatory activities would be required prior to initiation of onsite treatment via stabilization. These activities include

- securing permit(s) for onsite treatment (if necessary), and

- construction of a 20-foot by 120-foot concrete pad for staging of onsite stabilization equipment.

Permitting. As previously discussed, permits are typically waived for remedial actions conducted at CERCLA sites; however, the intent of any construction or work permits would need to be met during remedial action implementation. The permits that may be required for onsite treatment are described in Subsection 7.1.3.1.

Staging of Onsite Stabilization Equipment. A 20-foot by 20-foot concrete pad for laydown of the onsite stabilization unit and necessary support equipment would be constructed in the vicinity of PSCs 41 and 43 during site preparatory activities. Once the pad was constructed, stabilization equipment would then be mobilized to the area and staged on the pad. Decontamination of heavy equipment would also take place on this pad. The pad would be graded toward a sump for collection of generated water.

Onsite Stabilization of Filter Media and Hazardous Debris. Filter media would be treated onsite via stabilization. A typical process-flow diagram for stabilization is provided on Figure 7-10.

Stabilization is a treatment process by which contaminants are immobilized in a low-permeability matrix to prevent migration. The treated matrix produced by an onsite stabilization unit is typically a friable, clay-like material suitable for use as backfill. It is a demonstrated technology for soil containing inorganic contaminants such as those present at PSCs 41 and 43. The stabilization process is similar to that described for Alternative 4 except for some extra considerations for onsite treatment, which are discussed in the following paragraphs.

Pretreatment. Filter media and hazardous debris would be excavated and stockpiled on the concrete pad. The excavation rate would be controlled to match processing rates, resulting in a small stockpile area. Typical processing rates for mobile stabilization units are 20 to 150 tons per hour. Wastes in the stockpile area would be covered temporarily to prevent dust emissions and rainwater infiltration and percolation. Prior to treatment, wastes would be passed through a screen that separates oversized material (typically of a nominal diameter of 4 inches to 6 inches) from the finer media. Oversized material would be crushed and added to the finer waste stream.

Primary Treatment. Once screened, wastes would enter the primary mixing chamber via a conveyor belt. Setting agents would be added to the waste as discussed for Alternative 4. Once mixed, treated wastes would be staged until pickup for backfilling occurs. Samples of the treated media would be collected at this time for offsite laboratory analysis to demonstrate the efficacy of the treatment process. It is desirable to allow curing to take place after backfill and compaction has occurred. Therefore, processing and backfill rates would be staggered so that treated media would not need to be staged for long periods of time.

Utilities. Utilities typically required for an onsite stabilization unit include water (5 to 10 gallons per minute) and fuel (typically provided by the vendor).

Support Equipment. Stabilization units are typically transported to a site via flatbed trucks and would be staged on the constructed concrete pad. Minimal support equipment is needed because the operation of the system is fairly simple.

Onsite Redeposition of Stabilized Wastes. Stabilized wastes would be sampled and analyzed at an offsite laboratory to demonstrate the efficacy of the treatment process. Once demonstration of efficacy has been achieved (i.e., tests show that the concentrations of the treated material are below land disposal restriction [LDR] requirements), treated wastes would be backfilled and compacted in place into excavated areas at PSCs 41 and 43. It is preferable to allow final curing of the stabilized product to occur after the material has been compacted in place. When it is allowed to cure in place, the resulting material will have a higher compressive strength than if it were allowed to cure prior to backfill and compaction.

Site Restoration. Site restoration for this alternative would be implemented similarly to that described for Alternatives 3 and 4, except that treated wastes instead of clean fill would be used as backfill material in excavated areas. Additional restorative activities for this alternative are demobilization of the stabilization equipment and removal of the concrete staging pad. The concrete would be disposed at an RCRA-permitted solid waste landfill facility.

7.2.3.2 Technical Criteria Evaluation The technical criteria evaluation is similar to that discussed for Alternative 4 with the exceptions noted in the following paragraphs.

Compliance with ARARs. It is expected that site activities outlined for this alternative would comply with the ARARs summarized in Section 5.1. All generated wastes produced during the removal activities would be managed and disposed in accordance with RCRA and other appropriate Federal and State regulations. The intent of construction and work permits would be met during onsite treatment via stabilization.

Long-term Effectiveness and Permanence. Stabilization has been chosen by USEPA as the basis for the treatment standards of F006 and F019 listed waste. Stabilization has been demonstrated as a containment or encapsulation technology for metals contamination. Although there is little long-term performance data on this technology, the scientific data available indicates that properly designed systems will be effective in the long term.

Reduction in Mobility, Toxicity, or Volume. Filter media and hazardous debris would be treated onsite via stabilization. The stabilization process typically increases the volume of contaminated media by 20 to 30 percent because stabilizing agents are added to the media requiring treatment. The mobility of media contaminants is reduced because the contaminants become entrapped in the treated matrix; however, the toxicity of the filter media is not affected because stabilization is a physical treatment process that does not chemically destroy or inactivate contaminants.

Short-term Effectiveness. Treatment of contaminated media from PSCs 41 and 43 would minimize potential future exposure of human and ecological receptors to contaminants in these media, and would immediately reduce potential sources of groundwater contamination.

OU 2 is generally a limited access area; however, access to PSCs 41 and 43 would be further limited during site preparation, excavation, treatment, and restorative activities. Air monitoring would be required during remedial activities and, if necessary, dust control would be implemented. All activities would be conducted in the appropriate level of PPE.

Implementability. This remedial alternative is based on well-established engineering practices and equipment. Equipment and services necessary for the excavation, treatment, and backfill of the debris and filter media are available from local vendors.

Approximately 2 weeks would be necessary for site preparation and removal of surface debris. Upon completion of site preparatory activities, approximately 4 weeks would be necessary for excavation of hazardous debris and filter media, treatment of fine filter media, demonstration of treatment efficacy, and backfill of material into excavated areas, along with disposal of excavated debris to a solid waste disposal facility. One week would be necessary for completion of restorative activities at PSCs 41 and 43.

Cost. Table 7-6 presents the summary of the cost estimates for this alternative. Costs are based on a 7-week project lifespan. Total cost, including contingency, was estimated to be $558,000. Capital costs were estimated to be $444,000. No operation and maintenance (O&M) costs or present-worth analyses were included in the cost estimate due to the short project lifespan. Prices were rounded to the nearest $1,000.

Table 7-5
Summary of Cost Estimate for Alternative 5

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Capital costs			Amount
	Direct		
		Site preparation	$35,000
		Mobilization of stabilization unit and trial test	$15,000
		Excavation of filter media and hazardous debris	$29,000
		Onsite treatment of filter media and hazardous debris	$171,000
		Backfill of treated wastes	$29,000
		Sampling and analysis	$54,000
		Disposal of surface debris	$10,000
		Restoration activities	$43,000
	Total Direct Cost		$386,000
	Indirect		
		Health and safety (5 percent of direct cost)	$19,000
		Legal, administrative, and permitting (10 percent of direct cost)	$39,000
	Total Indirect Cost		$58,000
Total Capital Cost			$444,000
Operation and Maintenance (O&M) Costs			
	Manhours for oversight		$21,000
Total O&M Cost			$21,000
Subtotal, Capital and O&M Costs			$465,000
		Contingency (20 percent of subtotal)	$93,000
Total Cost of Alternative 5			$558,000

Notes: Prices are rounded to the nearest $1,000 for this estimate.

Health and safety cost assumes that site operations would be carried out in Level D personal protection equipment.

No present-worth analysis was completed because of the brief project duration.

8.0 COMPARATIVE ANALYSES OF REMEDIAL ALTERNATIVES

The purpose of comparative analysis is to identify the advantages and disadvantages of the alternatives presented in Chapter 7.0 relative to one another. This analysis uses the criteria on which the detailed analyses were completed. Evaluating the relative performance of each alternative aids in the selection of a interim remedy for source control at PSCs 2, 41, and 43.

Tables 8-1 and 8-2 summarize the comparative analyses for PSC 2 and PSCs 41 and 43, respectively. A summary of the distinguishing characteristics and features of each alternative is provided in the following sections.

8.1 SUMMARY OF ANALYSES FOR PSC 2. All alternatives for PSC 2 provide for the overall protection of human health and the environment by removing soil from the site, thereby reducing the contaminants, preventing exposure, and reducing a source of groundwater contamination. However, both Alternatives 1 and 2 provide further reduction of contaminants in soil because they propose to treat soil prior to disposal. The alternatives are in compliance with ARARs as long as the petroleum-contaminated soil does not contain a hazardous waste.

Alternatives 1 and 2 reduce soil contamination via thermal treatment, which has been used successfully at similar sites. However, implementation of Alternative 2 would not pose a risk of exposure to soils to offsite populations because soil would be treated onsite. Both of the proposed alternatives had estimated costs within the same order of magnitude.

8.2 SUMMARY OF ANALYSES FOR PSCs 41 AND 43. All alternatives proposed for PSCs 41 and 43 provide overall protection of human health and the environment by removing filter media from the sludge drying beds, thereby preventing exposure, reducing onsite contaminants, and reducing a source of groundwater contamination. Both Alternatives 4 and 5 provide reduction of mobility of filter media contaminants via treatment. All contaminated media generated by the proposed interim remedial actions would be managed in compliance with ARARs.

If Alternative 3 were implemented, contaminated filter media would be transferred to an offsite disposal facility. Alternatives 4 and 5 reduce the mobility of filter media contaminants via stabilization, a demonstrated technology for treatment of inorganic contaminants. However, implementation of Alternative 5 would not pose a risk of exposure to filter media to offsite populations because media would be treated onsite. The estimated costs for Alternatives 3 and 4 were an order of magnitude higher than that for Alternative 5.

Table 8-1
Comparative Analyses of Remedial Alternatives for PSC 2

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Criterion	**Alternative 1:** LNAPL recovery and excavation and offsite thermal treatment and disposal of contaminated soil and offsite disposal of LNAPL	**Alternative 2:** LNAPL recovery and excavation and onsite thermal treatment of contaminated soil, onsite redeposition of treated soil and offsite disposal of LNAPL
Overall Protection of Human Health and the Environment		
How risks are eliminated, reduced, or controlled	Alternative 1 would provide an increased level of protection of human health and the environment. Risks are reduced by removing contaminants from the site, thereby preventing exposure and reducing a source of groundwater contamination. Worker health and safety requirements would be maintained. Subsequent risks at disposal facility are reduced through offsite treatment for removal of soil contaminants.	Analysis is the same as for Alternative 1. Though excavated soil remains onsite, risks are reduced through treatment to remove contaminants of concern. Unlike Alternative 1, implementation of this alternative involves no risks posed to offsite populations by transportation of contaminated soil.
Short-term or cross-media effects	No short-term or cross-media effects are expected for the implementation of this alternative.	Analysis is the same as for Alternative 1.
Compliance with ARARs		
Chemical-, location-, and action-specific ARARs	Contaminants would be removed from soil via offsite treatment to levels specified in State ARARs for petroleum-contaminated soil. If soil is found to contain hazardous wastes, disposal ARARs would not be met by this alternative. LNAPL would be recovered from the site to the extent practicable.	Contaminants would be removed from soil via onsite treatment to levels specified in State ARARs for petroleum-contaminated soil. Air emissions from onsite treatment unit may require treatment to comply with ARARs. LNAPL would be removed from the site to the extent practicable.
Long-term Effectiveness and Permanence		
Magnitude of residual risk	Reduction in risk at PSC 2 is permanent because contaminants would be removed from the site. Contaminants remaining below the specified action levels for this remedial action would pose a minimal direct-contact hazard and would be addressed during the overall FS for OU 2 if they pose a risk to groundwater uses. Risk associated with soil contaminants is reduced further through treatment for removal of these contaminants.	Analysis is the same as for Alternative 1. Onsite redeposition of treated soil leaves no residual.
Adequacy of controls	LNAPL recovery followed by excavation and subsequent offsite disposal of soil and LNAPL would provide immediate and long-term source control.	Analysis is the same as for Alternative 1. The thermal treatment unit would be equipped with appropriate shut-down mechanisms if problems with implementation arise.
Reliability of controls	Excavation of soil is highly reliable. Offsite disposal reliability is acceptable. Offsite treatment equipment is also generally reliable.	Analysis is the same as for Alternative 1. Optimization of the thermal treatment parameters during the first week of operation would enhance reliability of the treatment operation, as would proper and continual maintenance of the unit.

See notes at end of table.

Table 8-1 (Continued)
Comparative Analyses of Remedial Alternatives for PSC 2

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Criterion	**Alternative 1:** LNAPL recovery and excavation and offsite thermal treatment and disposal of contaminated soil and offsite disposal of LNAPL	**Alternative 2:** LNAPL recovery and excavation and onsite thermal treatment of contaminated soil, onsite redeposition of treated soil and offsite disposal of LNAPL
Reduction of Mobility, Toxicity, or Volume		
Treatment process and remedy	Contaminated soil would be thermally treated offsite at a stationary State-permitted facility.	Contaminated soil would be treated onsite via thermal treatment.
Amount of hazardous material destroyed or treated	Approximately 3,400 cubic yards (4,600 tons) of contaminated soil would be treated under this alternative.	Analysis is the same as for Alternative 1.
Reduction of mobility, toxicity, or volume through treatment	Treatment of soil via thermal treatment would achieve significant and permanent reduction in toxicity, mobility, and volume of soil contaminants. VOCs would be mobilized to the vapor phase and destroyed in an afterburner.	Analysis is the same as for Alternative 1, except that reductions in mobility, toxicity, and volume of contaminants would occur within site boundaries.
Irreversibility of treatment	Removal of VOCs from soil via thermal treatment is irreversible.	Analysis is the same as for Alternative 1.
Type and quantity of treatment residual	Approximately 1,000 gallons of water from decontamination would require treatment. Treated soil would be disposed by the offsite treatment vendor.	Approximately 1,000 gallons of water from decontamination would require treatment. Unlike Alternative 1, treated soil would be reused onsite as backfill in the excavated areas at PSC 2.
Short-Term Effectiveness		
Protection of community during remedial action	If required, dust control would be implemented during excavation of soil. Volatilization of soil contaminants would be monitored during excavation and transport of soil, and controlled with foam and covering. Work area would be fenced off to control access.	Analysis is the same as for Alternative 1. Air emissions during thermal treatment would be monitored and controlled.
Protection of workers during remedial actions	Workers would be required to follow an approved Health and Safety Plan. There are risks associated with open hole excavation and volatilization of contaminants during excavation.	Analysis is the same as for Alternative 1. Experienced, trained personnel would be responsible for operation of the thermal treatment unit.
Environmental effects	No effects expected to surface water or groundwater. Releases of contaminants or particulates to air are expected to have minimal environmental effect.	Analysis is the same as for Alternative 1. Air emissions during thermal treatment would be monitored and controlled, but would have minimal environmental effects.
Time until remedial action objectives are achieved	Approximately 5 weeks are necessary to meet the remedial action objectives for PSC 2.	Approximately 6 weeks are necessary to meet the remedial action objectives for PSC 2.

See notes at end of table.

Table 8-1 (Continued)
Comparative Analyses of Remedial Alternatives for PSC 2

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Criterion	**Alternative 1:** LNAPL recovery and excavation and offsite thermal treatment and disposal of contaminated soil and offsite disposal of LNAPL	**Alternative 2:** LNAPL recovery and excavation and onsite thermal treatment of contaminated soil, onsite redeposition of treated soil and offsite disposal of LNAPL
Implementability		
Ability to construct technology	Soil would be transported to a prefabricated offsite stationary thermal treatment unit.	Thermal treatment units are delivered prefabricated and require little construction or site preparation.
Reliability of technology	Offsite thermal treatment has been implemented successfully at other sites with similar waste streams. Regulated landfills for treated soil are designed and constructed to minimize leaching of contaminants.	Onsite thermal treatment has been implemented successfully at other sites with similar waste streams. Unlike regulated landfills, onsite redeposition does not have leaching or runoff control protocols.
Ease of undertaking additional remedial action, if necessary	Implementation of this alternative would pose no impediment to additional remediation.	Analysis is the same as for Alternative 1. However, concrete pad constructed for staging of the thermal treatment unit would require removal before site restoration.
Monitoring considerations	Air monitoring would be conducted as appropriate during excavation and transportation.	Analysis is the same as for Alternative 1. Thermal treatment system would be monitored for gaseous releases. Treated soil would be sampled and analyzed to demonstrate compliance with remedial objectives.
Coordination with other agencies	Coordination with NAS Jacksonville personnel would be required for the duration of remedial activities. Coordination with county, USEPA, FDEP, and landfill regulatory agencies necessary. Coordination with offsite stationary thermal treatment facility would be necessary also.	Analysis is the same as for Alternative 1, except that coordination with landfill agencies would not be necessary because treated soil would be redeposited onsite. Coordination with onsite thermal treatment vendors would be required also.
Availability and capacity of treatment, storage, and disposal services	Availability of permitted stationary offsite thermal treatment facilities for contaminated soil would be required at the time of remedial action. Availability of landfills permitted to accept treated soils would be required also.	Availability of thermal treatment unit at time of remedial action is necessary. Unlike Alternatives 1 and 2, availability of offsite landfills is not required.
Availability of technologies, equipment, and specialists	Construction contractors, equipment, and laboratories are available. Offsite stationary thermal treatment facilities are also available locally, but would require coordination.	Analysis is the same as for Alternative 1. Thermal treatment vendors are generally available, but would require schedule coordination.
Ability to obtain approvals from other agencies	Approval from State and USEPA necessary prior to offsite disposal of contaminated soil. Approval from State and USEPA necessary prior to offsite treatment of contaminated soils.	Approval from State and USEPA necessary prior to onsite treatment. If results of the pilot treatment test are acceptable, approval should not be difficult. Approval to backfill treated soil onsite would also be necessary; sampling and analysis of soil to demonstrate efficacy of onsite treatment would be required in order to get approval.

See notes at end of table.

Table 8-1 (Continued)
Comparative Analyses of Remedial Alternatives for PSC 2

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Criterion	**Alternative 1:** LNAPL recovery and excavation and offsite thermal treatment and disposal of contaminated soil and offsite disposal of LNAPL	**Alternative 2:** LNAPL recovery and excavation and onsite thermal treatment of contaminated soil, onsite redeposition of treated soil and offsite disposal of LNAPL
Cost		
Capital costs	$567,000	$491,00
O&M Cost	$14,000	$21,000
Total present worth (including contingency)	$697,000	$614,000

Notes: PSC = potential source of contamination.
RI/FS = Remedial Investigation and Feasibility Study.
NAS = Naval Air Station.
ARARs = applicable or relevant and appropriate requirements.
LNAPL = light nonaqueous-phase liquid.
OU = operable unit.
VOCs = volatile organic compounds.
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act.
USEPA = U.S. Environmental Protection Agency.
FDEP = Florida Department of Environmental Protection.
RCRA = Resource Conservation and Recovery Act.
O&M = operating and maintenance.

Table 8-2
Comparative Analyses of Remedial Alternatives for PSCs 41 and 43

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Criterion	**Alternative 3:** Excavation and offsite disposal of all media	**Alternative 4:** Excavation, offsite treatment and disposal of filter media and hazardous debris, offsite disposal of nonhazardous debris	**Alternative 5:** Excavation, onsite treatment of filter media and hazardous debris, onsite redeposition of treated wastes, offsite disposal of nonhazardous debris
Overall Protection of Human Health and the Environment			
How risks are eliminated, reduced, or controlled	Alternative 3 would provide an increased level of protection of human health and the environment. Risks are reduced by removing contaminants from the site, thereby preventing exposure and reducing a source of groundwater contamination. Worker health and safety requirements would be maintained.	Analysis is the same as for Alternative 3.	Analysis is the same as for Alternative 3. Though excavated filter media remain onsite, risks are reduced through treatment to immobilize contaminants of concern. Unlike Alternatives 3 and 4, no risks are posed to offsite populations by transportation of contaminated filter media.
Short-term or cross-media effects	No short-term or cross-media effects are expected for the implementation of this alternative.	Analysis is the same as for Alternative 3.	Analysis is the same as for Alternative 3. Contaminants in stabilized media are not expected to leach from treated matrix.
Compliance with ARARs			
Chemical-, location-, and action-specific ARARs	RCRA LDR ARARs for hazardous media would be met.	ARARs for disposal of hazardous and nonhazardous media would be met. Also, contaminated filter media would be treated via stabilization, for wastes at PSCs 41 and 43.	Analysis is the same as for Alternative 4. Also, contaminated filter media would be treated via stabilization for wastes at the sites.
Long-term Effectiveness and Permanence			
Magnitude of residual risk	Reduction in risk at PSCs 41 and 43 is permanent because contaminants would be removed from the site. Contaminants remaining would pose a minimal direct-contact hazard and would be addressed during the overall FS for OU 2 if they pose a risk to groundwater uses.	Analysis is the same as for Alternative 3. Risk associated with filter media contaminants is reduced further through treatment to immobilize these contaminants.	Analysis is the same as for Alternative 3. Risk associated with filter media contaminants is reduced further through treatment to immobilize these contaminants. Onsite redeposition of treated media poses minimal direct contact risk.
Adequacy of controls	Excavation and subsequent offsite disposal of all media would provide immediate and long-term source control.	Excavation and subsequent offsite treatment and/or disposal of media would provide immediate and long-term source control.	Analysis is the same as for Alternative 3.
Reliability of controls	Excavation of media is highly reliable. Reliability of disposal services is acceptable.	Excavation of media is highly reliable. Reliability of treatment and disposal services are acceptable.	Analysis is the same as for Alternative 3, except that offsite disposal of contaminated wastes would not be necessary. Stabilization is a well-demonstrated technology and mobile units are generally reliable.

See notes at end of table.

Table 8-2 (Continued)
Comparative Analyses of Remedial Alternatives for PSCs 41 and 43

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Criterion	**Alternative 3:** Excavation and offsite disposal of all media	**Alternative 4:** Excavation, offsite treatment and disposal of filter media and hazardous debris, offsite disposal of nonhazardous debris	**Alternative 5:** Excavation, onsite treatment of filter media and hazardous debris, onsite redeposition of treated wastes, offsite disposal of nonhazardous debris
Reduction of Mobility, Toxicity, or Volume			
Treatment process and remedy	Excavated filter media and debris would be disposed offsite without treatment.	Excavated filter media and hazardous debris would be treated offsite via stabilization and subsequently disposed. Nonhazardous debris would not be treated but would be decontaminated onsite prior to offsite disposal.	Filter media and hazardous debris would be treated using onsite stabilization equipment and backfilled onsite. Nonhazardous debris would not be treated but would be decontaminated prior to offsite disposal.
Amount of hazardous material destroyed or treated	Neither contaminated filter media nor debris would be treated under this alternative.	Approximately 2,450 cubic yards of filter media and 114 tons of debris would be treated offsite under this alternative. Nonhazardous debris would not be treated.	Approximately 2,450 cubic yards of filter media and 114 tons of hazardous debris would be treated onsite under this alternative. Nonhazardous debris would not be treated.
Reduction of mobility, toxicity, or volume through treatment	Toxicity, mobility, and volume of contaminants in filter media would be reduced onsite but would be transferred to an offsite landfill.	Treatment of filter media and hazardous debris via stabilization would achieve significant reduction in mobility of contaminants. Inorganic compounds would become entrapped in a low-permeability matrix. However, addition of chemical setting agents to the wastes would increase the volume of contaminated media. The toxicity of contaminants would not be reduced because they are entrapped rather than destroyed.	Analysis is the same as for Alternative 4.
Irreversibility of treatment	No treatment is used, but disposal is generally irreversible.	Stabilization is a potentially reversible treatment. Offsite disposal is generally irreversible.	Analysis is the same as for Alternative 4.
Type and quantity of treatment residual	Approximately 1,000 gallons of water from decontamination would require treatment.	Approximately 1,000 gallons of water from decontamination would require treatment.	Approximately 1,000 gallons of water from decontamination would require treatment. Treated wastes would be reused as backfill in excavated areas at PSCs 41 and 43.

See notes at end of table.

Table 8-2 (Continued)
Comparative Analyses of Remedial Alternatives for PSCs 41 and 43

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Criterion	**Alternative 3:** *Excavation and offsite disposal of all media*	**Alternative 4:** Excavation, offsite treatment and disposal of filter media and hazardous debris, offsite disposal of nonhazardous debris	**Alternative 5:** Excavation, onsite treatment of filter media and hazardous debris, onsite redeposition of treated wastes, offsite disposal of nonhazardous debris
Short-Term Effectiveness			
Protection of community during remedial action	If required, dust control would be implemented during excavation of filter media. Volatilization of filter media contaminants should not be problematic because VOC contamination is not extensive at the sites. Work areas would be fenced off to control access.	Analysis is the same as for Alternative 3.	Analysis is the same as for Alternative 3, except that treated wastes remain within site boundaries.
Protection of workers during remedial actions	Workers would be required to follow an approved Health and Safety Plan. There are human safety risks associated with open hole excavation.	Analysis is the same as for Alternative 3.	Analysis is the same as for Alternative 3. Trained personnel would be responsible for the operation of the stabilization equipment.
Environmental effects	No effects expected to surface water or groundwater. Releases of contaminants or particulates to air are expected to have minimal environmental effect.	Analysis is the same as for Alternative 3.	Analysis is the same as for Alternative 3. If curing conditions are optimized and the chemical environment remains the same, contaminants should not leach from stabilized filter media that would be backfilled onsite.
Time until remedial action objectives are achieved	Approximately 5 weeks are necessary to meet the remedial action objectives for PSCs 41 and 43.	Approximately 5 weeks are necessary to meet the remedial action objectives for PSCs 41 and 43.	Approximately 7 weeks are necessary to meet the remedial action objectives for PSCs 41 and 43.
Implementability			
Ability to construct technology	No construction would be required for implementation of this alternative.	Analysis is the same as for Alternative 3.	Wastes would be treated using prefabricated stabilization equipment, a well-demonstrated technology that uses common equipment and requires minimal construction or site preparation.

See notes at end of table.

Table 8-2 (Continued)
Comparative Analyses of Remedial Alternatives for PSCs 41 and 43

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Criterion	**Alternative 3:** Excavation and offsite disposal of all media	**Alternative 4:** Excavation, offsite treatment and disposal of filter media and hazardous debris, offsite disposal of nonhazardous debris	**Alternative 5:** Excavation, onsite treatment of filter media and hazardous debris, onsite redeposition of treated wastes, offsite disposal of nonhazardous debris
Reliability of technology	Regulated landfills are designed and constructed to minimize leaching of contaminants.	Offsite stabilization has been used successfully with similar waste streams. Regulated landfills are designed and constructed to minimize leaching of contaminants.	Onsite stabilization has been implemented successfully at other sites with similar waste streams. Unlike regulated landfills, onsite redepostion of treated media does not have leaching or runoff control protocols.
Ease of undertaking additional remedial action, if necessary	Implementation of this alternative would pose no impediment to additional remediation.	Analysis is the same as for Alternative 3.	Care would have to be taken to avoid unnecessary disturbance of backfilled treated wastes when undertaking additional investigations or remedial actions. Disturbing backfilled areas is undesirable because it would provide pathways for reversal of treatment and weakening of the structural integrity of the stabilized media.
Monitoring considerations	Air monitoring would be conducted as appropriate during excavation and transportation.	Analysis is the same as for Alternative 3.	Analysis is the same as for Alternative 3. Air monitoring would also be required during stabilization of wastes. Treated wastes would be sampled and analyzed to demonstrate compliance with TC leaching standards for PSCs 41 and 43.
Coordination with other agencies	Coordination with NAS Jacksonville personnel would be required for the duration of remedial activities. Coordination with county, USEPA, FDEP, and landfill regulatory agencies necessary.	Analysis is the same as for Alternative 3. Coordination with offsite stabilization vendors would be required.	Analysis is the same as for Alternative 3. Coordination with mobile stabilization vendors would be required.

See notes at end of table.

Table 8-2 (Continued)
Comparative Analyses of Remedial Alternatives for PSCs 41 and 43

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Criterion	**Alternative 3:** Excavation and offsite disposal of all media	**Alternative 4:** Excavation, offsite treatment and disposal of filter media and hazardous debris, offsite disposal of nonhazardous debris	**Alternative 5:** Excavation, onsite treatment of filter media and hazardous debris, onsite redeposition of treated wastes, offsite disposal of nonhazardous debris
Availability and capacity of treatment, storage, and disposal services	Availability of landfills permitted to accept excavated filter media, and hazardous and nonhazardous debris would be required at the time of remedial action.	Availability of offsite stabilization equipment for contaminated media would be required at the time of remedial action. Availability of landfills permitted to accept nonhazardous debris would be required also.	Availability of stabilization equipment for contaminated media would be required at the time of remedial action. Availability of landfills permitted to accept nonhazardous debris would be required also.
Availability of technologies, equipment, and specialists	Construction contractors, equipment, and laboratories are available.	Analysis is the same as for Alternative 3. Stabilization equipment and specialists are also generally available, but would require coordination.	Analysis is the same as for Alternative 3. Mobile stabilization equipment and specialists are also generally available, but would require coordination.
Ability to obtain approvals from other agencies	Approval from State and USEPA are necessary prior to offsite disposal of contaminated filter media and debris.	Approvals from State and USEPA are necessary prior to offsite treatment. If results of the pilot treatment test are acceptable, approval should not be difficult.	Approvals from State and USEPA are necessary prior to onsite treatment. If results of the pilot treatment test are acceptable, approval should not be difficult. Approval to backfill treated filter media onsite would also be necessary; sampling and analysis of filter media to demonstrate efficacy of onsite treatment would be required in order to get approval.
Cost			
Capital costs	$1,706,000	$1,836,000	$444,000
O&M Costs	$14,000	$14,000	$21,000
Total present worth (including contingency)	$2,064,000	$2,220,000	$558,000

Notes: PSC = potential source of contamination.
RI/FS = Remedial Investigation and Feasibility Study.
NAS = Naval Air Station.
ARARs = applicable or relevant and appropriate requirements.
OU = operable unit.
VOCs = volatile organic compounds.
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act.
USEPA = U.S. Environmental Protection Agency.
FDEP = Florida Department of Environmental Protection.
TSD = treatment, storage, and disposal.
RCRA = Resource Conservation and Recovery Act.
TC = toxicity characteristic.
BDAT = best demonstrated available technology.
O&M = operating and maintenance.

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APPENDIX A

Field Screening Analytical Results

Field Screening Equipment

The following paragraphs provide brief summaries of the methods and equipment used for screening samples during the Focused Remedial Investigation (RI) field activities.

Atomic Absorption (AA) AA spectroscopy was used to screen for total soil arsenic, cadmium, chromium, lead, and nickel. Samples were brought to the field office, prepared that day, and analyzed the following day. Samples were analyzed with a Perkin-Elmer™ 3100 AA model spectrometer. Instrument detection limits were determined for each element. These were in the low parts per million range.

Gas Chromatograph (GC) Samples were screened for purgeable volatile organics using a Hewlett Packard™ 5890 Series II GC in conjunction with a Tekmar™ LSC-2000 purge-and-trap system. The system is controlled by a microcomputer Chem Station™ connected to an HP LaserJet™ III printer. This system can detect volatile organic compounds (VOCs) in soil or water in the low parts per billion range. Samples were screened for the following purgeable VOCs: 1,1,1-trichloroethane, 1,1-dichloroethane, benzene, chlorobenzene, ethylbenzene, methylene chloride, tetrachloroethene, toluene, trichloroethene, vinyl chloride, cis-1,2-dichloroethene, m/p-xylene, o-xylene, and trans-1,2-dichloroethene.

Infrared (IR) Spectroscopy Samples were screened for total petroleum hydrocarbon (TPH) by IR spectroscopy using a Foxboro Miran™ fixed filter IR unit. The method protocol is adapted from U.S. Environmental Protection Agency (USEPA) Method 418.1, with a modified micro-extraction suitable for soil analysis. This method is used to determine gross contamination because of the large number of compounds that are collectively measured by this technique. These results may not directly correlate with routine laboratory analysis, e.g., target compound list (TCL) organics analysis, due to the better specificity of laboratory methods used.

Table A-1
Summary of Positive Detections in Soil Analytical Results, Field Screening
Volatile Organics*
Operable Unit 2

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Identifier /Depth	1,1-Dichloro-ethane	trans-1,2-Dichloroethene	Benzene	Chlorobenzene	Ethylbenzene	m/p-Xylene	o-Xylene	Methylene Chloride	Tetrachlor-oethene	Toluene
Former Fire-fighting Training Area (PSC 2)										
OU2SB00401 /0-1'	--	--	--	--	--	70	--	--	--	--
OU2SB00801 /0-1'	--	--	75 M	110 JM	210 M	670 M	450 JM	--	--	--
OU2SB01001 /0-1'	--	--	17	78	--	7.7	4.6 J	--	--	--
OU2SB01701 /0-1'	--	--	27000	--	14000	38000	2800	--	--	11000
OU2SB03101 /0-1'	--	--	--	--	--	54 M	86 JM	--	--	--
OU2SB06601 /0-1'	--	--	--	--	--	--	1.8 JM	--	--	--
Domestic Waste Sludge Drying Bed (PSC 41)										
DDBSB00503 /2.5-3.5'	--	--	--	--	--	30	--	--	--	--
DDBSB00903 /3-4'	--	--	--	--	--	--	19	--	--	--
DDBSB01203 /3-4'	9.6	--	--	--	--	--	--	--	--	--
DDBSB02202 /2-3.5'	--	--	--	--	47	--	--	--	--	--
DDBSB02402 /2-4'	--	2 M	--	--	--	--	--	--	--	--
DDBSB02602 /2-3.5'	--	1.2 M	--	--	--	--	--	--	--	--
DDBSB02702 /2-3'	--	1.28 M	--	--	--	--	--	--	--	--
Industrial Waste Sludge Drying Bed (PSC 43)										
IDBSB00801 /2"-2'	--	--	--	--	--	--	--	1.2 B	--	--
IDBSB01001 /0-1'	--	--	--	--	--	--	12 JM	--	1.9 J	--
IDBSB01002 /3-5'	--	--	--	--	--	--	27 JM	--	--	--
IDBSB01201 /0-1'	--	--	--	--	--	--	--	--	2 B	--
IDBSB01202 /2-3.5'	--	--	--	--	--	--	--	--	2.5 B	--
IDBSB01301 /0-1'	--	--	--	--	--	--	--	--	2.3 B	--
IDBSB01302 /2-3.5'	--	--	--	--	--	--	--	--	4.4 B	--
IDBSB01401 /0-1'	--	--	--	--	--	--	--	--	3.5 B	--
IDBSB01402 /2-3.5'	--	--	--	--	--	--	--	--	2.5 B	--
IDBSB01502 /2-3.5'	--	--	--	--	--	--	--	--	2.3 B	--
IDBSB01601 /0-1'	--	--	--	--	--	--	--	--	3.6 B	--

Notes: Analytical results expressed in $\mu g/kg$ dry weight.
J = Reported value is an estimated quantity; M = Matrix spike recoveries do not meet criteria; B = Target compound is detected in the associated method blank.
*Field screening of 14 purgeable volatile organic compounds (VOCs) using purge and trap gas chromatography done on 23 samples from PSC 2, 69 samples from PSC 41 and 36 samples from PSC 43.

Table A-2
Summary of Positive Detections in Soil Analytical Results, Field Screening
Inorganics - Arsenic, Cadmium, Chromium, Lead and Nickel
Operable Unit 2

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Identifier /Depth	Arsenic	Cadmium	Chromium	Lead	Nickel
Former Fire-fighting Training Area (PSC 2)					
OU2SB00101 /0-1'	–	–	2	2	–
OU2SB00301 /0-1'	–	–	8	30	–
OU2SB00401 /0-1'	–	–	18	22	–
OU2SB00801 /0-1'	12	–	10	40	–
OU2SB01001 /0-1'	–	–	16		–
OU2SB01701 /0-1'	2	20	20	310	14
OU2SB02001 /0-1'	–	–	4		4
OU2SB02401 /0-1'	–	–	6	40	6
OU2SB03101 /0-1'	–	–	18	18	10
OU2SB04001 /0-1'	–	–	42	6	12
OU2SB06301 /0-1'	–	4	12	34	10
OU2SB06601 /0-1'	–	–	14	6	–
Domestic Waste Sludge Drying Beds (PSC 41)					
DDBSB00101 /0-1'	8	8	180	6	16
DDBSB00102 /1.5-3'	24	8	6	–	16
DDBSB00103 /3-4'	8	–	4	–	–
DDBSB00201 /0-1'	16	6	400	12	–
DDBSB00202 /1.5-3'	16	2	16	–	6
DDBSB00203 /3-4'	6	–	6	–	–
DDBSB00301 /0-1'	58	170	6200	130	130
DDBSB00302 /1.5-3'	–	6	14	–	34
DDBSB00303 /3-4'	–	–	6	–	–
DDBSB00401 /0-1'	–	24	540	14	62
DDBSB00402 /1-2.5'	–	10	4	6	52
DDBSB00403 /2.5-3.5'	–	–	4	2	–
DDBSB00501 /0-1'	–	6	6	10	10
DDBSB00502 /1-2.5'	–	8	6	4	26
DDBSB00503 /2.5-3.5'	2	–	4	–	2
DDBSB00601 /0-1'	–	34	460 E	140	90
DDBSB00602 /1-2'	–	2	6	2	8
DDBSB00603 /2.5-3.5'	–	–	6	–	2
DDBSB00701 /0-1.5'	–	82	4100	310	94
DDBSB00702 /1.5-2.5'	–	–	10	2	–
DDBSB00703 /1.5-2.5'	–	4	12	6	18
DDBSB00801 /0-1'	42	36	450 E	280	130
DDBSB00802 /1-2.5'	40	8	40	4	22
DDBSB00803 /3-4'	52	–	2	–	–
DDBSB00901 /0-1'	32	36	480 E	360	90
DDBSB00902 /1-2.5'	6	2	4	–	–
DDBSB00903 /3-4	18	–	2	2	–
DDBSB01001 /0-1'	24	30	450 E	270	230
DDBSB01002 /1-3'	–	4	12	8	10
DDBSB01003 /3-4'	34	–	10	10	–

See notes at end of table.

Table A-2 (Continued)
Summary of Positive Detections in Soil Analytical Results, Field Screening
Inorganics - Arsenic, Cadmium, Chromium, Lead and Nickel
Operable Unit 2

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Identifier /Depth	Arsenic	Cadmium	Chromium	Lead	Nickel
DDBSB01101 /0-1'	24	26	400 E	420	150
DDBSB01102 /1-2'	10	2	14	74	6
DDBSB01103 /3-4'	6	–	10	10	2
DDBSB01201 /0-1'	2	16	400 E	98	110
DDBSB01202 /1-2.5'	–	–	4	2	4
DDBSB01203 /3-4'	18	2	4	2	12
DDBSB01301 /0-1'	18	22	1300	74	36
DDBSB01302 /1-2.5'	24	2	16	120	12
DDBSB01303 /2.5-3.5'	6	–	8	12	6
DDBSB01401 /0-1'	12	6	74	36	16
DDBSB01402 /1-2'	46	–	6	8	8
DDBSB01403 /2-3'	–	–	6	6	–
DDBSB01501 /0-1'	16	88 E	1300	410	160
DDBSB01501D /0-1'	10	76	500 E	330	120 E
DDBSB01502 /1-2'	32	–	20	8	–
DDBSB01503 /2-3'	–	–	6	–	10
DDBSB01601 /0-1'	2	2	130	18	22
DDBSB01602 /2-4'	8	–	12	4	–
DDBSB01701 /0-1'	–	–	34	4	8
DDBSB01702 /2-4'	–	–	36	6	10
DDBSB01702D /2-4'	10	–	10	4	4
DDBSB01801 /0-1'	–	4	220	22	18
DDBSB01802 /2-3'	6	–	54	4	28
DDBSB01901 /0-1'	–	4	140	22	12
DDBSB01902 /2-4'	–	–	70	4	26
DDBSB02001 /0-1'	16	14	370 E	56	28
DDBSB02002 /2-3.5'	–	–	52	2	18
DDBSB02101 /0-1'	6	2	110	16	24
DDBSB02102 /0-1'	–	–	16	4	6
DDBSB02201 /0-1'	34	2	54	6	8
DDBSB02202 /2-3.5'	–	–	44	4	8
DDBSB02301 /0-1'	–	4	140	18	20
DDBSB02301D /0-1'	6	2	92	14	4
DDBSB02302 /2-3.5'	–	–	44	2	20
DDBSB02401 /0-1'	14	–	32	4	–
DDBSB02401D /0-1'	12	2	40	–	2
DDBSB02402 /2-4'	–	–	10	–	–
DDBSB02402D /2-4'	14	–	2	–	6
DDBSB02501 /0-1'	16	–	26	–	–
DDBSB02501D /0-1'	–	–	14	–	8
DDBSB02502 /2-3.5'	6	–	4	–	–
DDBSB02502D /2-3.5'	22	–	10	–	6
DDBSB02601 /0-1'	–	–	22	–	–
DDBSB02601D /0-1'	22	–	26	–	10

See notes at end of table.

Table A-2 (Continued)
Summary of Positive Detections in Soil Analytical Results, Field Screening
Inorganics - Arsenic, Cadmium, Chromium, Lead and Nickel
Operable Unit 2

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Identifier /Depth	Arsenic	Cadmium	Chromium	Lead	Nickel
DDBSB02602 /2-3.5'	14	–	6	–	–
DDBSB02701 /0-1'	18	–	22	–	–
DDBSB02702 /2-3'	–	–	8	–	–
Industrial Waste Sludge Drying Beds (PSC 43)					
IDBSB00101 /0-2"	–	150	13000	–	880
IDBSB00201 /0-1'	2	–	48	4	–
IDBSB00202 /1-2'	–	–	110	8	10
IDBSB00203 /2-3'	–	12	1600	46	80
IDBSB00301 /0-2"	–	100	6000	220	200
IDBSB00401 /2"-1.5'	–	–	88	10	14
IDBSB00402 /1.5-3.5'	12	–	140	–	–
IDBSB00403 /3.5-4'	–	10	100	22	–
IDBSB00501 /0-2"	–	86	6100	370	240
IDBSB00601 /2"-1'	6	–	28	–	–
IDBSB00602 /1-2'	12	–	14	–	–
IDBSB00602D /1-2'	18	–	4	2	–
IDBSB00603 /4'	–	66	110	8	16
IDBSB00603D /4'	–	34	110	28	2
IDBSB00701 /0-2"	–	380	19000	1200	3200
IDBSB00801 /2"-2'	–	–	100	–	6
IDBSB00802 /2"-2.2'	–	18	540	–	22
IDBSB00803 /4'	–	10	130	–	30
IDBSB00803D /4'	–	10	56	4	2
IDBSB00901 /0-1'	–	–	6	4	8
IDBSB00902 /3-5'	–	–	2	2	–
IDBSB01001 /0-1'	6	–	12	–	–
IDBSB01002 /3-5'	–	–	2	2	–
IDBSB01101 /0-1'	2	–	6	2	6
IDBSB01102 /3-5'	–	–	2	–	–
IDBSB01201 /0-1'	–	–	14	–	–
IDBSB01202 /3-5'	–	–	4	–	–
IDBSB01301 /0-1'	–	–	10	–	2
IDBSB01302 /2-3.5'	–	–	6	–	2
IDBSB01401 /0-1'	–	–	6	2	8
IDBSB01402 /2-3.5'	–	–	4	2	6
IDBSB01501 /0-1'	–	–	6	–	10
IDBSB01502 /2-3.5'	–	–	4	–	2
IDBSB01601 /0-1'	6	–	10	–	4
IDBSB01602 /2-3.5'	–	–	4	–	8
IDBSB01701 /0-1'	–	–	4	–	6
IDBSB01702 /2-3.5'	–	–	4	2	–
IDBSB01801 /0-1'	–	–	6	2	–
IDBSB01802 /2-3.5'	–	–	6	–	–

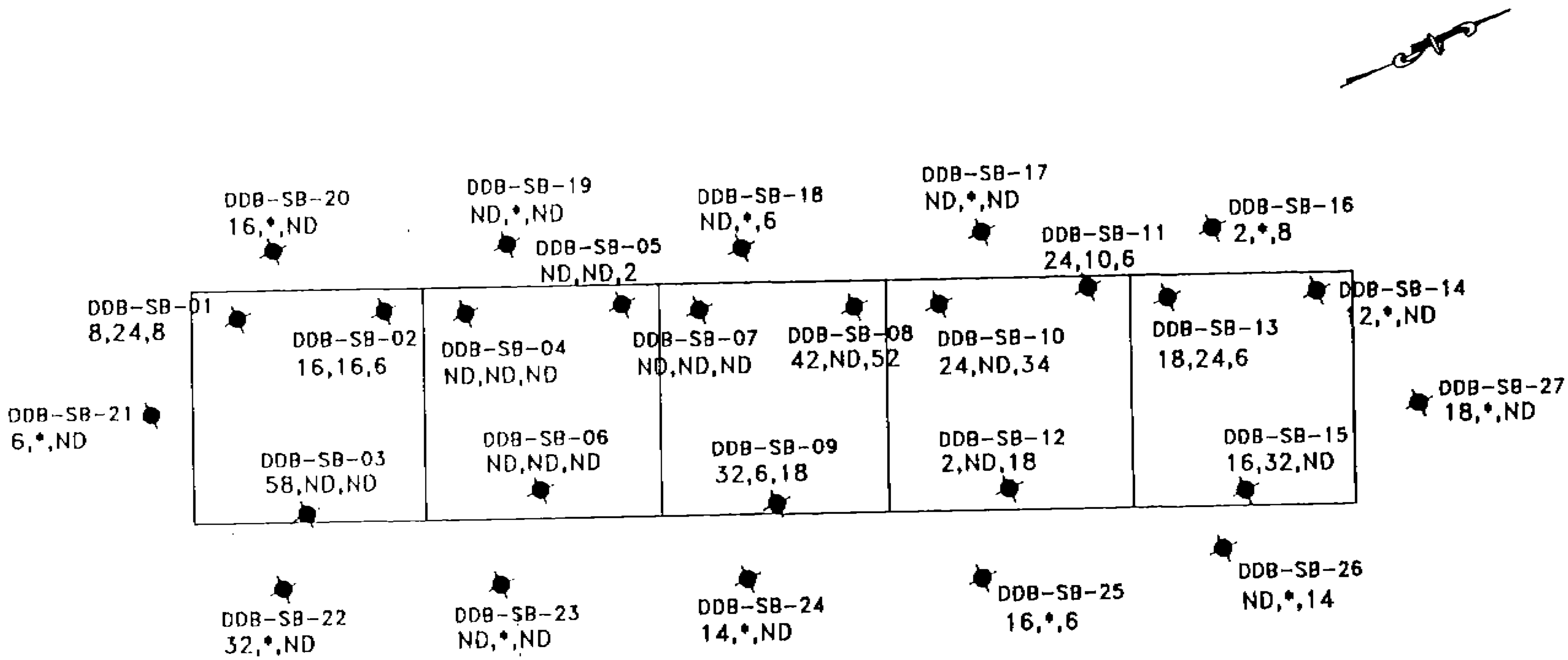
Notes: Analytical results expressed in mg/kg dry weight.
E = Analyte is detected at a concentration above the highest calibration standard.

Table A-3
Summary of Soil Analytical Results - Field Screening
Total Petroleum Hydrocarbons
Operable Unit 2

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Identifier /Depth	TPH		Identifier / Depth	TPH		Identifier / Depth	TPH	
OU2SB00101 /0-1'	7900		OU2SB02301 /0-1'	2800		OU2SB05001 /0-1'	51	UJ
OU2SB00201 /0-1'	50	UJ	OU2SB02401 /0-1'	500		OU2SB05101 /0-1'	51	UJ
OU2SB00301 /0-1'	260	BJ	OU2SB02501 /0-1'	620		OU2SB05201 /0-1'	51	UJ
OU2SB00401 /0-1'	9600		OU2SB02601 /0-1'	580	J	OU2SB05301 /0-1'	52	UJ
OU2SB00501 /0-1'	54	UJ	OU2SB02701 /0-1'	5700		OU2SB05401 /0-1'	51	UJ
OU2SB00601 /0-1'	4200		OU2SB02702 /2-3'	7000		OU2SB05501 /0-1'	51	UJ
OU2SB00701 /0-1'	6100		OU2SB02703 /4-5'	1700		OU2SB05601 /0-1'	51	UJ
OU2SB00801 /0-1'	4600		OU2SB02801 /0-1'	190	BJ	OU2SB05602 /2-3'	76	
OU2SB00802 /2-3'	280		OU2SB02901 /0-1'	4200		OU2SB05603 /4-5'	61	U
OU2SB00803 /4-5'	3800		OU2SB03001 /0-1'	54	UJ	OU2SB05701 /0-1'	55	BJ
OU2SB00901 /0-1'	2800		OU2SB03101 /0-1'	4600		OU2SB05801 /0-1'	53	UJ
OU2SB01001 /0-1'	1000	J	OU2SB03201 /0-1'	52	UJ	OU2SB05901 /0-1'	54	UJ
OU2SB01101 /0-1'	5700		OU2SB03301 /0-1'	51	UJ	OU2SB06001 /0-1'	51	UJ
OU2SB01201 /0-1'	9500		OU2SB03401 /0-1'	52	UJ	OU2SB06101 /0-1'	260	BJ
OU2SB01301 /0-1'	5400		OU2SB03501 /0-1'	180	BJ	OU2SB06102 /2-3'	55	
OU2SB01401 /0-1'	5700		OU2SB03601 /0-1'	82	BJ	OU2SB06103 /4-5'	87	
OU2SB01501 /0-1'	5400		OU2SB03701 /0-1'	51	U	OU2SB06201 /0-1'	53	UJ
OU2SB01502 /2-3'	17000		OU2SB03801 /0-1'	50	U	OU2SB06301 /0-1'	470	BJ
OU2SB01503 /4-5'	7500		OU2SB03901 /0-1'	120	BJ	OU2SB06302 /2-3'	54	U
OU2SB01601 /0-1'	150000		OU2SB04001 /0-1'	190	BJ	OU2SB06303 /3-4'	83	
OU2SB01602 /2-3'	6300		OU2SB04101 /0-1'	120	BJ	OU2SB06401 /0-1'	52	UJ
OU2SB01603 /4-5'	6800		OU2SB04201 /0-1'	200	BJ	OU2SB06501 /0-1'	580	BJ
OU2SB01701 /0-1'	150000		OU2SB04301 /0-1'	140	BJ	OU2SB06601 /0-1'	140	B
OU2SB01702 /2-3'	9600		OU2SB04302 /2-3'	57	U	OU2SB06701 /0-1'	51	U
OU2SB01703 /4-5'	8100		OU2SB04303 /4-5'	250		OU2SB06801 /0-1'	52	U
OU2SB01801 /0-1'	1700		OU2SB04401 /0-1'	130	BJ	OU2SB06901 /0-1'	51	U
OU2SB01901 /0-1'	2100		OU2SB04501 /0-1'	53	UJ	OU2SB07001 /0-1'	59	B
OU2SB01902 /2-3'	7200		OU2SB04601 /0-1'	130	BJ	OU2SB07101 /0-1'	50	U
OU2SB01903 /4-5'	11000		OU2SB04701 /0-1'	50	UJ	OU2SB07201 /0-1'	50	U
OU2SB02001 /0-1'	150	BJ	OU2SB04801 /0-1'	120	BJ	OU2SB07301 /0-1'	60	B
OU2SB02101 /0-1'	1200	J	OU2SB04901 /0-1'	50	UJ	OU2SB07401 /0-1'	100	B
OU2SB02201 /0-1'	4700							

Notes: Analytical results expressed in mg/kg dry weight.
J = Reported value is an estimated quantity.
U = Not detected at the instrument detection limit (IDL). IDL maybe slightly higher depending on moisture content.
B = Reported contamination in the associated method blank.



NOTE:
ND – NON DETECT
X,Y,Z – CONCENTRATIONS OF ARSENIC IN mg/kg DETECTED IN SOIL AT 0'-1', 1'-2.5', 3'-4' BELOW SURFACE
* – SAMPLE NOT COLLECTED

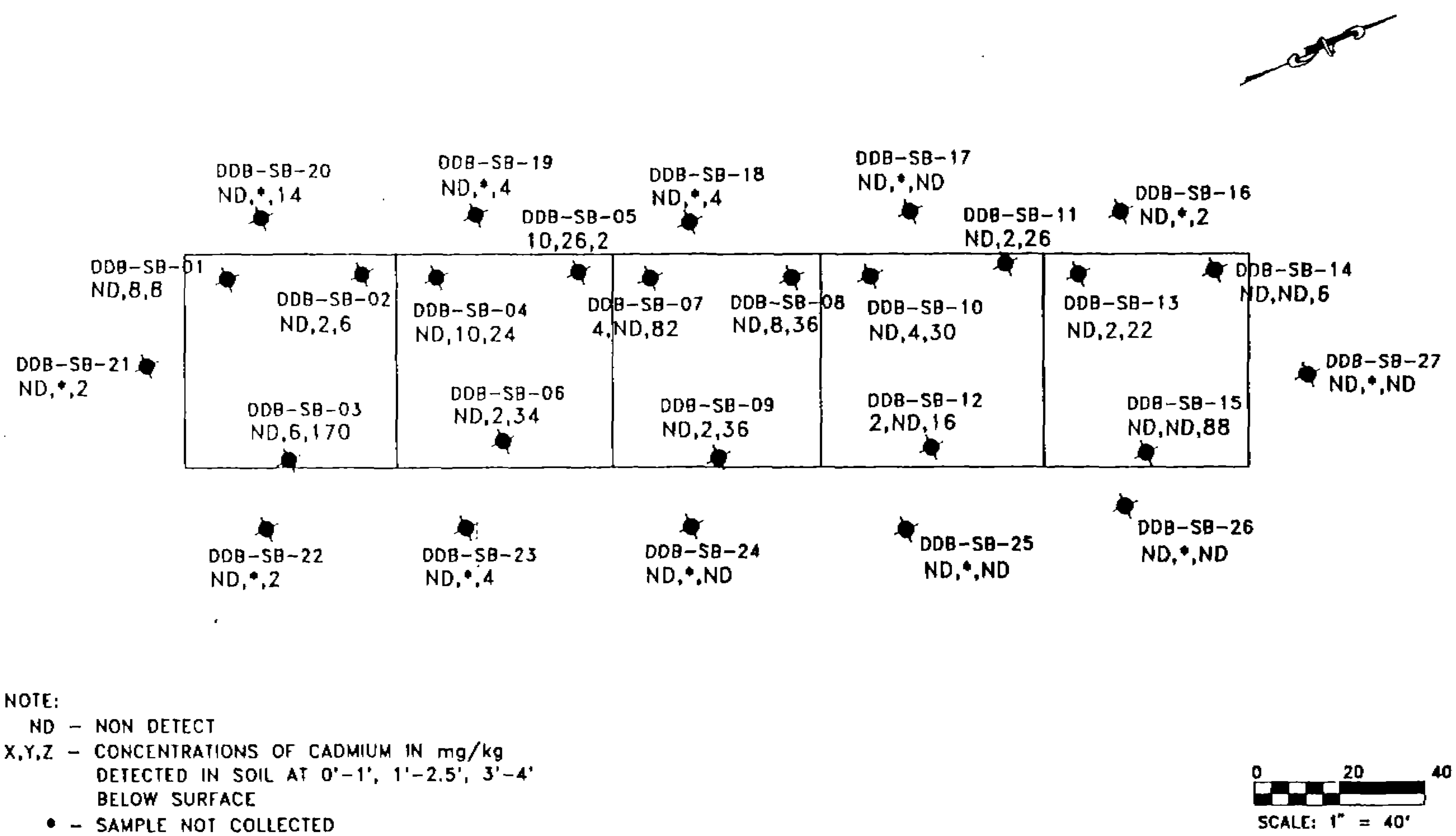
0 20 40
SCALE: 1" = 40'

FIGURE A-1
ONSITE ARSENIC RESULTS FOR DOMESTIC SLUDGE DRYING BEDS, PSC 41

FOCUSED RI/FS REPORT FOR OU2

NAS JACKSONVILLE
JACKSONVILLE, FLORIDA

DOMARSEN/DRM/12-13-93



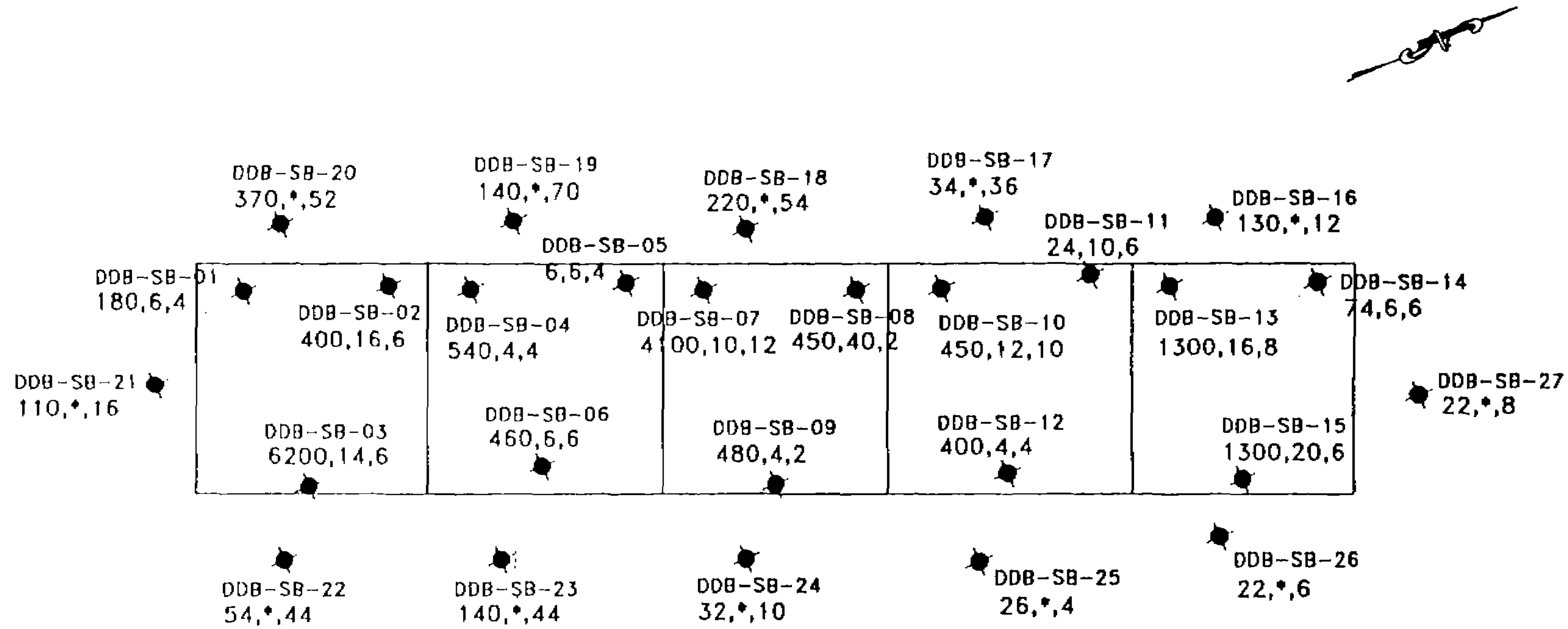
NOTE:
ND – NON DETECT
X,Y,Z – CONCENTRATIONS OF CADMIUM IN mg/kg DETECTED IN SOIL AT 0'-1', 1'-2.5', 3'-4' BELOW SURFACE
* – SAMPLE NOT COLLECTED

FIGURE A-2
ONSITE CADMIUM RESULTS FOR DOMESTIC SLUDGE DRYING BEDS, PSC 41

FOCUSED RI/FS REPORT FOR OU2

NAS JACKSONVILLE
JACKSONVILLE, FLORIDA

DOMCAD/DRM/12-13-93



NOTE:
ND – NON DETECT
X,Y,Z – CONCENTRATIONS OF CHROMIUM IN mg/kg DETECTED IN SOIL AT 0'-1', 1'-2.5', 3'-4' BELOW SURFACE
* – SAMPLE NOT COLLECTED

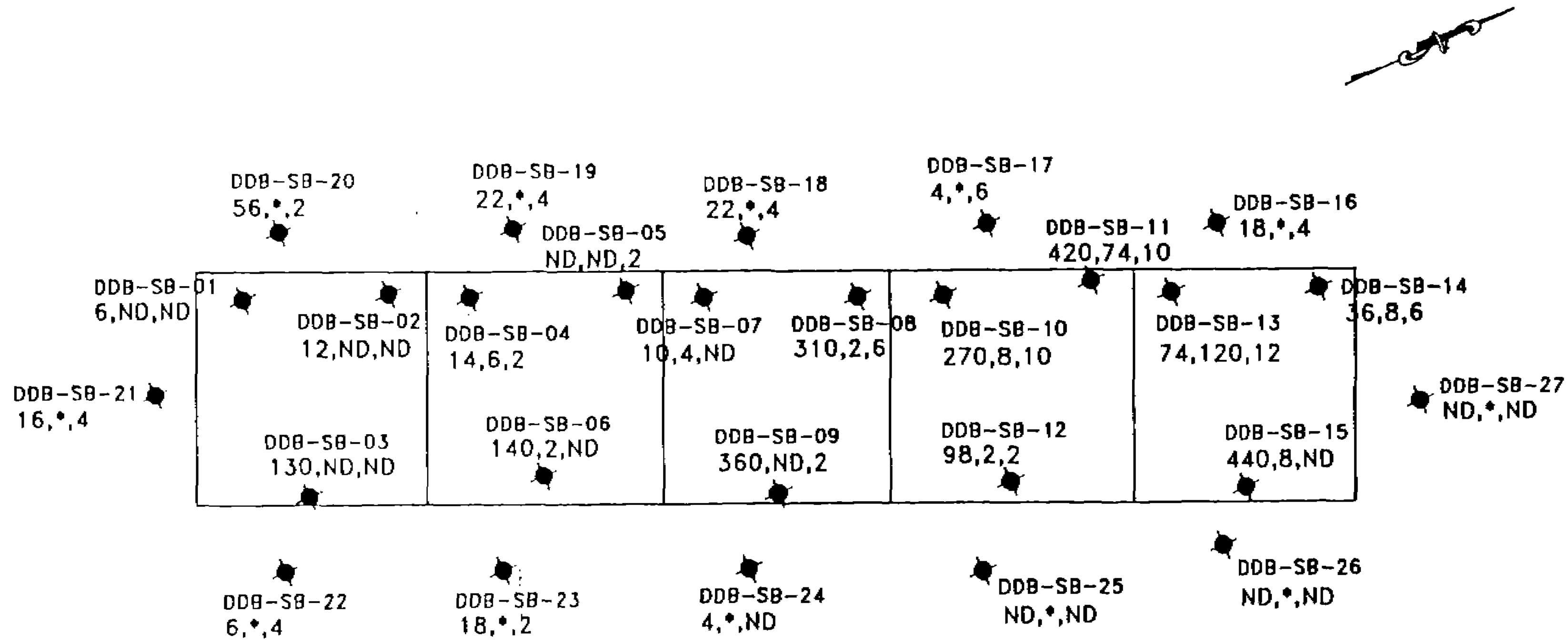
0 20 40
SCALE: 1" = 40'

FIGURE A-3
ONSITE CHROMIUM RESULTS FOR DOMESTIC SLUDGE DRYING BEDS, PSC 41

FOCUSED RI/FS REPORT FOR OU2

NAS JACKSONVILLE
JACKSONVILLE, FLORIDA

DOMCHROM/DRM/12-13-93



NOTE:
ND – NON DETECT
X,Y,Z – CONCENTRATIONS OF LEAD IN mg/kg DETECTED IN SOIL AT 0'-1', 1'-2.5', 3'-4' BELOW SURFACE
* – SAMPLE NOT COLLECTED

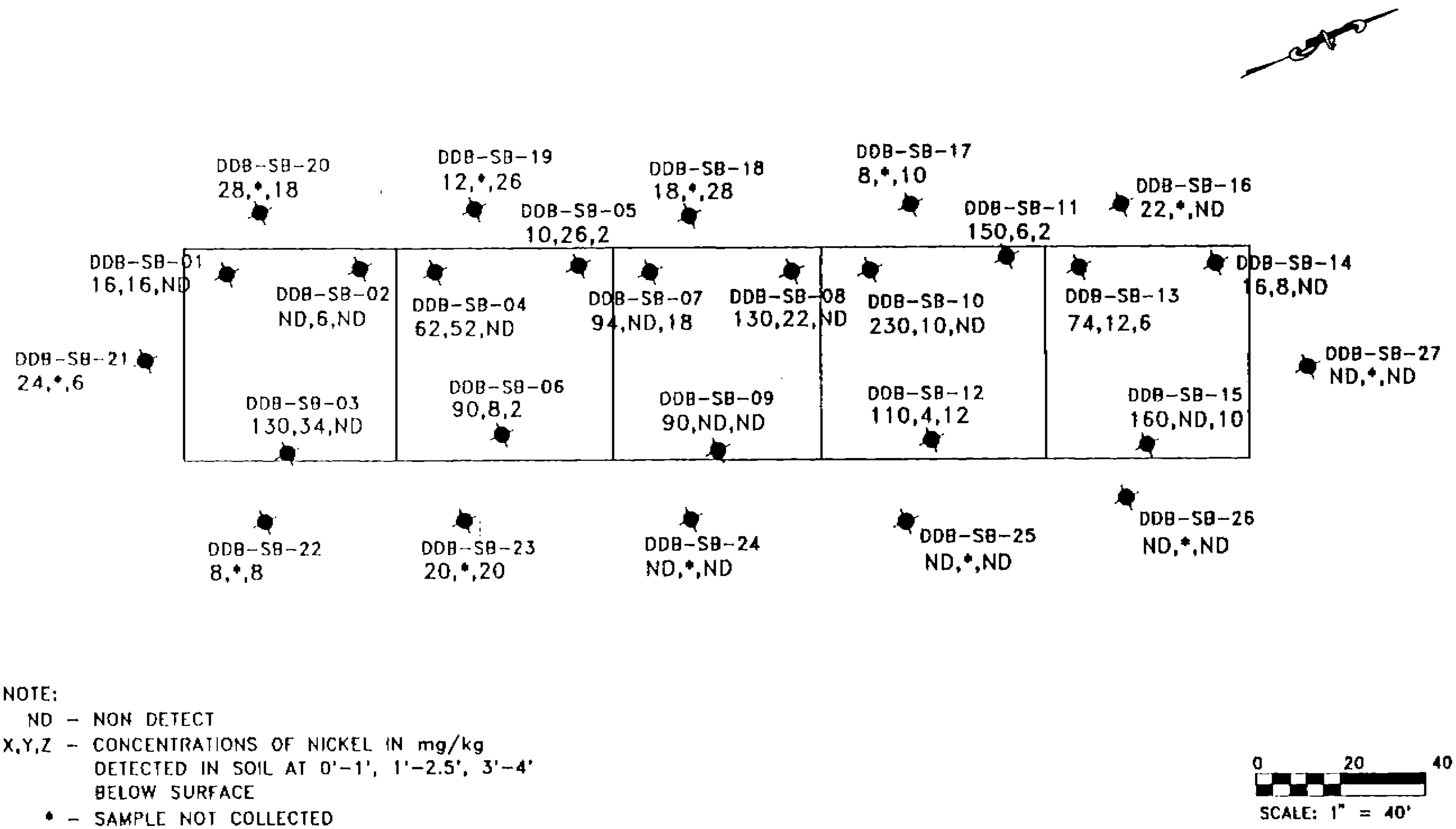
0 20 40
SCALE: 1" = 40'

FIGURE A-4
ONSITE LEAD RESULTS FOR DOMESTIC SLUDGE DRYING BEDS, PSC 41

FOCUSED RI/FS REPORT FOR OU2

NAS JACKSONVILLE
JACKSONVILLE, FLORIDA

DOMLEAD/DRM/12-13-93



NOTE:
ND - NON DETECT
X,Y,Z - CONCENTRATIONS OF NICKEL IN mg/kg DETECTED IN SOIL AT 0'-1', 1'-2.5', 3'-4' BELOW SURFACE
* - SAMPLE NOT COLLECTED

FIGURE A-5
ONSITE NICKEL RESULTS FOR DOMESTIC SLUDGE DRYING BEDS, PSC 41

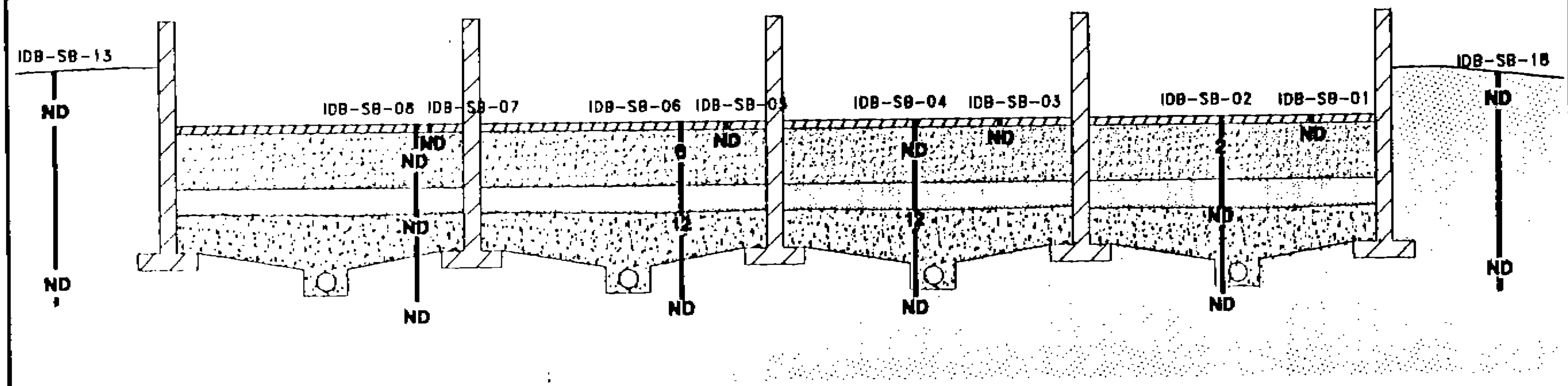
FOCUSED RI/FS REPORT FOR OU2

NAS JACKSONVILLE
JACKSONVILLE, FLORIDA

DOMNICK/DRM/12-13-93

FocRIFS.OU2
MVL08.94

A-12



RESULTS (In mg/kg) FROM 0 TO 4 FT. BELOW SURFACE
NOTE: ND – NON-DETECT

0 5 10
SCALE: 1" = 10'
(APPROX.)
VERTICAL EXAGGERATION: 3:1

LEGEND

- SAND
- FINE GRAVEL
- COARSE GRAVEL
- NATIVE SOIL

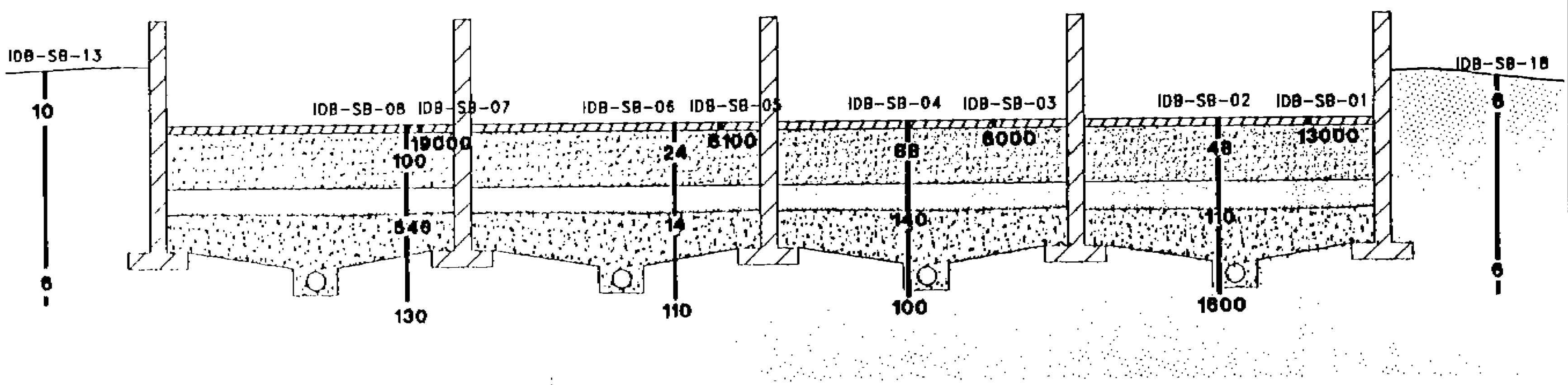
FIGURE A-6
ONSITE ARSENIC RESULTS FOR INDUSTRIAL SLUDGE DRYING BEDS, PSC 43

FOCUSED RI/FS REPORT FOR OU2

NAS JACKSONVILLE
JACKSONVILLE, FLORIDA

INDARSENIC/DRM/12-10-93

FocRIFS.OU2
MVL.08.94



RESULTS (in mg/kg) FROM 0 TO 4 FT. BELOW SURFACE
NOTE: ND – NON-DETECT

0 5 10
SCALE: 1" = 10'
(APPROX.)
VERTICAL EXAGGERATION: 3:1

LEGEND

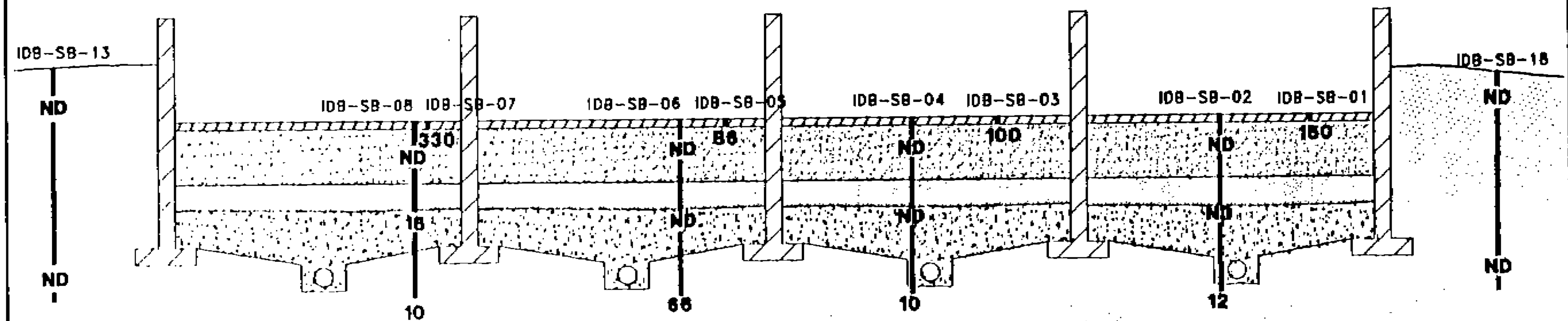
SAND
FINE GRAVEL
COARSE GRAVEL
NATIVE SOIL

FIGURE A-7
ONSITE CHROMIUM RESULTS FOR INDUSTRIAL SLUDGE DRYING BEDS, PSC 43

FOCUSED RI/FS REPORT FOR OU2

NAS JACKSONVILLE
JACKSONVILLE, FLORIDA

INDCHROMIUM/DRM/12-10-93



RESULTS (In mg/kg) FROM 0 TO 4 FT. BELOW SURFACE
NOTE: ND – NON-DETECT

SCALE: 1" = 10'
(APPROX.)
VERTICAL EXAGGERATION: 3:1

LEGEND

SAND

FINE GRAVEL

COARSE GRAVEL

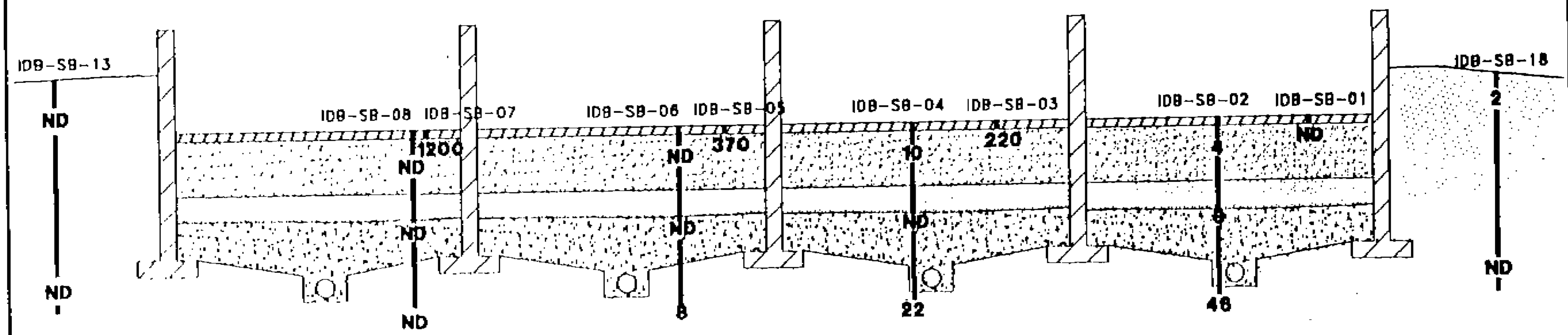
NATIVE SOIL

FIGURE A-8
ONSITE CADMIUM RESULTS FOR INDUSTRIAL SLUDGE DRYING BEDS, PSC 43

FOCUSED RI/FS REPORT FOR OU2

NAS JACKSONVILLE
JACKSONVILLE, FLORIDA

INDCADMIUM/DRM/12-10-93



RESULTS (In mg/kg) FROM 0 TO 4 FT. BELOW SURFACE
NOTE: ND - NON-DETECT

0 5 10

SCALE: 1" = 10'
(APPROX.)
VERTICAL EXAGGERATION: 3:1

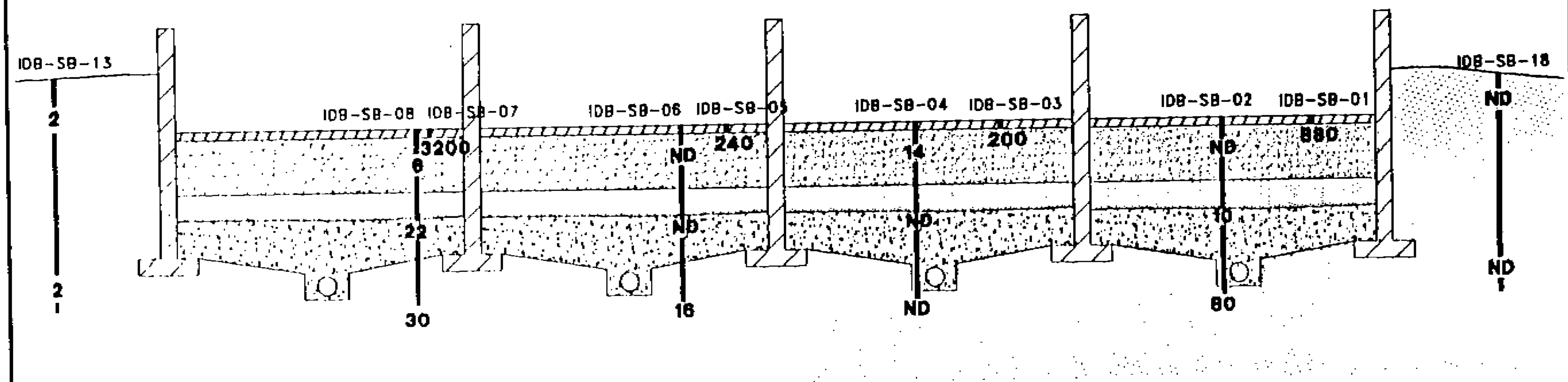
LEGEND

- SAND
- FINE GRAVEL
- COARSE GRAVEL
- NATIVE SOIL

FIGURE A-9
ONSITE LEAD RESULTS FOR INDUSTRIAL SLUDGE DRYING BEDS, PSC 43

FOCUSED RI/FS REPORT FOR OU2

NAS JACKSONVILLE
JACKSONVILLE, FLORIDA



RESULTS (In mg/kg) FROM 0 TO 4 FT. BELOW SURFACE
NOTE: ND - NON-DETECT

0 5 10
SCALE: 1" = 10' (APPROX.)
VERTICAL EXAGGERATION: 3:1

LEGEND
- SAND
- FINE GRAVEL
- COARSE GRAVEL
- NATIVE SOIL

FIGURE A-10
ONSITE NICKEL RESULTS FOR INDUSTRIAL SLUDGE DRYING BEDS, PSC 43

FOCUSED RI/FS REPORT FOR OU2

NAS JACKSONVILLE
JACKSONVILLE, FLORIDA

INDNICKEL/DRM/12-10-93

APPENDIX B

Evaluation of Screening Sample Analytical Results

B.1 Introduction

In accordance with the approved work plan, samples were sent to an offsite laboratory for full TAL/TCL analysis based on the TPH concentration screened onsite during the field investigation (RI/FSWP, ABB-ES, 1992). More than 10% of the samples screened onsite for volatile organic compounds (VOCs), five heavy metals, and total petroleum hydrocarbons (TPH) were submitted to an offsite laboratory in order to provide comparative information on the overall quality of field screening results compared with the higher quality offsite data. Presented below is an evaluation of the analytical results for samples split for onsite field screening and offsite laboratory analysis. This evaluation compares Naval Energy and Environmental Support Activity (NEESA) Level D (U.S. Environmental Protection Agency [USEPA] Level IV) offsite laboratory results with USEPA Level II field screening sample results for the following compounds and analytes:

- volatile organic compounds (VOCs): 1,1,1-Trichloroethane, 1,1-Dichloroethane, Benzene, Chlorobenzene, Ethylbenzene, Methylene chloride, Tetra-chloroethane, Toluene, Trichloroethene, Vinyl chloride, m/p-Xylene, o-Xylene, trans-1,2-Dichloroethene, and cis-1,2-Dichloroethene;
- inorganic analytes: arsenic, cadmium, chromium, lead, and nickel; and
- TPH.

B.2 Evaluation Methods

Two approaches were used to assess paired offsite and onsite analytical results: (1) application of the duplicate precision criteria to paired offsite and onsite results for organic compounds, inorganic analytes, and TPH; and (2) linear regression analysis of the positive detection pairs for inorganic analytes and TPH.

The duplicate precision criteria has been routinely used in the NEESA and USEPA Contract Laboratory Program (CLP) to evaluate comparability of laboratory duplicate samples. The same approach can be applied to field duplicates or split samples. Precision is a quantitative measure that is expressed as the relative percent difference (RPD) between analytical values for two samples from the same source divided by the average of their analytical values. The values used to assess precision are obtained from estimated and positive detections above contract required quantitation limits (CRQLs) or instrument detection limits (IDLs). RPD is calculated using the equation:

$$RPD = \frac{D_1 - D_2}{\frac{1}{2}(D_1 + D_2)} \times 100 \qquad (1)$$

where D_1 and D_2 are the reported values for the duplicate samples.

Sources of poor precision include sample heterogeneity, improper handling of samples, or imprecise preparation or analysis of the samples. Split samples measure comparability of field and laboratory results; therefore, the results may have more variability than laboratory duplicates, which measure only laboratory performance. Soil duplicate results have a greater variance than water matrices due to difficulties associated with collecting identical field samples. Another source of variability is the different methods used in the analysis, i.e., field methods versus CLP methods.

There are no specific NEESA review criteria for split sample precision. The standard operating procedure used by some USEPA regional offices (e.g., Region II) specifies that field duplicates be qualified as estimated if RPD is greater than 100 for paired data where sample and duplicate are both greater than 5 times the contract required detection limit (CRDL) or the CRQL). If the sample and/or duplicate is less than five times the CRDL or CRQL, the absolute difference criteria is used. Field duplicates are qualified as estimated if the absolute difference between the analytical values is greater than two times the CRDL or CRQL. When the IDL is greater than the CRDL, the IDL value is substituted for the CRDL. No calculations are made if both sample and duplicate are below detection or quantitation limits; the field duplicates are considered to be within control limits.

Linear regression analyses were applied to the data for cadmium, chromium, copper, lead, and TPH. Ideally, the linear correlation coefficients between measurements obtained by both techniques should be near 1. When field screening and/or offsite laboratory data is a nondetect (U qualifier), the pair was excluded from the linear regression analysis to circumvent uncertainties in applying censored values to the data below detection limits.

B.3 Findings

Volatile Organics A comparison of the field screening results and the offsite laboratory results for VOCs is presented in Table B-1. In 94 percent of the cases (239 out of 252 pairs), the field screening report of a non-detection was confirmed by the offsite laboratory. RPD was calculated for one of two occurrences of positive detections in both field screening and offsite laboratory analysis, i.e., total xylenes in sample OU2SB03101. For the detected concentrations of 140 and 350 micrograms per kilogram (μg/kg), RPD equals 57 percent. The reported values are within control limits based on the RPD criteria. In the only other occurrence of a positive detection pair (ethylbenzene in sample OU2SB01701, with reported concentrations of 14,000 and 7 μg/kg), the absolute difference criteria was used because one value is below CRQL, as with the remaining 11 pairs where only the onsite field screening data indicated positive detections. Of these 12 data pairs where the difference criteria was used, only 2 pairs are in control: benzene and total xylenes results in sample OU2SB01001. Thus, 3 percent of the data failed the difference criteria. In summary, Level B field screening data for VOCs are confirmed by the offsite analytical results in 97 percent of the cases.

Total Petroleum Hydrocarbons Onsite field screening and offsite analytical results for TPH are presented in Table B-2. One out of 11 data pairs (9 percent) failed the absolute difference criteria. Simple linear regression analysis performed on three positive detection pairs shows a correlation coefficient, $r^2 = 0.91$. TPH field screening data are confirmed by the offsite analytical results in most cases.

Inorganics: Arsenic, Cadmium, Chromium, Nickel, and Lead Onsite field screening and offsite analytical results for the five heavy metals are presented in Table B-3. Using the RPD or absolute difference criteria for the duplicate analytical

Table B-1
Comparison of Analytical Results Between Onsite Screening and Offsite Laboratory
Purgeable Volatile Organics

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

	1,1,1-Trichloroethane		1,1-Dichloroethane		1,2-Dichloroethene		Benzene		Chlorobenzene		Ethylbenzene	
Identifier /Depth	ONSITE	OFFSITE	ONSITE	OFFSITE	ONSITE	OFFSITE	ONSITE	OFFSITE	ONSITE	OFFSITE	ONSITE	OFFSITE
Former Fire-fighting Training Area (PSC 2)												
OU2SB00101 /0-1'	--	--	--	--	--	--	--	--	--	--	--	--
OU2SB00301 /0-1'	--	--	--	--	--	--	--	--	--	--	--	--
OU2SB00401 /0-1'	--	--	--	--	--	--	--	--	--	--	--	--
OU2SB00801 /0-1'	--	--	--	--	--	--	**75 M**	--	**110 JM**	--	**210 M**	--
OU2SB01001 /0-1'	--	--	--	--	--	--	**17**	--	**78**	--	--	--
OU2SB01701 /0-1'	--	--	--	--	--	--	**2700 0**	--	--	--	**14000**	**7 J**
OU2SB02401 /0-1'	--	--	--	--	--	--	--	--	--	--	--	--
OU2SB03101 /0-1'	--	--	--	--	--	--	--	--	--	--	--	--
OU2SB04001 /0-1'	--	--	--	--	--	--	--	--	--	--	--	--
OU2SB06601 /0-1'	--	--	--	--	--	--	--	--	--	--	--	--
Domestic Waste Sludge Drying Beds (PSC 41)												
DDBSB00201 /0-1'	--	--	--	--	--	--	--	--	--	--	--	--
DDBSB00502 /1-2.5'	--	--	--	--	--	--	--	--	--	--	--	--
DDBSB00601 /0-1'	--	--	--	--	--	--	--	--	--	--	--	--
DDBSB00602 /1-2'	--	--	--	--	--	--	--	--	--	--	--	--
Industrial Waste Sludge Drying Beds (PSC 43)												
IDBSB00201 /0-1'	--	--	--	--	--	--	--	--	--	--	--	--
IDBSB00202 /1-2'	--	--	--	--	--	--	--	--	--	--	--	--
IDBSB00203 /2-3'	--	--	--	--	--	--	--	--	--	--	--	--
IDBSB00301 /0-2"	--	--	--	--	--	--	--	--	--	--	--	--
IDBSB00401 /2"-1.5'	--	--	--	--	--	--	--	--	--	--	--	--
IDBSB00402 /1.5-3.5'	--	--	--	--	--	--	--	--	--	--	--	--
IDBSB00601 /2"-1'	--	--	--	--	--	--	--	--	--	--	--	--

See notes at end of table.

Table B-1 (Continued)
Comparison of Analytical Results Between Onsite Screening and Offsite Laboratory
Purgeable Volatile Organics

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Identifier /Depth	1,1,1-Trichloroethane		1,1-Dichloroethane		1,2-Dichloroethene		Benzene		Chlorobenzene		Ethylbenzene	
	ONSITE	OFFSITE	ONSITE	OFFSITE	ONSITE	OFFSITE	ONSITE	OFFSITE	ONSITE	OFFSITE	ONSITE	OFFSITE
Former Fire-fighting Training Area (PSC 2)												
OU2SB00101 /0-1'	--	--	--	--	--	--	--	--	--	--	--	--
OU2SB00301 /0-1'	--	--	--	--	--	--	--	--	--	--	--	--
OU2SB00401 /0-1'	--	--	--	--	--	--	--	--	--	--	**70**	--
OU2SB00801 /0-1'	--	--	--	--	--	--	--	--	--	--	**1120**	--
OU2SB01001 /0-1'	--	--	--	--	--	--	--	--	--	--	**12.3**	--
OU2SB01701 /0-1'	--	--	--	--	**11000**	--	--	--	--	--	**40800**	--
OU2SB02401 /0-1'	--	--	--	--	--	--	--	--	--	--	--	--
OU2SB03101 /0-1'	--	--	--	--	--	--	--	--	--	--	**140**	**350**
OU2SB04001 /0-1'	--	--	--	--	--	--	--	--	--	--	--	--
OU2SB06601 /0-1'	--	--	--	--	--	--	--	--	--	--	--	--
Domestic Waste Sludge Drying Beds (PSC 41)												
DDBSB00201 /0-1'	--	--	--	--	--	--	--	--	--	--	--	--
DDBSB00502 /1-2.5'	--	--	--	--	--	--	--	--	--	--	--	--
DDBSB00601 /0-1'	--	--	--	--	--	--	--	--	--	--	--	--
DDBSB00602 /1-2'	--	--	--	--	--	--	--	--	--	--	--	--
Industrial Waste Sludge Drying Beds (PSC 43)												
IDBSB00201 /0-1'	--	--	--	--	--	--	--	--	--	--	--	--
IDBSB00202 /1-2'	--	--	--	--	--	--	--	--	--	--	--	--
IDBSB00203 /2-3'	--	--	--	--	--	--	--	--	--	--	--	--
IDBSB00301 /0-2"	--	--	--	--	--	--	--	--	--	--	--	--
IDBSB00401 /2"-1.5'	--	--	--	--	--	--	--	--	--	--	--	--
IDBSB00402 /1.5-3.5'	--	--	--	--	--	--	--	--	--	--	--	--
IDBSB00601 /2"-1'	--	--	--	--	--	--	--	--	--	--	--	--

Notes: Analytical results expressed in $\mu g/kg$ dry weight.
-- = Compound not detected at the instrument detection limit (onsite) or contract required quantitation limit (offsite).
Bolded entries indicate positive detections of a compound in both offsite and onsite laboratories (2 occurrences), and in the onsite laboratory only (11 occurrences);
Shaded entries indicate paired data is out of control for the precision (absolute difference) criteria.

Table B-2
Comparison of Analytical Results Between Onsite Screening and Offsite Laboratory
Total Petroleum Hydrocarbons

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Identifier /Depth	Total Petroleum Hydrocarbons Onsite		Off-site		Difference	RPD
Former Fire-fighting Training Area (PSC 2)						
OU2SB05601 /0-1'	–		13.4		13.4	
OU2SB05701 /0-1'	**55**	BJ	**29.3**		25.7	
OU2SB05801 /0-1'	–		2.9	J	2.9	
OU2SB05901 /0-1'	–		–		–	
OU2SB05901RP /0-1'	–		–		–	
OU2SB06001 /0-1'	–		–		–	
OU2SB06101 /0-1'	**260**	BJ	**642**			85
OU2SB06601 /0-1'	**140**	B	**25.2**		114.8	
OU2SB06701 /0-1'	–		11		11	
OU2SB06901 /0-1'	–		1.8		1.8	

Notes: Analytical results expressed in mg/kg dry weight.
– = TPH not detected at the method detection limits: 50 mg/kg onsite; 1.6 mg/kg offsite. Detection limits may be slightly higher depending on soil moisture content.
RPD = relative percent difference.
Shaded pair is out of control for the precision (absolute difference) criteria.
Bolded entries are analytical pairs used in linear regression analysis.

Table B-3
Comparison of Analytical Results Between Onsite Screening and Offsite Laboratory
Inorganics - Arsenic, Cadmium, Chromium, Lead and Nickel

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

	ARSENIC		CADMIUM		CHROMIUM		LEAD		NICKEL	
Identifier /Depth	OFFSITE	ONSITE	OFFSITE	ONSITE	OFFSITE	ONSITE	OFFSITE	ONSITE	OFFSITE	ONSITE
Former Fire-fighting Training Area (PSC 2)										
OU2SB00101 /0-1'	0.93 J	--	0.79 B	--	1.9 B	2	10.4 J	2	--	--
OU2SB00301 /0-1'	--	--	0.7 B	--	5.6	8	33.1	30	--	--
OU2SB00401 /0-1'	1.1 B	--	0.66 B	--	4.9	18	6.5 J	22	1.9 B	--
OU2SB00801 /0-1'	--	12	0.97 B	--	2.8	10	10.2	40	--	--
OU2SB01001 /0-1'	--	--	0.66 B	--	1.1 B	16	2.8	--	--	--
OU2SB01701 /0-1'	2.1 B	2	7.2	20	17.6	20	133	310	7.5 B	14
OU2SB02401 /0-1'	--	--	1.2	--	2.7	6	47	40	2.7 B	6
OU2SB03101 /0-1'	0.35 B	--	1.5	--	6.1	18	30.8	18	--	10
OU2SB04001 /0-1'	--	--	2.1	--	5.4	42	28.2	6	--	12
OU2SB06601 /0-1'	0.34 B	--	0.8 B	--	10.8	14	4.5	6	--	--
Domestic Waste Sludge Drying Beds (PSC 41)										
DDBSB00101 /0-1'	--	8	9.6	8	206	180	23 J	6	20.7	16
DDBSB00102 /1.5-3'	--	24	--	8	6.6	6	8.5 J	--	6.4 B	16
DDBSB00103 /3-4'	--	8	--	--	--	4	4.5 J	--	--	--
DDBSB00301 /0-1'	61.1 J	58	134	170	5310	6200	252 J	130	110	130
DDBSB00302 /1.5-3'	0.62 J	--	4	6	4.4	14	4.2 J	--	18.7	34
DDBSB00303 /3-4'	0.88 J	--	--	--	0.75 B	6	2 J	--	--	--
DDBSB00401 /0-1'	1.5 J	--	28.5	24	375	540	58.1 J	14	73.7	62
DDBSB00402 /1-2.5'	0.73 J	--	14	10	2.4 B	4	4.4 J	6	52.8	52
DDBSB00403 /2.5-3.5'	--	--	--	--	--	4	2.3 J	2	--	--
Industrial Waste Sludge Drying Beds (PSC 43)										
IDBSB00101 /0-1'	0.94 J	--	223	150	15000	13000	563 J	--	1110	880
IDBSB00501 /0-1'	--	--	98.3	86	7050	6100	444 J	370	518	240
IDBSB00602 /1-2'	--	12	--	--	4.8	14	2.1 J	--	3 B	--
IDBSB00701 /0-1'	0.84 J	--	484 B	380	47700	19000	1220 J	1200	1540	3200
IDBSB00802 /1-2.5'	--	--	23	18	264	540	15.5 J	--	6.7 B	22
IDL	0.34	1	0.52	1	0.5	1	0.22	1	1.84	1
CRDL	2		1		2		0.6		8	
Correlation coefficient (r^2)	N/A		0.9818		0.9371		0.9806		0.9078	

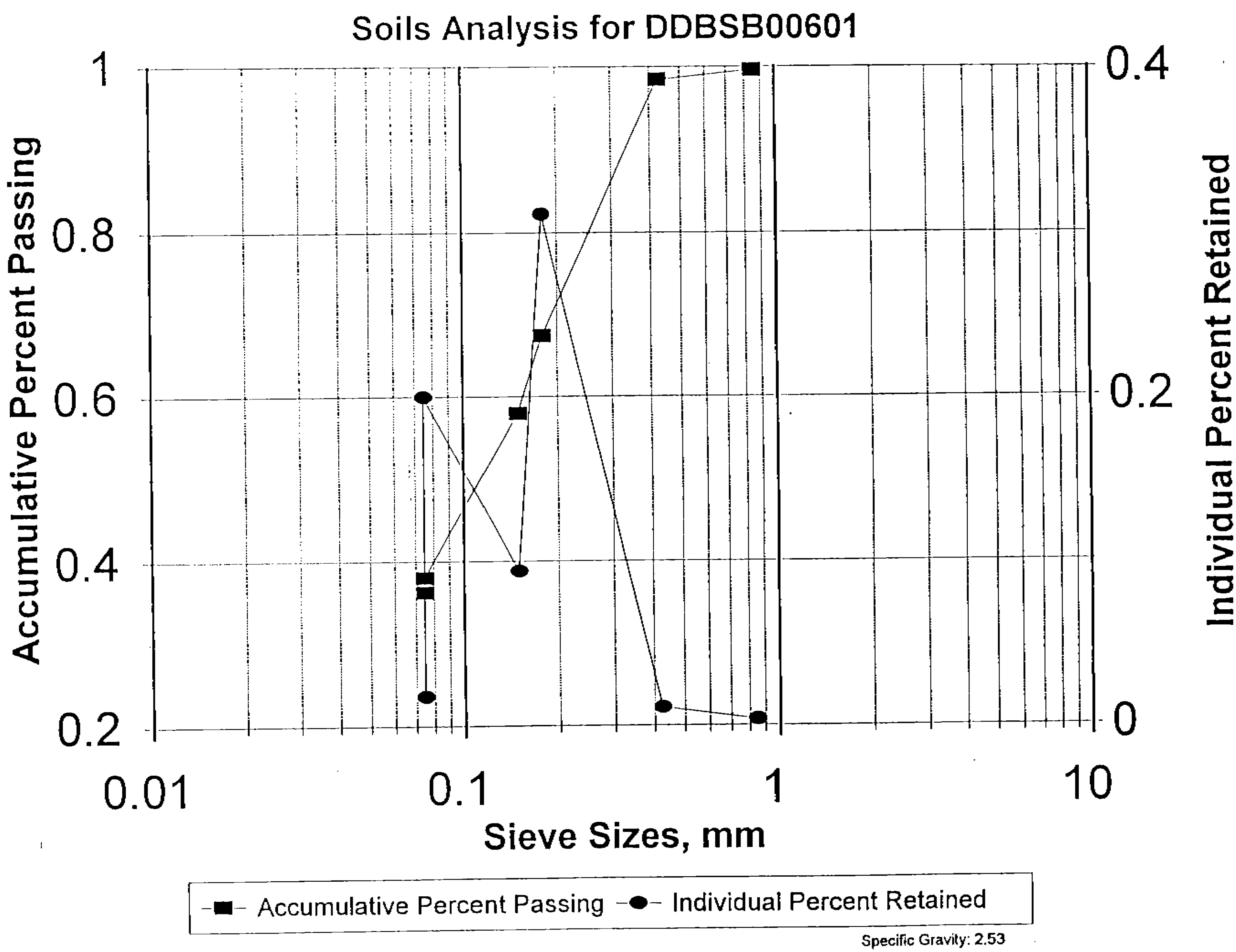
Notes: Analytical results expressed in mg/kg dry weight; IDL = instrument Detection Limit; IDL maybe slightly higher depending on soil moisture content.
-- = analyte not detected at the IDL; J = reported value is an estimated quantity; B = Reported value is between IDL and contract required detection limits (CRDL).
Shaded entries indicate paired data is out of control for the precision criteria. Bolded pairs are used in linear regression analysis.

values, 26 out of 120 pairs (21 percent) of the analytical results were out of control limits for the 5 heavy metals, broken down as follows: arsenic, 5 samples outside control limits for the absolute difference criteria (20 percent); cadmium, none (0 percent); chromium, 8 samples outside control limits for the absolute difference criteria (33 percent); lead, 5 samples outside RPD control limits and 8 samples outside absolute difference control limits (54 percent); and nickel, none (0 percent).

Linear regression analysis for cadmium, chromium, lead, and nickel show that field screening and offsite analytical data are significantly correlated for samples with positive detections from both screening and laboratory analysis, as indicated by their correlation coefficients (Table B-3). Based on these results, most of the field screening data for the five heavy metals are confirmed by the offsite analytical results.

APPENDIX C

Grain Size Distribution, Total Organic Carbon, and Heats of Combustion



Soils Analysis for DDBSB00601
Accumulative Percent Passing
Individual Percent Retained
1
0.8
0.6
0.4
0.2
0.4
0.2
0
0.01
0.1
1
10
Sieve Sizes, mm
Accumulative Percent Passing
Individual Percent Retained
Specific Gravity: 2.53

Soils Analysis

PARTICLE SIZE ANALYSIS
ASTM D-422

Proj. Desc. :	ABB/NAS Jacksonville	Sample I.D. :	90046009
Proj. Number:	LGN00999.99.JA	Sample Desc.:	DDBSB00601
ATTENTION:	Ms. Nancy Mosurick	Date Analyzed:	06/30/93

INITIAL SAMPLE MASS	Units		HYGROSCOPIC MOISTURE CONTENT	Units	
Mass Dry Sample	g	50.00	Can No.	--	[ ]
Moisture Cont	%	0.00	Gross Wet Mass	g	50.(
Corr. Dry Mass	g	50.00 (M)	Gross Dry Mass	g	50.(
Pass #10 sieve	%	100.00 (B)	Moisture Mass	g	0.(
Mass of total sample represented			Tare Mass	g	0.(
by mass used in hydrometer test			Dry Soil Mass	g	50.(
W = (M/B) x 100 =		50.00 g	Moisture Content	%	0.(

Hydrometer No.: 87026 Type: 152H
Dispersing Agent: Sodium Hexametaphosphate
Amount Used: 50 ml

Specific Gravity: 2.53

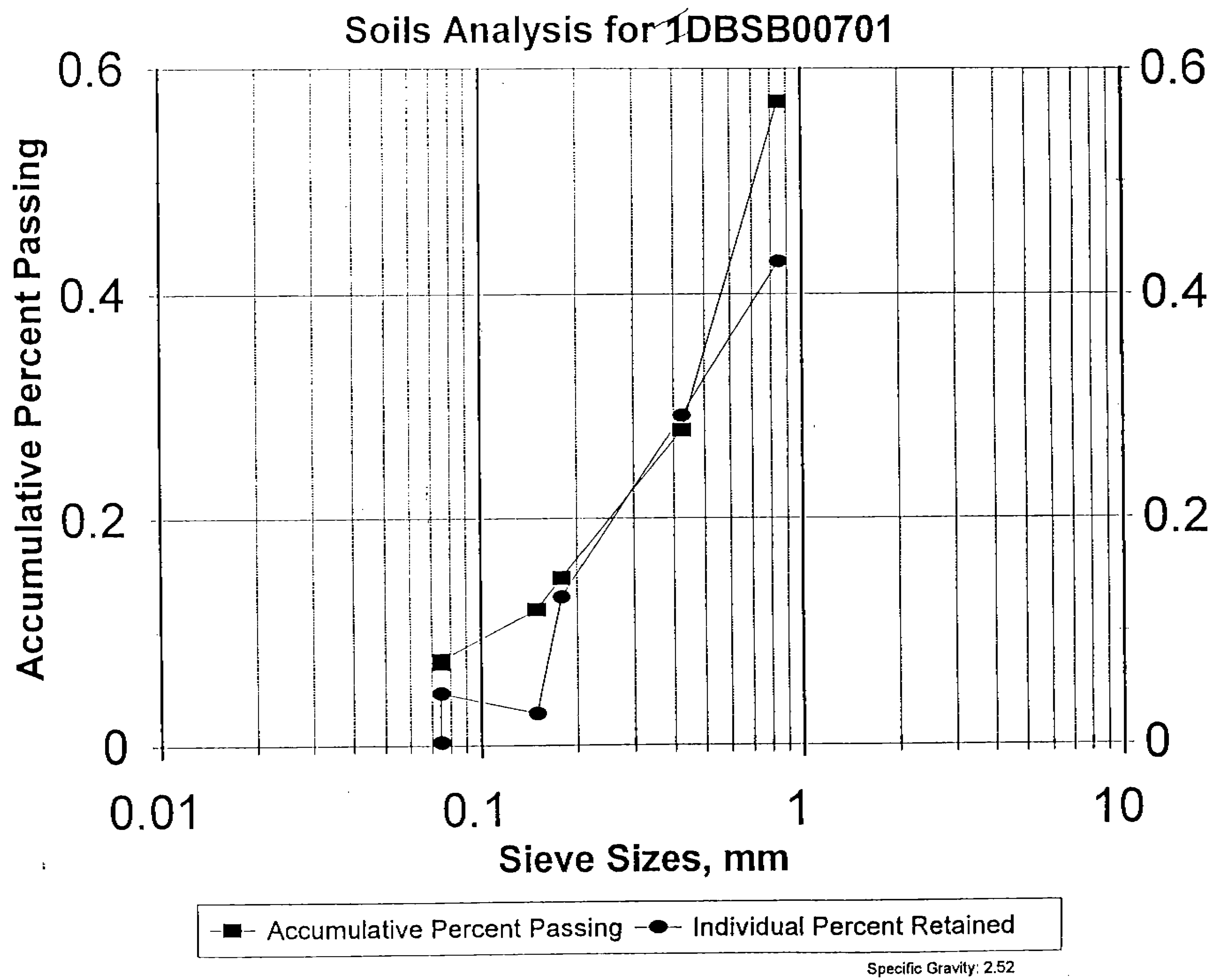
Material Retained On 75 um Sieve After Washing

STD Sieve #	Gross Mass	Tare Mass	Net Mass Indiv.	Retained Accumulative	Percent Retained Individual	Percent Retained Accumulative	STD Sieve	Accum. Percent Passing
20#	414.82	414.63	0.2	--	0.4	0.4	0.850mm	99.6
40#	395.98	395.41	0.6	0.8	1.1	1.5	0.425mm	98.5
80#	368.59	353.05	15.5	16.3	31.1	32.6	0.180mm	67.4
100#	371.36	366.67	4.7	21.0	9.4	42.0	0.150mm	58.0
200#	391.43	381.42	10.0	31.0	20.0	62.0	0.075mm	38.0
<200#	368.71	367.80	0.9	50.0	1.8	63.8	<0.075mm	36.2

Day	Reading Time Hr	Min	Elapsed Time (min)	Hydrom Reading	Temp °C	Corr. Hydrom Reading	Particle Diam. (mm)	Pct Soil Susp.
24	6	09	0	--	21.2	--	--	--
24	7	10	0.67	22.0	21.2	16.7	0.0609	34.3
24	7	40	30	12.5	21.2	7.2	0.0096	14.8
24	8	10	60	11.5	21.2	6.2	0.0069	12.7
24	11	10	240	9.5	21.2	4.2	0.0035	8.6
24	3	10	480	8.5	20.9	3.1	0.0025	6.4
25	7	10	1440	7.5	21.0	2.2	0.0014	4.5

Approved By: [signature] Date: 7/2/93

CH2M HILL Quality Analytical Laboratory
5090 Caterpillar Road Redding
California 96002-1412
916 244 52
FAX 916 24


Soils Analysis for 1DBSB00701
Accumulative Percent Passing
Individual Percent Retained
0.6
0.4
0.2
0
0.01
0.1
1
10
Sieve Sizes, mm
Accumulative Percent Passing
Individual Percent Retained
Specific Gravity: 2.52

Soils Analysis

PARTICLE SIZE ANALYSIS
ASTM D-422

Proj. Desc. :	ABB/NAS Jacksonville	Sample I.D. :	90046005
Proj. Number:	LGN00999.99.JA	Sample Desc.:	1DBSB00701
ATTENTION:	Ms. Nancy Mosurick	Date Analyzed:	06/30/93

INITIAL SAMPLE MASS	Units		HYGROSCOPIC MOISTURE CONTENT	Units	
Mass Dry Sample	g	50.00	Can No.	--	[ ]
Moisture Cont	%	0.00	Gross Wet Mass	g	50
Corr. Dry Mass	g	50.00 (M)	Gross Dry Mass	g	50
Pass #10 sieve	%	100.00 (B)	Moisture Mass	g	0
Mass of total sample represented			Tare Mass	g	0
by mass used in hydrometer test			Dry Soil Mass	g	50
W = (M/B) x 100 =		50.00 g	Moisture Content	%	0

Hydrometer No: 87026 Type: 152H
Dispersing Agent: Sodium Hexametaphosphate
Amount Used: 50 ml

Specific Gravity: 2.52

Material Retained On 75 um Sieve After Washing

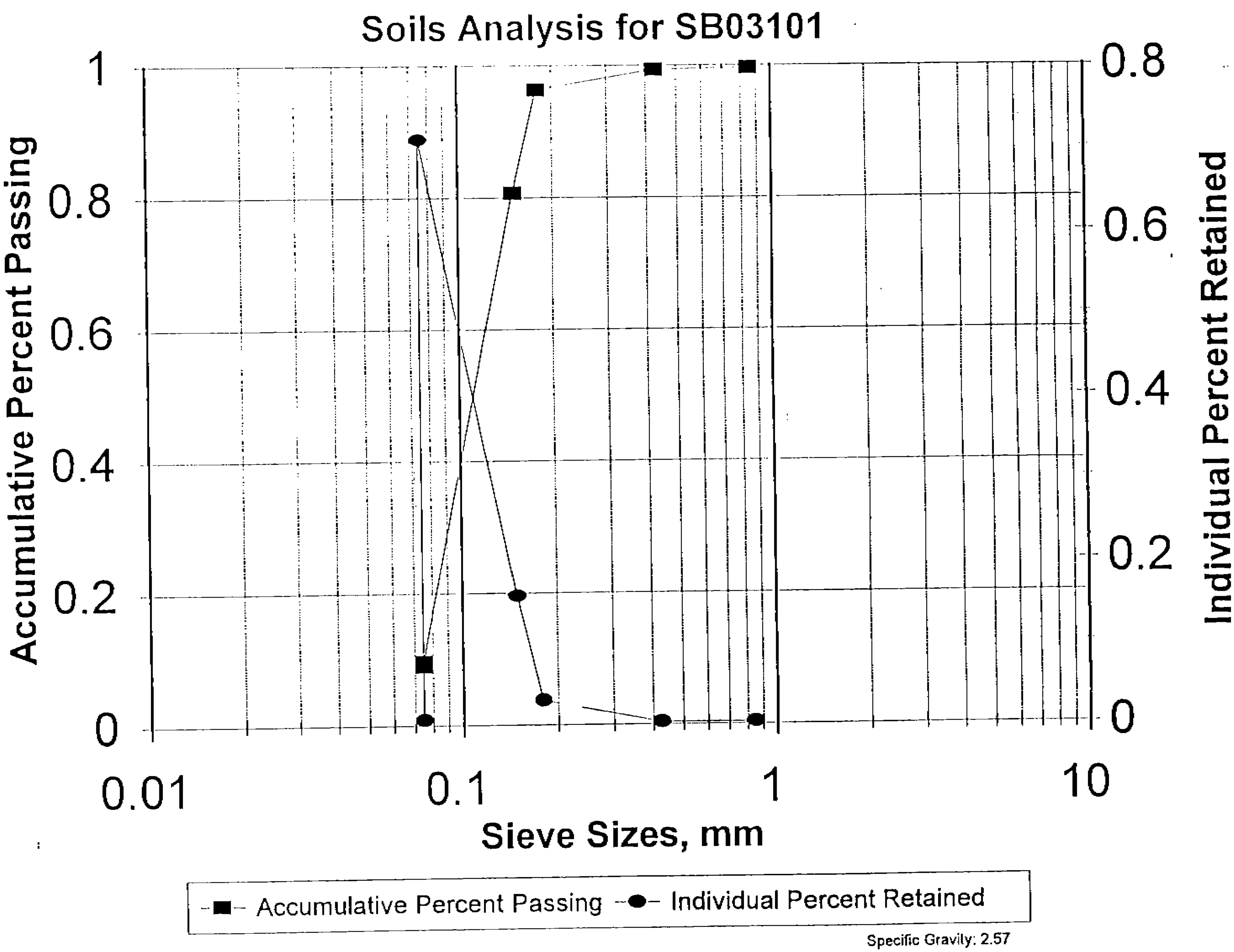
STD Sieve #	Gross Mass	Tare Mass	Net Mass Indiv.	Retained Accumulative	Percent Retained Individual	Percent Retained Accumulative	STD Sieve	Accum. Percent Passing
20#	450.20	428.76	21.4	--	42.9	42.9	0.850mm	57.1
40#	409.68	395.06	14.6	36.1	29.2	72.1	0.425mm	27.9
80#	343.66	337.12	6.5	42.6	13.1	85.2	0.180mm	14.8
100#	358.96	357.58	1.4	44.0	2.8	88.0	0.150mm	12.0
200#	378.69	376.40	2.3	46.3	4.6	92.5	0.075mm	7.5
<200#	360.41	360.28	0.1	50.0	0.3	92.8	<0.075mm	7.2

Reading Time Day	Hr	Min	Elapsed Time (min)	Hydrom Reading	Temp °C	Corr. Hydrom Reading	Particle Diam. (mm)	Pct Soil Susp.
24	6	08	0	--	21.2	--	--	--
24	7	09	0.67	9.5	21.2	4.2	0.0658	8.6
24	7	39	30	7.5	21.2	2.2	0.0099	4.5
24	8	09	60	6.0	21.2	0.7	0.0071	1.4
24	11	09	240	5.5	21.2	0.2	0.0036	0.4
24	3	09	480	5.5	20.9	0.1	0.0025	0.2
25	7	09	1440	5.0	21.0	0.0	0.0015	0.0

Approved By: [signature] Date: 7/1/93

CH2M HILL Quality Analytical Laboratory
5090 Caterpillar Road Redding
California 96003-1412

0001
FAX 7-13-2-
7-1-93


Soils Analysis for SB03101
Accumulative Percent Passing
Individual Percent Retained
Sieve Sizes, mm
0.01
0.1
1
10
0
0.2
0.4
0.6
0.8
1
Accumulative Percent Passing
Individual Percent Retained
Specific Gravity: 2.57

Soils Analysis

PARTICLE SIZE ANALYSIS
ASTM D-422

Proj. Desc. :	ABB/NAS Jacksonville	Sample I.D. :	90048020
Proj. Number:	LGN00999.99.JA	Sample Desc.:	SBO3101
ATTENTION:	Ms. Nancy Mosurick	Date Analyzed:	07/07/93

INITIAL SAMPLE MASS	Units		HYGROSCOPIC MOISTURE CONTENT	Units	
Mass Dry Sample	g	50.00	Can No.	--	[ ]
Moisture Cont	%	0.00	Gross Wet Mass	g	5(
Corr. Dry Mass	g	50.00 (M)	Gross Dry Mass	g	5(
Pass #10 sieve	%	100.00 (B)	Moisture Mass	g	(
Mass of total sample represented by mass used in hydrometer test W = (M/B) x 100 = 50.00 g			Tare Mass	g	(
			Dry Soil Mass	g	5(
			Moisture Content	%	(

Hydrometer No.: 87026 Type: 152H
Dispersing Agent: Sodium Hexametaphosphate
Amount Used: 50 ml

Specific Gravity: 2.57

Material Retained On 75 um Sieve After Washing

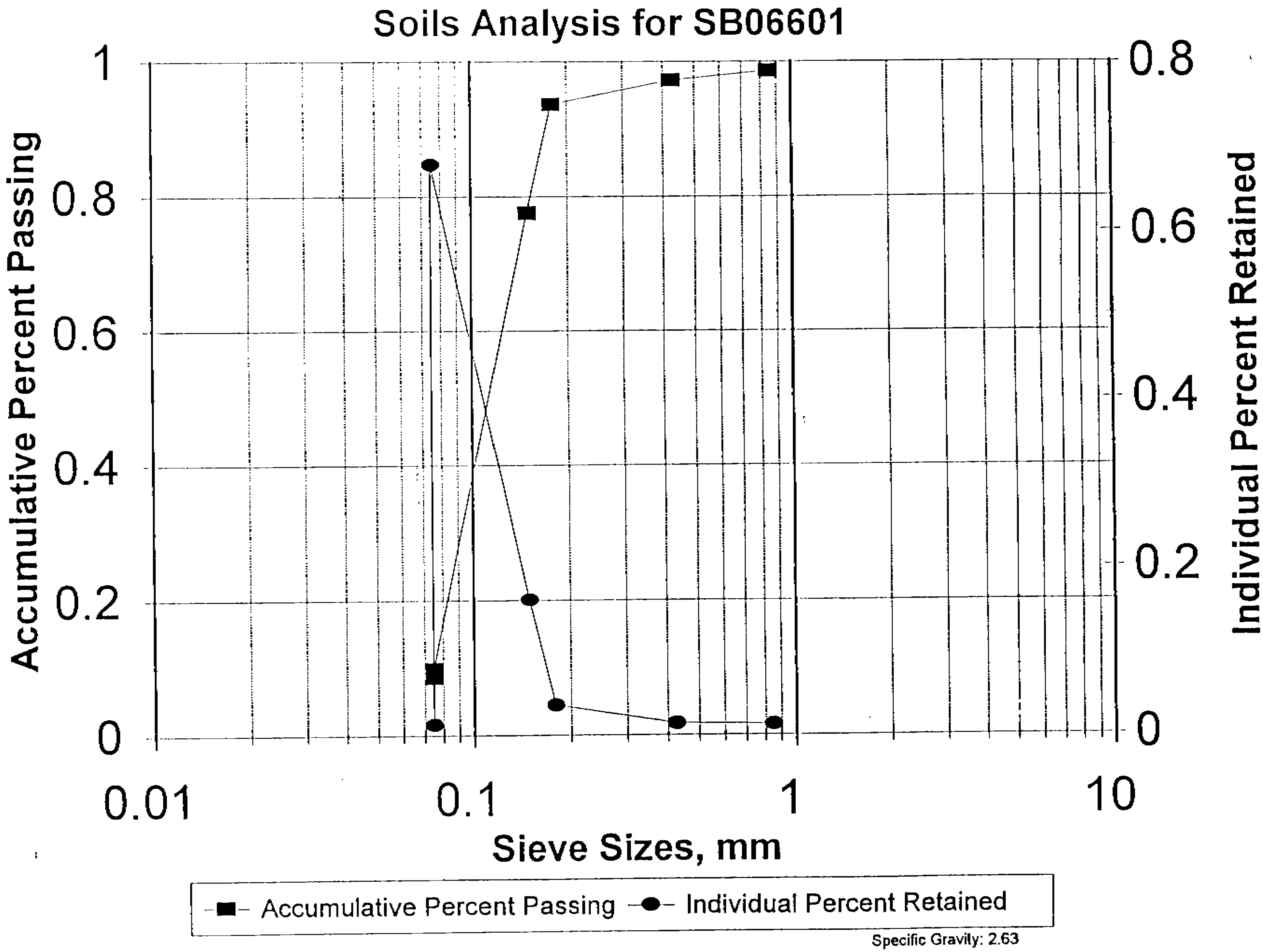
STD Sieve #	Gross Mass	Tare Mass	Net Mass Indiv.	Retained Accumulative	Percent Retained Individual	Percent Retained Accumulative	STD Sieve	Accum. Percent Passing
20#	428.90	428.75	0.1	--	0.3	0.3	0.850mm	99.7
40#	395.20	395.06	0.1	0.3	0.3	0.6	0.425mm	99.4
80#	338.67	337.15	1.5	1.8	3.0	3.6	0.180mm	96.4
100#	365.44	357.60	7.8	9.6	15.7	19.3	0.150mm	80.7
200#	417.00	381.44	35.6	45.2	71.1	90.4	0.075mm	9.6
<200#	360.63	360.28	0.4	50.0	0.7	91.1	<0.075mm	8.9

Reading Time Day	Hr	Min	Elapsed Time (min)	Hydrom Reading	Temp °C	Corr. Hydrom Reading	Particle Diam. (mm)	Pct Soil Susp.
6	7	12	0	--	21.8	--	--	--
6	7	13	0.67	12.5	21.8	7.4	0.0632	15.1
6	7	43	30	8.5	21.8	3.4	0.0097	6.9
6	8	13	60	8.0	21.7	2.9	0.0069	5.9
6	11	13	240	8.0	21.5	2.8	0.0034	5.7
6	3	13	480	7.0	21.5	1.8	0.0024	3.7
7	7	13	1440	6.5	21.4	1.3	0.0014	2.6

Approved By: [signature] Date: 7/8/93

0006

CH2M HILL Quality Analytical Laboratory
5090 Caterpillar Road, Redding, California 96003-1412



Soils Analysis for SB06601
Accumulative Percent Passing
Individual Percent Retained
1
0.8
0.6
0.4
0.2
0
0.8
0.6
0.4
0.2
0
0.01
0.1
1
10
Sieve Sizes, mm
Accumulative Percent Passing
Individual Percent Retained
Specific Gravity: 2.63

Soils Analysis

PARTICLE SIZE ANALYSIS
ASTM D-422

Proj. Desc. :	ABB/NAS Jacksonville	Sample I.D. :	90048024
Proj. Number:	LGN00999.99.JA	Sample Desc.:	SBO6601
ATTENTION:	Ms. Nancy Mosurick	Date Analyzed:	07/07/93

INITIAL SAMPLE MASS	Units		HYGROSCOPIC MOISTURE CONTENT	Units	
Mass Dry Sample	g	50.00	Can No.	--	[ ]
Moisture Cont	%	0.00	Gross Wet Mass	g	5C
Corr. Dry Mass	g	50.00 (M)	Gross Dry Mass	g	5C
Pass #10 sieve	%	100.00 (B)	Moisture Mass	g	C
Mass of total sample represented			Tare Mass	g	C
by mass used in hydrometer test			Dry Soil Mass	g	5C
W = (M/B) x 100 =		50.00 g	Moisture Content	%	C

Hydrometer No.: 87026 Type: 152H
Dispersing Agent: Sodium Hexametaphosphate
Amount Used: 50 ml

Specific Gravity: 2.63

Material Retained On 75 um Sieve After Washing

STD Sieve #	Gross Mass	Tare Mass	Net Mass Indiv.	Retained Accumulative	Percent Retained Individual	Percent Retained Accumulative	STD Sieve	Accum. Percent Passing
20#	415.32	414.69	0.6	--	1.3	1.3	0.850mm	98.7
40#	396.08	395.36	0.7	1.3	1.4	2.7	0.425mm	97.3
80#	354.82	353.03	1.8	3.1	3.6	6.3	0.180mm	93.7
100#	374.73	366.69	8.0	11.2	16.1	22.4	0.150mm	77.6
200#	410.31	376.40	33.9	45.1	67.8	90.2	0.075mm	9.8
<200#	368.44	367.78	0.7	50.0	1.3	91.5	<0.075mm	8.5

Reading Time Day	Hr	Min	Elapsed Time (min)	Hydrom Reading	Temp °C	Corr. Hydrom Reading	Particle Diam. (mm)	Pct Soil Susp.
6	7	13	0	--	21.8	--	--	--
6	7	14	0.67	10.0	21.8	4.9	0.0629	9.9
6	7	44	30	8.0	21.8	2.9	0.0095	5.8
6	8	14	60	7.5	21.7	2.4	0.0067	4.8
6	11	14	240	6.5	21.5	1.3	0.0034	2.6
6	3	14	480	6.5	21.5	1.3	0.0024	2.6
7	7	14	1440	6.5	21.4	1.3	0.0014	2.6

Approved By: Ronald R. Hull Date: 7/8/93

0006

CH2M HILL Quality Analytical Laboratory
5090 Caterpillar Road, Redding, California 96003-1412
916.244.52:

00012
7-9-93

Soils Analysis

PARTICLE SIZE ANALYSIS
ASTM D-422

Proj. Desc. :	ABB/NAS Jacksonville	Sample I.D. :	90048024 Dup
Proj. Number:	LGN00999.99.JA	Sample Desc.:	SBO6601
ATTENTION:	Ms. Nancy Mosurick	Date Analyzed:	07/07/93

INITIAL SAMPLE MASS	Units		HYGROSCOPIC MOISTURE CONTEN	Units	
Mass Dry Sample	g	50.00	Can No.	--	[ ]
Moisture Cont	%	0.00	Gross Wet Mass	g	5
Corr. Dry Mass	g	50.00 (M)	Gross Dry Mass	g	5
Pass #10 sieve	%	100.00 (B)	Moisture Mass	g	
Mass of total sample represented			Tare Mass	g	
by mass used in hydrometer test			Dry Soil Mass	g	5
W = (M/B) x 100 =		50.00 g	Moisture Content	%	

Hydrometer No.: 87026 Type: 152H
Dispersing Agent: Sodium Hexametaphosphate
Amount Used: 50 ml

Specific Gravity: 2.63

Material Retained On 75 um Sieve After Washing

STD Sieve #	Gross Mass	Tare Mass	Net Mass Indiv.	Retained Accumulative	Percent Retained Individual	Percent Retained Accumulative	STD Sieve	Accum. Percent Passing
20#	429.28	428.75	0.5	--	1.1	1.1	0.850mm	98.9
40#	395.60	395.04	0.6	1.1	1.1	2.2	0.425mm	97.8
80#	338.75	337.15	1.6	2.7	3.2	5.4	0.180mm	94.6
100#	364.00	357.59	6.4	9.1	12.8	18.2	0.150mm	81.8
200#	415.59	381.41	34.2	43.3	68.4	86.6	0.075mm	13.4
<200#	362.19	360.28	1.9	50.0	3.8	90.4	<0.075mm	9.6

Reading Time Day	Reading Time Hr	Min	Elapsed Time (min)	Hydrom Reading	Temp °C	Corr. Hydrom Reading	Particle Diam. (mm)	Pct Soil Susp.
6	7	14	0	--	21.8	--	--	--
6	7	15	0.67	10.0	21.8	4.9	0.0629	9.9
6	7	45	30	8.0	21.8	2.9	0.0095	5.8
6	8	15	60	7.5	21.7	2.4	0.0067	4.8
6	11	15	240	6.5	21.5	1.3	0.0034	2.6
6	3	15	480	6.5	21.5	1.3	0.0024	2.6
7	7	15	1440	6.5	21.4	1.3	0.0014	2.6

Approved By: Donald R. Hull   Date: 7/8/93

0001
0006

CH2M HILL Quality Analytical Laboratory
5090 Caterpillar Road, Redding, California 96003-1412
916.244.52
FAX 916.24

GG 7-8-93

Corvallis Applied Sciences Laboratory

Client Information		Lab Information	
Project Name:	NAS-JAX OU1 Field Sampling	Date Rec'd:	6/22/93
Project Manager:	Nancy Mousurick/LGN	Batch ID:	538201
Sampled By:	C. D. Goodwin	Dilution Factor:	
Client Sample ID:	OU2-SB-031-01	Report Revision No.:	1
Sampling Date:	6/17/93	Reported By:	E. Sealy
Sampling Time:	1812	Reviewed By:	H. Van Nice
Type:			
Matrix	Soil		
Basis:			

Analyte	Reporting Limit	Sample Result	Qualifier	Units	Method	Date Analyzed
BTU	105	299		BTU/LB	ASTM D240	7/7/93

U=Not detected at specified detection limits
J=Estimated value
T=Exceeded holding time

0001

0006

Corvallis Applied Sciences Laboratory

Client Information		Lab Information	
Project Name:	NAS-JAX OU1 Field Sampling	Date Rec'd:	6/22/93
Project Manager:	Nancy Mousurick/LGN	Batch ID:	538202
Sampled By:	C. D. Goodwin	Dilution Factor:	
Client Sample ID:	OU2-SB-066-01	Report Revision No.:	1
Sampling Date:	6/17/93	Reported By:	E. Sealy
Sampling Time:	1815	Reviewed By:	H. Van Nice
Type:			
Matrix	Soil		
Basis:			

Analyte	Reporting Limit	Sample Result	Qualifier	Units	Method	Date Analyzed
BTU	105	121		BTU/LB	ASTM D240	7/7/93

U=Not detected at specified detection limits
J=Estimated value
T=Exceeded holding time

FORM 1
ANALYSIS DATA SHEET
GENERAL CHEMISTRY LEVEL 2 & 3

Client Sample Number: SB06601

Lab Name: CH2M HILL LABORATORIES

Batch Number(s): GN-90048

Matrix (soil/water): SOIL

Date Collected: 06/17/93

% Solids (if soil): 98.9

Date Received: 06/18/93

Lab Sample ID: GN-90048024

METHOD	ANALYTE	CONCENTRATION	CONC. UNITS	DATE ANALYZED
415.1	TOC	33800	mg/Kg	07/08/93

Comments:

FORM 1
ANALYSIS DATA SHEET
GENERAL CHEMISTRY LEVEL 2 & 3

Client Sample Number: IDBSB00701

Lab Name: CH2M HILL LABORATORIES

Batch Number(s): GN-90046

Matrix (soil/water): SOIL

Date Collected: 06/15/93

% Solids (if soil): 89.4

Date Received: 06/16/93

Lab Sample ID: GN-90046005

METHOD	ANALYTE	CONCENTRATION	CONC. UNITS	DATE ANALYZED
415.1	TOC	28700	mg/Kg	06/30/93

Comments:

FORM 1
ANALYSIS DATA SHEET
GENERAL CHEMISTRY LEVEL 2 & 3

Client Sample Number: DDBSB00601

Lab Name: CH2M HILL LABORATORIES

Batch Number(s): GN-90046

Matrix (soil/water): SOIL

Date Collected: 06/15/93

% Solids (if soil): 96.9

Date Received: 06/16/93

Lab Sample ID: GN-90046009

METHOD	ANALYTE	CONCENTRATION	CONC. UNITS	DATE ANALYZED
415.1	TOC	21100	mg/Kg	06/30/93

Comments:

FORM 1 - GENERAL CHEMISTRY

Western Atlas International

CORE LABORATORIES

LABORATORY TESTS RESULTS
10/27/93

OB NUMBER: 935130 CUSTOMER: CH2M HILL ATTN: KAREN DANIELS

LIENT I.D.........:
ATE SAMPLED.......: 10/13/93
IME SAMPLED.......: 12:35
ORK DESCRIPTION...: U2-PZ-00-01

LABORATORY I.D...: 935130-0001
DATE RECEIVED....: 10/15/93
TIME RECEIVED....: 15:29
REMARKS..........:

EST DESCRIPTION	FINAL RESULT	LIMITS/*DILUTION	UNITS OF MEASURE	TEST METHOD	DATE
rsenic by ICP	<8	8	mg/Kg	ICP, SW 846	10/26/93
TU, Gross, Bomb	19664	175	BTU/lb	ASTM D-240	10/21/93
admium by ICP	<2.0	2.0	mg/Kg	ICP, SW 846	10/26/93
apillary Gas Chromatography	Attached		See Attached	Capilliary GC	10/25/93
hloride, Bomb Method	<0.1	0.1	Wt. %	ASTM D-808	10/26/93
hromium by ICP	<2.0	2.0	mg/Kg	ICP, SW 846	10/26/93
stillation		*1		ASTM D-86	10/21/93
I.B.P.	276	0	Deg F.	ASTM D-86	
5% Recovered	344	1			
10% Recovered	372	1			
20% Recovered	390	1			
30% Recovered	401	1			
40% Recovered	412	1			
50% Recovered	424	1			
60% Recovered	432	1			
70% Recovered	443	1			
80% Recovered	452	1			
90% Recovered	470	1			
95% Recovered	500	1			
End Point	552	1	Deg F.		
% Recovered	96.0	0.1			
% Loss	3.5	0.1			
% Residue	0.5	0.1			
ash Point, PMCC,	110		Deg. F	ASTM D-93	10/25/93
nematic Viscosity	1.77		cSt @ 40 C	ASTM D-445	10/26/93
ad by ICP	87	4.0	mg/Kg	ICP, SW 846	10/26/93
S in Transformer Oil, ASTM D4059	<1	1	ppm wt.	EPA 8080, 3580	10/19/93
ecific Gravity	0.8177			ASTM D-1298	10/21/93

P O BOX 34766
HOUSTON, TX 77234-4282
(713) 943-9776

Western Atlas International

CORE LABORATORIES

P.O. Box 34766
Houston, TX 77234
(713) 943-9776

CH2M Hill
ATTN: Karen Daniels

Job No: 935130
Sample ID: U2-PZ-00-01 10/13/93

CAPILLARY ANALYSIS

	Wt.%	LV.%	Mole
iso-Pentane	0.03	0.04	0.C
n-Pentane	0.02	0.03	0.C
2,3-Dimethylbutane	0.07	0.09	0.1
2-Methylpentane	0.11	0.14	0.2
3-Methylpentane	0.09	0.11	0.1
n-Hexane	0.14	0.18	0.2
Methylcyclopentane	0.09	0.10	0.1
2,4-Dimethylpentane	0.26	0.33	0.4
Cyclohexane	0.08	0.09	0.
2-Methylhexane	0.17	0.21	0.2
2,3-Dimethylpentane	0.47	0.57	0.7
3-Methylhexane	0.23	0.28	0.3
cis-1,3-Dimethylcyclopentane	0.05	0.06	0.C
trans-1,3-Dimethylcyclopentane	0.04	0.05	0.C
trans-1,2-Dimethylcyclopentane	0.07	0.08	0.1
2,2,4-Trimethylpentane	2.21	2.70	3.4
n-Heptane	0.33	0.41	0.5
Methylcyclohexane	0.32	0.35	0.5
2,2-Dimethylhexane	0.05	0.06	0.C
2,5-Dimethylhexane	0.42	0.51	0.5
2,4-Dimethylhexane	0.27	0.33	0.3
trans,cis-1,2,4-Trimethylcyclopentane	0.04	0.05	0.C
3,3-Dimethylhexane	0.01	0.01	0.C
trans,cis-1,2,3-Trimethylcyclopentane	0.05	0.06	0.C
2,3,4-Trimethylpentane	1.07	1.26	1.4
2,2,3-Trimethylpentane	1.15	1.36	1.5
2,3-Dimethylhexane	0.27	0.32	0.3
2-Methyl-3-Ethylpentane	0.02	0.02	0.C
2-Methylheptane	0.24	0.29	0.3
4-Methylheptane	0.06	0.07	0.C
3-Methylheptane	0.21	0.25	0.2
cis-1,3-Dimethylcyclohexane	0.21	0.23	0.2
trans-1,4-Dimethylcyclohexane	0.07	0.08	0.1
2,2,4,4-Tetramethylpentane	0.02	0.02	0.
2,2,5-Trimethylhexane	0.68	0.80	0.

Western Atlas International

CORE LABORATORIES

P.O. Box 34766
Houston, TX 77234
(713) 943-9776

CH2M Hill
ATTN: Karen Daniels

Job No: 935130
Sample ID: U2-PZ-00-01 10/13/93

CAPILLARY ANALYSIS

	Wt.%	LV.%	Mol
trans-1-Ethyl-3-Methylcyclopentane	0.01	0.01	0.
trans-1-Ethyl-2-Methylcyclopentane	0.03	0.03	0.
trans-1,2-Dimethylcyclohexane	0.09	0.10	0.
n-Octane	0.54	0.65	0.
Isopropylcyclopentane	0.01	0.01	0.
2,3,5-Trimethylhexane	0.11	0.13	0.
2,2-Dimethylheptane	0.01	0.01	0.
cis-1,2-Dimethylcyclohexane	0.08	0.08	0.
n-Propylcyclopentane	0.18	0.20	0.
2,6-Dimethylheptane	0.11	0.12	0.
1,1,3-Trimethylcyclohexane	0.17	0.19	0.
3,5-Dimethylheptane	0.15	0.18	0.
3-Methyl-3-Ethylhexane	0.01	0.01	0.
Ethylbenzene	0.08	0.08	0.
2,3,4-Trimethylhexane	0.06	0.07	0.
trans,trans-1,2,4-Trimethylcyclohexane	0.09	0.10	0.
meta-Xylene	0.16	0.16	0.
para-Xylene	0.07	0.07	0.
2,3-Dimethylheptane	0.12	0.14	0.
3,4-Dimethylheptane	0.01	0.01	0.
4-Ethylheptane	0.03	0.04	0.
4-Methyloctane	0.15	0.18	0.
2-Methyloctane	0.18	0.21	0.
3-Ethylheptane	0.06	0.07	0.
3-Methyloctane	0.25	0.29	0.
ortho-Xylene	0.02	0.02	0.
1-Methyl-2-Propylcyclopentane	0.07	0.08	0.
cis-1-Ethyl-3-Methylcyclohexane	0.14	0.15	0.
trans-1-Ethyl-4-Methylcyclohexane	0.15	0.16	0.
iso-Butylcyclopentane	0.01	0.01	0.
n-Nonane	0.81	0.96	0.
Unidentified C-9 Compounds	0.09	0.11	0.
trans-1-Ethyl-3-Methylcyclohexane	0.14	0.15	0.
1-Methyl-1-Ethylcyclohexane	0.04	0.04	0.
iso-Propylbenzene	0.03	0.03	0.

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CH2M Hill
ATTN: Karen Daniels

Job No: 935130
Sample ID: U2-PZ-00-01 10/13/93

CAPILLARY ANALYSIS

	Wt.%	LV.%	Mole
sec-Butylcyclopentane	0.11	0.12	0.1
iso-Propylcyclohexane	0.05	0.05	0.0
2,2-Dimethyloctane	0.07	0.08	0.0
4,4-Dimethyloctane	0.02	0.02	0.0
3,5-Dimethyloctane	0.06	0.07	0.0
Propylcyclohexane	0.28	0.30	0.3
n-Butylcyclopentane	0.07	0.07	0.0
n-Propylbenzene	0.07	0.07	0.0
1,3-Dimethyl-2-Ethylcyclohexane	0.13	0.14	0.1
meta-Ethyltoluene	0.14	0.14	0.1
para-Ethyltoluene	0.16	0.16	0.2
1,3,5-Trimethylbenzene	0.37	0.36	0.4
4-Ethyloctane	0.07	0.08	0.0
5-Methylnonane	0.13	0.15	0.1
4-Methylnonane	0.26	0.30	0.2
ortho-Ethyltoluene	0.37	0.36	0.4
3-Ethyloctane	0.05	0.06	0.0
3-Methylnonane	0.38	0.44	0.4
trans-1-Methyl-4-isopropylcyclohexane	0.12	0.13	0.1
1,2,4-Trimethylbenzene	0.45	0.44	0.5
cis-1-Methyl-3-Propylcyclohexane	0.18	0.19	0.2
iso-Butylcyclohexane	0.20	0.21	0.2
cis-1-Methyl-4-isopropylcyclohexane	0.03	0.03	0.0
1-Ethyl-2,3-Dimethylcyclohexane	0.08	0.08	0.0
iso-Butylbenzene	0.11	0.11	0.1
n-Decane	2.01	2.33	2.2
Unidentified C-10 Compounds	0.50	0.58	0.5
1,2,3-Trimethylbenzene	0.37	0.36	0.4
Indane	0.14	0.12	0.1
1-Methyl-4-isopropylbenzene	0.10	0.10	0.1
sec-Butylcyclohexane	0.91	0.95	1.0
1-Methyl-2-isopropylbenzene	0.03	0.03	0.0
1,3-Diethylbenzene	0.34	0.33	0.4
1-Methyl-3-Propylbenzene	0.70	0.69	0.5
1-Methyl-4-Propylbenzene	0.28	0.28	0.

Western Atlas International

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CH2M Hill
ATTN: Karen Daniels

Job No: 935130
Sample ID: U2-PZ-00-01 10/13/93

CAPILLARY ANALYSIS

	Wt.%	LV.%	Mole
n-Butylbenzene	0.40	0.40	0.4
1,2-Diethylbenzene	0.24	0.23	0.2
1-Methyl-2-Propylbenzene	0.79	0.77	0.9
4-Methyldecane	0.51	0.59	0.5
1,4-Dimethyl-2-Ethylbenzene	0.91	0.88	1.0
1,3-Dimethyl-4-Ethylbenzene	0.44	0.43	0.5
3-Methyldecane	0.55	0.63	0.5
1,2-Dimethyl-4-Ethylbenzene	0.33	0.32	0.3
1,3-Dimethyl-2-Ethylbenzene	0.24	0.23	0.2
1,2-Dimethyl-3-Ethylbenzene	0.37	0.35	0.4
n-Undecane	5.12	5.87	5.1
Unidentified C-11 Compounds	4.26	4.88	4.2
1,2,4,5-Tetramethylbenzene	0.34	0.33	0.4
(2-Methylbutyl)Benzene	0.23	0.23	0.2
1,2,3,5-Tetramethylbenzene	0.48	0.46	0.5
1,2,3,4-Tetramethylbenzene	0.73	0.70	0.8
Pentylbenzene	0.36	0.36	0.3
trans-1-Methyl(4-Methylpentane)cyclopentane	0.50	0.51	0.5
n-Dodecane	4.57	5.17	4.1
Naphthalene	0.53	0.38	0.6
2-Methyl Naphthalene	1.02	0.87	1.1
1-Methyl Naphthalene	0.97	0.81	1.0
Unidentified C12 Compounds	12.48	12.33	11.9
Tridecane	4.01	3.42	3.3
Unidentified C13 Compounds	15.57	13.24	13.1
Tetradecane	3.00	2.55	2.1
Unidentified C14 Compounds	11.51	9.81	9.0
Pentadecane	0.72	0.79	0.5
Unidentified C15 Compounds	4.86	5.34	3.5
Hexadecane	0.13	0.14	0.0
Unidentified C16 Compounds	0.52	0.57	0.1
Heptadecane	0.02	0.02	0.0
Pristane	0.02	0.02	0.0
Unidentified C17 Compounds	0.02	0.02	0.0
Octadecane	0.01	0.01	0.0
Phytane	0.01	0.01	0.0
Nonadecane	0.01	0.01	0.
	100.00	100.00	100.

APPENDIX D

Risk Evaluation Supporting Documentation

Table D-1
Summary of Contaminants of Potential Concern for Public Health at PSC 2 in Surface Soil (0 to 1 Foot)

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Common Name	Units	Frequency of Detection[1]	Range of Sample Quantitation Limits	Minimum Detected Concentration	Maximum Detected Concentration	Background Concentration[2]	CPC[3]
Metals and Cyanide (mg/kg)							
Aluminum	mg/kg	10/10	4.5 - 5.2	1,000	3,090	1,076	YES
Arsenic	mg/kg	1/10	0.34 - 0.48	0.93	0.93	0.9	YES
Barium	mg/kg	1/10	0.24 - 0.28	121	121	8.98	YES
Cadmium	mg/kg	4/10	0.53 - 0.61	1.2	7.2	0.94	YES
Calcium	mg/kg	4/10	87.6 - 101	1,550	34,100	1,211	NO [4]
Chromium	mg/kg	8/10	0.5 - 0.58	2.8	17.6	4.76	YES
Copper	mg/kg	5/10	0.32 - 0.38	8.5	90.9	2.38	YES
Iron	mg/kg	10/10	1.1 - 1.3	179	3,750	849	NO [5]
Lead	mg/kg	10/10	0.23 - 0.26	2.8	133	15.6	YES
Manganese	mg/kg	8/10	0.14 - 0.17	4.7	24.3	17.2	YES
Mercury	mg/kg	1/10	0.015 - 0.016	0.1	0.1	0.1	NO [4]
Zinc	mg/kg	9/10	0.47 - 0.54	5.2	260	10.4	YES
Pesticides/Polychlorinated Biphenyls (μg/kg)							
4,4'-DDE	μg/Kg	1/10	3.5 - 3.5	1	1	NA	YES
Dieldrin	μg/Kg	4/10	3.4 - 8.5	1.6	13	NA	YES
alpha-Chlordane	μg/Kg	4/10	1.7 - 1.8	0.68	2.9	NA	YES
gamma-Chlordane	μg/Kg	4/10	1.7 - 1.8	0.56	3.6	NA	YES

Table D-1
Summary of Contaminants of Potential Concern for Public Health at PSC 2 in Surface Soil (0 to 1 Foot)

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Common Name	Units	Frequency of Detection[1]	Range of Sample Quantitation Limits	Minimum Detected Concentration	Maximum Detected Concentration	Background Concentration[2]	CPC[3]
Semivolatile Organic Compounds (μg/kg)							
2-Methylnaphthalene	μg/Kg	2/10	3400 - 37000	9,400	11,000	NA	YES
Benzo(a)pyrene	μg/Kg	1/10	330 - 330	210	210	NA	YES
Benzo(b)fluoranthene	μg/Kg	1/10	330 - 330	260	260	NA	YES
Benzo(g,h,i)perylene	μg/Kg	1/10	330 - 330	150	150	NA	YES
Benzo(k)fluoranthene	μg/Kg	1/10	330 - 330	170	170	NA	YES
Chrysene	μg/Kg	1/10	330 - 330	81	81	NA	YES
Dibenz(a,h)anthracene	μg/Kg	1/10	330 - 330	73	73	NA	YES
Indeno(1,2,3-cd)pyrene	μg/Kg	1/10	330 - 330	170	170	NA	YES
Naphthalene	μg/Kg	1/10	3400 - 3400	4,100	4,100	NA	YES
Pyrene	μg/Kg	1/10	330 - 330	140	140	NA	YES
Volatile Organic Compounds (μg/kg)							
2-Butanone	μg/Kg	1/22[5]	56 - 56	24	24	NA	YES
4-Methyl-2-pentanone	μg/Kg	1/22[6]	56 - 56	550	550	NA	YES
Acetone	μg/Kg	10/22[6]	10 - 56	3	70	NA	YES
Ethylbenzene	μg/Kg	1/22[6]	56 - 56	7	7	NA	YES
Xylene (total)	μg/Kg	1/22[6]	51 - 51	350	350	NA	YES

Notes: NA = not available.
CPC = chemical of potential concern.

1. The frequency of detection and the range of sample quantitation limits reflect the off-site laboratory samples (OU2SB00101, OU2SB00301, OU2SB00401, OU2SB00801, OU2SB01001, OU2SB01701, OU2SB02401, OU2SB03101, OU2SB04001, and OU2SB06001) unless otherwise indicated.

2. The background concentration for each metal was calculated as two times the arithmetic mean (nondetects taken at one-half their value) using the background data set for 0-6" as provided in Appendix D.

3. Analyte is a CPC if the maximum detected concentration exceeds the background concentration and is not an essential nutrient.

4. Analyte is an essential nutrient and is therefore not included as a CPC.

5. The frequency of detection and the range of sample quantitation limits reflect the off-site laboratory samples (OU2SB00101, OU2SB00301, OU2SB00401, OU2SB00801, OU2SB01001, OU2SB01701, OU2SB02401, OU2SB03101, OU2SB04001, OU2SB06601, OU2SB06801, OU2SB06801, OU2SB06801RP, OU2SB07001, OU2SB07001RP, OU2SB07101, OU2SB07101RP, OU2SB07201, OU2SB7201RP, OU2SB07301, OU2SB07301RP, OU2SB07401, OU2SB07401RP).

Table D-2
Summary of Contaminants of Potential Concern for Public Health at PSC 41 in Surface Soil and Filter Media
(0 to 1 Foot)

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Common Name	Units	Frequency of Detection[1]	Range of Sample Quantitation Limits	Minimum Detected Concentration	Maximum Detected Concentration	Background Concentration[2]	CPC[3]
Metals (mg/kg)							
Aluminum	mg/kg	3/3	4.4 - 5.4	1,090	2,560	1,076	YES
Arsenic	mg/kg	2/3	0.34 - 0.4	1.5	61.1	0.9	YES
Barium	mg/kg	2/3	0.24 - 0.29	56.1	451	8.98	YES
Cadmium	mg/kg	3/3	0.064 - 0.53	9.6	134	0.94	YES
Calcium	mg/kg	3/3	87 - 105	2,220	4,850	1,211	NO[4]
Chromium	mg/kg	3/3	0.5 - 0.61	206	5,310	4.76	YES
Cobalt	mg/kg	1/3	0.96 - 1.2	20.7	20.7	1.74	YES
Copper	mg/kg	3/3	0.32 - 0.39	21.4	334	2.38	YES
Iron	mg/kg	3/3	1.14 - 1.4	1,810	9,750	849	NO[4]
Lead	mg/kg	3/3	0.23 - 0.28	23	252	15.6	YES
Magnesium	mg/kg	2/3	6.3 - 7.6	181	227	58.3	NO[4]
Manganese	mg/kg	3/3	0.14 - 0.17	36.2	252	17.2	YES
Mercury	mg/kg	2/3	0.015 - 0.018	0.3	12.2	0.1	YES
Nickel	mg/kg	3/3	1.8 - 2.2	20.7	110	6.06	YES
Selenium	mg/kg	1/3	0.4 - 0.4	1	1	0.28	YES
Silver	mg/kg	3/3	0.49 - 0.59	5.4	110	1.18	YES
Zinc	mg/kg	3/3	0.46 - 0.56	54.3	454	10.4	YES

Table D-2

Summary of Contaminants of Potential Concern for Public Health at PSC 41 in Surface Soil and Filter Media (0 to 1 Foot)

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Common Name	Units	Frequency of Detection[1]	Range of Sample Quantitation Limits	Minimum Detected Concentration	Maximum Detected Concentration	Background Concentration[2]	CPC[3]
Volatile Organic Compound (µg/kg)							
Acetone	µg/kg	1/2[5]	10 - 10	20	20	NA	YES

Notes: NA = not available.
CPC = chemical of potential concern.

1. The frequency of detection and the range of sample quantitation limits reflect only the off-site laboratory samples collected within the walls of the drying bed (DDBSB00101, DDBSB00301, and DDBSB00401) unless otherwise indicated.

2. The background concentration for each metal was calculated as two times the arithmetic mean (nondetects taken at one-half their value) using the background data set for 0-6" as provided in Appendix D.

3. Analyte is a CPC if the maximum detected concentration exceeds the background concentration and is not an essential nutrient.

4. Analyte is an essential nutrient and is therefore not included as a CPC.

5. The frequency of detection and the range of sample quantitation limits reflect only the off-site laboratory samples collected within the walls of the drying bed (DDBSB00201, DDBSB00601).

Table D-3
Summary of Contaminants of Potential Concern for Public Health at PSC 41 in Subsurface Soil and Filter Media (0 to 5 Feet)

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Common Name	Units	Frequency of Detection[1]	Range of Sample Quantitation Limits	Minimum Detected Concentration	Maximum Detected Concentration	Background Concentration[2]	CPC[3]
Metals (mg/kg)							
Aluminum	mg/kg	9/9	4.4 - 5.8	82.1	2,560	1,411	YES
Arsenic	mg/kg	5/9	0.34 - 0.43	0.62	61.1	0.8	YES
Barium	mg/kg	9/9	0.24 - 0.31	1.3	451	8.34	YES
Cadmium	mg/kg	5/9	0.064 - 0.67	4	134	1.08	YES
Calcium	mg/kg	7/9	87 - 113	194	4,850	1,050	NO[4]
Chromium	mg/kg	5/9	0.5 - 0.65	4.4	5,310	4.5	YES
Cobalt	mg/kg	1/9	0.96 - 1.2	20.7	20.7	1.76	YES
Copper	mg/kg	4/9	0.32 - 0.42	8.5	334	2.84	YES
Iron	mg/kg	9/9	1.14 - 1.5	19.1	9,750	757	NO[4]
Lead	mg/kg	9/9	0.23 - 0.29	2	252	12.8	YES
Magnesium	mg/kg	2/9	6.3 - 8.2	181	227	49	NO[4]
Manganese	mg/kg	6/9	0.14 - 0.19	16.6	524	14	YES
Mercury	mg/kg	2/9	0.015 - 0.018	0.3	12.2	0.1	YES
Nickel	mg/kg	5/9	1.8 - 2.4	18.7	110	7.52	YES
Selenium	mg/kg	1/9	0.4 - 0.4	1	1	0.3	YES
Silver	mg/kg	3/9	0.49 - 0.59	5.4	110	1.2	YES
Zinc	mg/kg	6/9	0.46 - 0.6	9	454	12.8	YES

Table D-3
Summary of Contaminants of Potential Concern for Public Health at PSC 41 in Subsurface Soil and Filter Media (0 to 5 Feet)

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Common Name	Units	Frequency of Detection[1]	Range of Sample Quantitation Limits	Minimum Detected Concentration	Maximum Detected Concentration	Background Concentration[2]	CPC[3]
Volatile Organic Compound (μg/kg)							
Acetone	μg/kg	1/4[5]	10 - 10	20	20	NA	YES

Notes: NA = not available.
CPC = chemical of potential concern

1. The frequency of detection and the range of sample quantitation limits reflect only the off-site laboratory samples collected from within the drying beds (DDBSB00101, DDBSB00102, DDBSB00103, DDBSB00301, DDBSB00302, DDBSB00303, DDBSB00401, DDBSB00402, and DDBSB00403) unless otherwise indicated.

2. The background concentration for each metal was calculated as two times the arithmetic mean (nondetects taken at one-half their value) using the background data set for 0-5' as provided in Appendix D.

3. Analyte is a CPC if the maximum detected concentration exceeds the background concentration and is not an essential nutrient.

4. Analyte is an essential nutrient and is therefore not included as a CPC.

5. The frequency of detection and the range of sample quantitation limits reflect only the off-site laboratory samples collected from within the drying beds (DDBSB00201, DDBSB00502, DDBSB00601, and DDBSB00602).

Table D-4
Summary of Contaminants of Potential Concern for Public Health at PSC 43 in Surface Soil and Filter Media (0 to 1 foot)

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Common Name	Units	Frequency of Detection[1]	Range of Sample Quantitation Limits[1]	Minimum Detected Concentration	Maximum Detected Concentration	Background Concentration[2]	CPC[3]
Metals (mg/kg)							
Aluminum	mg/kg	3/3	4.5 - 4.8	2,590	5,220	1,076	YES
Arsenic	mg/kg	2/3	0.34 - 0.36	0.84	0.94	0.9	YES
Barium	mg/kg	2/3	0.24 - 0.26	67.6	604	8.98	YES
Cadmium	mg/kg	2/3	0.54 - 0.57	98.3	223	0.94	YES
Calcium	mg/kg	3/3	89 - 95.2	15,500	53,700	1,211	NO [4]
Chromium	mg/kg	3/3	0.51 - 0.55	7,050	47,700	4.76	YES
Cobalt	mg/kg	3/3	0.98 - 1	28.9	178	1.74	YES
Copper	mg/kg	3/3	0 - 0.33	93	470	2.38	YES
Iron	mg/kg	3/3	1.2 - 1.2	2,180	5,860	849	NO [4]
Lead	mg/kg	3/3	0.23 - 0.24	444	1,220	15.6	YES
Magnesium	mg/kg	3/3	6.5 - 6.9	4,850	23,100	58.3	NO [4]
Manganese	mg/kg	3/3	0.15 - 0.16	1,660	4,650	17.2	YES
Mercury	mg/kg	1/3	0.016 - 0.016	0.16	0.16	0.1	YES
Nickel	mg/kg	3/3	1.9 - 2	518	1,540	6.06	YES
Selenium	mg/kg	3/3	0.34 - 0.36	0.43	1	0.28	YES
Silver	mg/kg	3/3	0.5 - 0.54	42.2	256	1.18	YES
Sodium	mg/kg	3/3	3 - 3.2	59.9	191	227	NO [4]
Zinc	mg/kg	3/3	0.48 - 0.51	292	1,130	10.4	YES

Table D-4
Summary of Contaminants of Potential Concern for Public Health at PSC 43 in Surface Soil and Filter Media (0 to 1 foot)

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Common Name	Units	*Frequency of Detection*[1]	Range of Sample Quantitation Limits[1]	Minimum Detected Concentration	*Maximum* Detected Concentration	Background Concentration[2]	CPC[3]
Volatile Organic Compound (μg/kg/l)							
Acetone	μg/kg	1/4[5]	10 - 10	44	44	NA	YES

Notes: NA = not available.
CPC = chemical of potential concern.

1. The frequency of detection and the range of sample quantitation limits reflect only the off-site laboratory samples collected from 0-2" within the walls of the drying bed (IDBSB00101, IDBSB00501, and IDBSB00701) unless otherwise indicated.

2. The background concentration for each metal was calculated as two times the arithmetic mean (nondetects taken at one-half their value) using the background data set for 0-6" as provided in Appendix D.

3. Analyte is a CPC if the maximum detected concentration exceeds the background concentration and is not an essential nutrient.

4. Analyte is an essential nutrient and is therefore not included as a CPC.

5. The frequency of detection and the range of sample quantitation limits reflect only the off-site laboratory samples collected from 0-2" within the walls of the drying bed (IDBSB00201, IDBSB00301, IDBSB00401, IDBSB601) unless otherwise indicated.

Table D-5
Summary of Contaminants of Potential Concern for Public Health at PSC 43 in Subsurface Soil and Filter Media (0 to 5 Feet)

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Common Name	Units	Frequency of Detection[1]	Range of Sample Quantitation Limits	Minimum Detected Concentration	Maximum Detected Concentration	Background Concentration[2]	CPC[3]
Metals (mg/kg)							
Aluminum	mg/kg	5/5	4.5 - 5.4	228	7,950	1,411	YES
Arsenic	mg/kg	2/5	0.34 - 0.36	0.84	0.94	0.8	YES
Barium	mg/kg	5/5	0.24 - 0.29	67.6	604	8.34	YES
Cadmium	mg/kg	3/5	0.54 - 0.64	23	223	1.08	YES
Calcium	mg/kg	3/5	89 - 107	15,500	53,700	1,050	NO[4]
Chromium	mg/kg	5/5	0.51 - 0.62	4.8	47,700	4.5	YES
Cobalt	mg/kg	3/5	0.98 - 1.2	28.9	178	1.76	YES
Copper	mg/kg	4/5	0 - 0.4	14.7	470	2.84	YES
Iron	mg/kg	5/5	1.2 - 1.4	37.3	5,860	757	NO[4]
Lead	mg/kg	5/5	0.23 - 0.28	2.1	1,220	12.8	YES
Magnesium	mg/kg	3/5	6.4 - 7.8	4850	23,100	49	NO[4]
Manganese	mg/kg	5/5	0.14 - 0.18	7.8	4,650	14	YES
Mercury	mg/kg	1/5	0.016 - 0.016	0.16	0.16	0.1	YES
Nickel	mg/kg	3/5	1.9 - 2.3	518	1,540	7.52	YES
Selenium	mg/kg	4/5	0.34 - 0.4	0.43	1	0.3	YES
Silver	mg/kg	3/5	0.5 - 0.6	42.2	256	1.2	YES
Zinc	mg/kg	4/5	0.48 - 0.57	5.2	1,130	12.8	YES

Table D-5
Summary of Contaminants of Potential Concern for Public Health at PSC 43 in Subsurface Soil and Filter Media (0 to 5 Feet)

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Common Name	Units	Frequency of Detection[1]	Range of Sample Quantitation Limits	Minimum Detected Concentration	Maximum Detected Concentration	Background Concentration[2]	CPC[3]
Volatile Organic Compound (μg/kg)							
Acetone	μg/Kg	1/7[5]	10 - 10	44	44	NA	YES

Notes: NA = not available.
CPC = chemical of potential concern.

1. The frequency of detection and the range of sample quantitation limits reflect only the off-site laboratory collected within the walls of the drying bed (IDBSB00101, IDBSB00501, IDBSB00602, IDBSB00701, IDBSB00802) unless otherwise indicated.

2. The background concentration for each metal was calculated as two times the arithmetic mean (nondetects taken at one-half their value) using the background data set for 0-6" as provided in Appendix D.

3. Analyte is a CPC if the maximum detected concentration exceeds the background concentration and it is not an essential nutrient.

4. Analyte is an essential nutrient and is therefore not included as a CPC.

5. The frequency of detection and the range of sample quantitation limits reflect only the off-site laboratory collected within the walls of the drying bed (IDBSB0201, IDBSB0202, IDBSB0203, IDBSB0301, IDBSB0402, IDBSB0401, IDBSB00601) unless otherwise indicated.

Table D-6
Oral Dose/Response Data for Noncarcinogenic Effects

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Chemical	Chronic Oral RfD (mg/kg-day)	Source	Subchronic Oral RfD (mg/kg-day)	Source	Study Type	Level	Effect	Animal	Factor	Source
TCL Volatile Organic Compounds										
2-Butanone	6.00E-01	HEAST (1)	2.00E-01	HEAST	Oral-drinking water	Low	Decreased fetal birth weight	Rat	3000 H,A,S,D	IRIS
4-Methyl-2-pentanone	5.00E-02	HEAST (1)	5.00E-01	HEAST	Oral-gavage	Low	Liver/kidney toxicity	Rat	1000 H,A,S	HEAST
Acetone	1.00E-01	IRIS	1.00E+00	HEAST	Oral-gavage	Low	Increased liver, kidney weight	Rat	1000 H,A,S	IRIS
Benzene	ND		ND							
Chlorobenzene	2.00E-02	IRIS	2.00E-01	(2)	Oral-capsule	Medium	Hepatic changes	Dog	1000 H,A,S	IRIS
Ethylbenzene	1.00E-01	IRIS	1.00E+00	(2)	Oral-gavage	Low	Liver, kidney toxicity	Rat	1000 H,A,S	IRIS
Toluene	2.00E-01	IRIS	2.00E+00	HEAST	Oral-gavage	Medium	Changes in liver, kidney weight	Rat	1000 H,A,S	IRIS
Xylenes (total)	2.00E+00	IRIS	4.00E+00	(2)	Oral-gavage	Medium	Hyperactivity, decreased weight	Rat	100 H,A	IRIS
TCL Semivolatile Organic Compounds										
2-Methylnaphthalene	4.00E-02	(3)	ND							
Benzo(a)pyrene	ND		ND							
Benzo(b)fluoranthene	ND		ND							
Benzo(g,h,i)perylene	ND		ND							
Benzo(k)fluoranthene	ND		ND							
Chrysene	ND		ND							
Dibenz(a,h)anthracene	ND		ND							
Indeno(1,2,3-c,d)pyrene	ND		ND							
Naphthalene	4.00E-02	(3)	ND							
Pyrene	3.00E-02	IRIS	3.00E-01	HEAST	Oral-gavage	Low	Renal tubular pathology	Mouse	3000 H,A,S,D	IRIS

Table D-6
Oral Dose/Response Data for Noncarcinogenic Effects

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Chemical	Chronic Oral RfD (mg/kg-day)	Source	Subchronic Oral RfD (mg/kg-day)	Source	Study Type	Level	Effect	Animal	Factor	Source
TCL Pesticides/PCBs										
4,4'-DDE	ND		ND							
alpha-Chlordane	6.00E-05	IRIS (4)	6.00E-05	HEAST (4)	Oral-diet	Low	Liver hypertrophy	Rat	1000 H,A,D	IRIS
Dieldrin	5.00E-05	IRIS	5.00E-05	HEAST	Oral-diet	Medium	Liver lesions	Rat	100 H,A	IRIS
gamma-Chlordane	6.00E-05	IRIS (4)	6.00E-05	HEAST (4)	Oral-diet	Low	Liver hypertrophy	Rat	1000 H,A,D	IRIS
TAL Inorganics										
Aluminum	ND		ND							
Antimony	4.00E-04	IRIS	4.00E-04	HEAST	Oral-drinking water	Low	Reduced lifespan	Rat	1000 H,A,L	IRIS
Arsenic	3.00E-04	IRIS	3.00E-04	HEAST	Oral-drinking water	Medium	Hyperpigmentation, keratosis	Human	3 D	IRIS
Barium	7.00E-02	IRIS	7.00E-02	HEAST	Oral-drinking water	Medium	Elevated blood pressure	Human	3 H	IRIS
Beryllium	5.00E-03	IRIS	5.00E-03	HEAST	Oral-drinking water	Low	No effects observed	Rat	100 H,A	IRIS
Cadmium	1.00E-03	IRIS	ND		Oral-diet	High	Proteinuria	Human	10 H	IRIS
Chromium	5.00E-03	IRIS (5)	2.00E-02	HEAST (5)	Oral-drinking water	Low	No effects observed	Rat	500 H,A,S	IRIS
Cobalt	ND		ND							
Copper	ND	(6)	ND	(6)						
Cyanide	2.00E-02	IRIS	2.00E-02	HEAST	Oral-diet	Medium	No effects observed	Rat	100 H,A	IRIS
Lead	ND		ND							

Table D-6
Oral Dose/Response Data for Noncarcinogenic Effects

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Chemical	Chronic Oral RfD (mg/kg-day)	Source	Subchronic Oral RfD (mg/kg-day)	Source	Study Type	Level	Effect	Animal	Factor	Source
Magnesium	ND		ND							
Manganese	1.40E-01	IRIS	1.40E-01	HEAST	Oral-diet	NA	No effects observed	Human	1	IRIS
Mercury	3.00E-04	HEAST (1,7)	3.00E-04	HEAST (7)	Oral-gavage	Low	Kidney effects	Rat	1000 H,A,D	HEAST
Nickel	2.00E-02	IRIS (8)	2.00E-02	HEAST (8)	Oral-diet	Medium	Decreased body, organ weights	Rat	300 H,A,D	IRIS
Selenium	5.00E-03	IRIS	5.00E-03	HEAST	Oral-diet	High	Selenosis	Human	3 H	IRIS
Silver	5.00E-03	IRIS	5.00E-03	HEAST	Injection-i.v.	Low	Argyria	Human	3 H	IRIS
Vanadium	7.00E-03	HEAST (1)	7.00E-03	HEAST	Oral-drinking water	Low	No effects observed	Rat	100 H,A	HEAST

Table D-6
Oral Dose/Response Data for Noncarcinogenic Effects

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Chemical	Chronic Oral RfD (mg/kg-day)	Source	Subchronic Oral RfD (mg/kg-day)	Source	Study Type	Level	Effect	Animal	Factor	Source
Zinc	3.00E-01	IRIS	3.00E-01	HEAST	Oral-diet supplement	Medium	Decrease in ESOD activity	Human	3 S	IRIS

(1) This value is currently listed in HEAST, but has been withdrawn from IRIS and is under review.
(2) This value has been recently withdrawn from HEAST and is currently under review.
(3) The values for naphthalene have been withdrawn from IRIS and HEAST and are currently under review. *The RfDo of 4.0E-02 was recommended for use by ECAO Cincinnati for Naphthalene.* The value will be used as a surrogate for 2-methylnaphthalene.
(4) The values for chlordane have been used as surrogates for alpha- and gamma-chlordane.
(5) The toxicity values for chromium are based on chromium VI.
(6) A drinking water standard for copper of 1.3 mg/L exists. Inadequate toxicity information is available to calculate an RfD.
(7) This mercury value is specific for inorganic mercury.
(8) The ingestion RfD values for nickel are based on nickel, soluble salts.

Uncertainty Factors: H = Variation in human sensitivity
A = Animal to human extrapolation
S = Extrapolation from subchronic to chronic NOAEL
L = Extrapolation from LOAEL to NOAEL
D = Inadequate data
M = Modifying factor

Notes: ND = no data.
NA = not applicable.
Integrated Risk Information System (IRIS) on-line database search, current as of October 1993.
Health Effects Assessment Summary Tables (HEAST), current as of March 1993.

Table D-7
Inhalation Dose/Response Data for Noncarcinogenic Effects

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Chemical	Chronic RfC (mg/m³)	Source	Subchronic RfC (mg/m³)	Source	Study Type	Confidence Level	Critical Effect	Test Animal	Uncertainty Factor	Source
TCL Volatile Organic Compounds										
2-Butanone	1.00E+00	IRIS	1.00E+00	HEAST	Inhalation	Low	Decreased fetal birth weight	Mouse	1000 H,A,S	IRIS
4-Methyl-2-Pentanone	2.00E-02	HEAST (1,5)	2.00E-01	HEAST (5)	Inhalation	Low	Liver, kidney effects	Rat	1000 H,A,S	HEAST
Acetone	ND		ND							
Benzene	ND		ND							
Chlorobenzene	2.00E-02	(2)	2.00E-01	(2)	Inhalation	Low	Liver, kidney effects	Rat	10,000 H,A,S,L	HEAST
Ethylbenzene	1.00E+00	IRIS	1.00E+00	(2)	Inhalation	Low	Developmental toxicity	Rat/rab-bit	300 H,A,S	IRIS
Toluene	4.00E-01	IRIS	4.00E-01	(2)	Inhalation	Medium	Neurological effects	Human	300 H,L,D	IRIS
Xylenes (total)	ND		ND							
TCL Semivolatile Organic Compounds										
2-Methylnaphthalene	1.30E-03	(3)	ND	ECAO	Inhalation	Low	Nasal effects	Mice	1000 H,A,D,L	ECAO
Benzo(a)pyrene	ND		ND							
Benzo(b)fluoranthene	ND		ND							
Benzo(g,h,i)perylene	ND		ND							
Benzo(k)fluoranthene	ND		ND							
Chrysene	ND		ND							
Dibenz(a,h)anthracene	ND		ND							
Indeno(1,2,3-c,d)pyrene	ND		ND							

Table D-7
Inhalation Dose/Response Data for Noncarcinogenic Effects

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Chemical	Chronic RfC (mg/m^3)	Source	Subchronic RfC (mg/m^3)	Source	Study Type	Confidence Level	Critical Effect	Test Animal	Uncertainty Factor	Source
Naphthalene	1.30E-03	(3)	ND	ECAO	Inhalation	Low	Nasal effects	Mice	1000 H,A,D,L	ECAO
Pyrene	ND		ND							
TCL Pesticides/PCBs										
4,4'-DDE	ND		ND							
alpha-Chlordane	ND		ND							
Dieldrin	ND		ND							
gamma-Chlordane	ND		ND							
TAL Inorganics										
Aluminum	ND		ND							
Antimony	ND		ND							
Arsenic	ND		ND							
Barium	1.00E-04	HEAST (1,5)	1.00E-03	HEAST (5)	Inhalation	Low	Fetotoxicity	Rat	1000 H,A,S	HEAST
Beryllium	ND		ND							
Cadmium	ND		ND							
Chromium	ND		4.00E-06	ECAO	Inhalation	Low	Nasal effects	Human	100 H,D	ECAO
Cobalt	ND		ND							
Copper	ND		ND							
Cyanide	ND		ND							
Lead	ND		ND							
Magnesium	ND		ND							

Table D-7
Inhalation Dose/Response Data for Noncarcinogenic Effects

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Chemical	Chronic RfC (mg/m³)	Source	Subchronic RfC (mg/m³)	Source	Study Type	Confidence Level	Critical Effect	Test Animal	Uncertainty Factor	Source
Manganese	4.00E-04	IRIS	4.00E-04	HEAST	Inhalation	Medium	Respiratory/psychomotor disturbances	Human	300 H,S,L	IRIS
Mercury	3.00E-04	HEAST (1,4)	3.00E-04	HEAST (4)	Inhalation	Low	Neurotoxicity	Human	30 H,D	HEAST
Nickel	ND		ND							
Selenium	ND		ND							
Silver	ND		ND							
Vanadium	ND		ND							
Zinc	ND		ND							

(1) This value is currently listed in HEAST, but has been withdrawn from IRIS and is under review.
(2) This value has been recently withdrawn from HEAST and is currently under review.
(3) The values for naphthalene have been withdrawn from IRIS and HEAST and are currently under review. The RfC of 1.3E-03 was recommended for use by ECAO Cincinnati for Naphthalene. The value will be used as a surrogate for 2-methylnaphthalene.
(4) The mercury RfC values were developed specifically for elemental mercury.
(5) This value is a RfD and therefore does not need converting per equation in footnote (3).

Uncertainty factors: H = Variation in human sensitivity
A = Animal to human extrapolation
S = Extrapolation from subchronic to chronic NOAEL
L = Extrapolation from LOAEL to NOAEL
D = Inadequate data
M = Modifying factor

Notes: ND = no data.
NA = not applicable.
Integrated Risk Information System (IRIS) on-line database search, current as of October 1993.
Health Effects Assessment Summary Tables (HEAST), current as of March 1993.

Table D-8
Oral Dose/Response Data for Carcinogenic Effects

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Chemical	Weight of Evidence	Slope Factor [(mg/kg/day)(-1)]	Source	Test Species	Exposure Route	Tumor Type	Study Source
TCL Volatile Organic Compounds							
2-Butanone	D	NE					
4-Methyl-2-pentanone	D	NE					
Acetone	D	NE					
Benzene	A	2.90E-02	IRIS	Human	Inhalation	Leukemia	IRIS
Chlorobenzene	D	NE					
Ethylbenzene	D	NE					
Toluene	D	NE					
Xylenes (total)	D	NE					
TCL Semivolatile Organic Compounds							
2-Methylnaphthalene	D	NE					
Benzo(a)pyrene	B2	7.30E+00	IRIS	Mouse	Oral-diet	Forestomach	IRIS
Benzo(b)fluoranthene	B2	7.30E+00	(1)				
Benzo(g,h,i)perylene	D	NE					
Benzo(k)fluoranthene	B2	7.30E+00	(1)				
Chrysene	B2	7.30E+00	(1)				
Dibenz(a,h)anthracene	B2	7.30E+00	(1)				
Indeno(1,2,3-c,d)pyrene	B2	7.30E+00	(1)				
Naphthalene	D	NE					
Pyrene	D	NE					

Table D-8
Oral Dose/Response Data for Carcinogenic Effects

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Chemical	Weight of Evidence	Slope Factor [(mg/kg/day)(-1)]	Source	Test Species	Exposure Route	Tumor Type	Study Source
TCL Pesticides/Polychlorinated Biphenyls							
4,4'-DDE	B2	3.40E-01	IRIS	Mouse/hamster	Oral-diet	Liver	IRIS
alpha-Chlordane	B2	1.30E+00	IRIS (2)	Mouse	Oral-diet	Liver	IRIS
Dieldrin	B2	1.60E+01	IRIS	Mouse	Oral-diet	Liver	IRIS
gamma-Chlordane	B2	1.30E+00	IRIS (2)	Mouse	Oral-diet	Liver	IRIS
TAL Inorganics							
Aluminum	D	NE					
Antimony	D	NE					
Arsenic	A	1.75E+00	IRIS (3)	Human	Oral-drinking water	Skin	IRIS
Barium	D	NE					
Beryllium	B2	4.30E+00	IRIS	Rat	Oral-drinking water	Total	IRIS
Cadmium	D	NE					
Chromium	D	NE					
Cobalt	D	NE					
Copper	D	NE					
Cyanide	D	NE					
Lead	B2	NE					
Magnesium	D	NE					
Manganese	D	NE					
Mercury	D	NE					
Nickel	D	NE					

Table D-8
Oral Dose/Response Data for Carcinogenic Effects

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Chemical	Weight of Evidence	Slope Factor [(mg/kg/day)(-1)]	Source	Test Species	Exposure Route	Tumor Type	Study Source
Selenium	D	NE					
Silver	D	NE					
Vanadium	D	NE					
Zinc	D	NE					

(1) The ingestion slope factor for benzo(a)pyrene was used as a surrogate for all PAHs classified as A or B carcinogens and for which a chemical-specific slope factor was not available.
(2) The values for chlordane have been used as surrogates for alpha- and gamma-chlordane.
(3) The ingestion slope factor for arsenic has been calculated from the drinking water unit risk of 5.00E-05 per(ug/L).

Weight of Evidence (route-specific):
A = Human carcinogen
B = Probable human carcinogen (B1 = limited human evidence; B2 = sufficient human evidence)
C = Possible human carcinogen
D = Not classifiable as to human carcinogenicity

Notes: NE = not evaluated.
Integrated Risk Information System (IRIS) on-line database search, current as of October 1993.
Health Effects Assessment Summary Tables (HEAST), current as of March 1993.

Table D-9
Inhalation Dose/Response Data for Carcinogenic Effects

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Chemical	Weight of Evidence	Slope Factor [(mg/kg/day)(-1)]	Source	Test Species	Exposure Route	Tumor Type	Study Source
TCL Volatile Organic Compounds							
2-Butanone	D	NE					
4-Methyl-2-pentanone	D	NE					
Acetone	D	NE					
Benzene	A	2.90E-02	HEAST	Human	Inhalation	Leukemia	IRIS
Chlorobenzene	D	NE					
Ethylbenzene	D	NE					
Toluene	D	NE					
Xylenes (total)	D	NE					
TCL Semivolatile Organic Compounds							
2-Methylnaphthalene	D	NE					
Benzo(a)pyrene	B2	6.10E+00	(1)	Hamster	Inhalation	Lung	IRIS
Benzo(b)fluoranthene	B2	6.10E+00	(2)				
Benzo(g,h,i)perylene	D	NE					
Benzo(k)Fluoranthene	B2	6.10E+00	(2)				
Chrysene	B2	6.10E+00	(2)				
Dibenz(a,h)anthracene	B2	6.10E+00	(2)				
Indeno(1,2,3-c,d)pyrene	B2	6.10E+00	(2)				
Naphthalene	D	NE					
Pyrene	D	NE					

Table D-9
Inhalation Dose/Response Data for Carcinogenic Effects

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Chemical	Weight of Evidence	Slope Factor [(mg/kg/day)(-1)]	Source	Test Species	Exposure Route	Tumor Type	Study Source
TCL Pesticides/Polychlorinated Biphenyls							
4,4'-DDE	D	NE					
alpha-Chlordane	B2	1.30E+00	HEAST (3)	Mouse	Oral-diet	Liver	IRIS
Dieldrin	B2	1.60E+01	HEAST	Mouse	Oral-diet	Liver	IRIS
gamma-Chlordane	B2	1.30E+00	HEAST (3)	Mouse	Oral-diet	Liver	IRIS
TAL Inorganics							
Aluminum	D	NE					
Antimony	D	NE					
Arsenic	A	5.00E+01	HEAST	Human	Inhalation	Lung	IRIS
Barium	D	NE					
Beryllium	B2	8.40E+00	HEAST	Human	Inhalation	Lung	IRIS
Cadmium	B1	6.10E+00	(1)	Human	Inhalation	Lung	IRIS
Chromium	A	4.10E+01	HEAST (4)	Human	Inhalation	Lung	IRIS
Cobalt	D	NE					
Copper	D	NE					
Cyanide	D	NE					
Lead	D	NE					
Magnesium	D	NE					
Manganese	D	NE					
Mercury	D	NE					
Nickel	A	8.40E-01	HEAST (5)	Human	Inhalation	Lung	IRIS

Table D-9
Inhalation Dose/Response Data for Carcinogenic Effects

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Chemical	Weight of Evidence	Slope Factor [(mg/kg/day)(-1)]	Source	Test Species	Exposure Route	Tumor Type	Study Source
Selenium	D	NE					
Silver	D	NE					
Vanadium	D	NE					
Zinc	D	NE					

(1) This value has been recently withdrawn from HEAST and is currently under review.
(2) The inhalation slope factor for benzo(a)pyrene was used as a surrogate for all PAHs classified as A or B carcinogens and for which a chemical-specific slope factor was not available.
(3) The values for chlordane have been used as surrogates for alpha- and gamma-chlordane.
(4) The toxicity values for chromium are based on chromium VI.
(5) The inhalation slope factor for nickel is based on nickel refinery dust.

Weight of Evidence (route-specific):
A = Human carcinogen
B = Probable human carcinogen (B1 = limited human evidence; B2 = sufficient human evidence)
C = Possible human carcinogen
D = Not classifiable as to human carcinogenicity

Notes: NE = not evaluated.
Integrated Risk Information System (IRIS) on-line database search, current as of October 1993.
Health Effects Assessment Summary Tables (HEAST), current as of March 1993.

Table D-10
Comparison of Maximum Concentrations of Contaminants of Potential Concern for Public Health at PSC 2 to Residential PRGS

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Common Name	Maximum Detected Concentration[1]	Background Concentration[7]	CPC[3]	Residential PRG[4]	Exceedance of PRG	FL Aggregate Resident Soil Target Level[11]	Exceedance of PRG
Metals (mg/kg)							
Aluminum	3,090	1076	YES	NA[5]	NA	NA	ND
Arsenic	0.93	0.9	YES	3.66E-01	YES	7.11E-01	YES
Barium	121	8.98	YES	1.89E+04	NO	NA	NA
Cadmium	7.2	0.94	YES	2.70E+02	NO	2.30E+02	NO
Calcium	34,100	1,211	NO[6]	NA[5]	NA	NA	NA
Chromium	17.6	4.76	YES	1.35E+03	NO	1.99E+03	NO
Copper	90.9	2.38	YES	NA[5]	NA	1.96E+04	NO
Iron	3,750	849	NO[5]	NA[5]	NA	ND	ND
Lead	133	15.6	YES	5.00E+0-2[7]	NO	ND	ND
Manganese	24.3	17.2	YES	3.78E+04	NO	2.15E+03	NO
Mercury	0.1	0.1	NO[4]	8.10E+01	NO	NA	NA
Zinc	260	10.4	YES	8.10E+04	NO	1.57E+05	NO
Pesticides/Polychlorinated Biphenyls (µg/kg)							
4,4'-DDE	1	NA	YES	1.88E+03	NO	3.37E+03	NO
Dieldrin	13	NA	YES	4.00E+01	NO	7.2E+00	YES
alpha-Chlordane	2.9	NA	YES	4.92E+02	NO	8.8E+02	NO
gamma-Chlordane	3.6	NA	YES	4.92E+02	NO	8.8E+02	NO
Semivolatile Organic Compounds (µg/kg)							
2-Methylnaphthalene	11,000	NA	YES	1.08E+07	NO	9E+05	NO
Benzo(a)Pyrene	210	NA	YES	8.77E+01	YES	1.51E+02	YES
Benzo(b)Fluoranthene	26[8]	NA	YES	8.77E+01	NO	1.5E+03	NO
Benzo(g,h,i)Perylene	150	NA	YES	NA[5]	NA	1.41E+07	NA
Benzo(k)Fluoranthene	17[9]	NA	YES	8.77E+01	NO	1.5E+03	NO
Chrysene	0.81[9]	NA	YES	8.77E+01	NO	1.5E+04	NO
Dibenz(a,h)Anthracene	73	NA	YES	8.77E+01	NO	1.51E+02	NO
Indeno(1,2,3-cd)Pyrene	17[9]	NA	YES	8.77E+01	NO	1.51E+03	NO

Table D-10
Comparison of Maximum Concentrations of Contaminants of Potential Concern for Public Health at PSC 2 to Residential PRGS

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Common Name	Maximum Detected Concentration[1]	Background Concentration[2]	CPC[3]	Residential PRG[4]	Exceedance of PRG	FL Aggregate Resident Soil Target Level[11]	Exceedance of PRG
Naphthalene	4,100	NA	YES	1.08E+07	NO	9.6E+06	NO
Pyrene	140	NA	YES	8.10E+06	NO	1.29E+07	NO
Volatile Organic Compounds (µg/kg)							
2-Butanone	24	NA	YES	1.62E+08	NO	3.3E+07	NO
4-Methyl-2-Pentanone	550	NA	YES	1.35E+07	NO	NA	NA
Acetone	70	NA	YES	2.07E+07	NO	7.35E+06	NO
Ethylbenzene	7	NA	YES	2.70E+07	NO	2.34E+07	NO
Xylene (total)	350	NA	YES	5.40E+08	NO	9.43E+07	NO

Notes: NA = not available.
CPC = chemical of potential concern.
ND = not determine by State of Florida

1. The detected concentration reflects the off-site laboratory (OU2SB00101, OU2SB00301, OU2SB00401, OU2SB00801, OU2SB01001, OU2SB1701, OU2SB02401, OU2SB03101, OU2SB04001, OU2SB06001) unless otherwise indicated.

2. The background concentration for each metal was calculated as two times the arithmetic mean (nondetects taken at one-half their value) using the background data set for 0-6" as provided in Appendix D.

3. Analyte is a CPC if the maximum detected concentration exceeds the background concentration and is not an essential nutrient.

4. The residential PRG used for comparison is the lesser of the cancer or non-cancer PRG, as detailed in Appendix D.

5. Toxicity information was not available for this contaminant in IRIS, HEAST, or from ECAO Cincinnati(as of October 1993), and the PRG calculations could not be completed. Appendix D provides the detailed toxicity information.

6. Analyte is an essential nutrient and is therefore not included as a CPC.

7. The PRG for lead is based on Florida regulations that require cleanup goals to be set between 500 and 1,000 mg/kg. For purposes of this report, 500 mg/kg has been selected as the residential PRG and 1,000 mg/kg has been selected as the industrial PRG.

8. A toxicity equivalence factor (TEF) of 0.1 is applied to the maximum concentration to estimate the relative potency of the contaminant in relation to benzo(a)pyrene (USEPA, 1992a).

9. A toxicity equivalence factor of 0.01 is applied to the maximum concentration to estimate the relative potency of the contaminant in relation to benzo(a)pyrene (USEPA, 1992a).

11. Value is Florida Soil Target Level. Value shown is the lower of the soil target level based on an Excess Cancer Risk of 1×10^{-6} and soil target level based on Hazard Index of 1 for aggregate resident.

Table D-11
Comparison of Maximum Concentrations of Contaminants of Potential Concern for Public Health at PSC 2 to Industrial PRGS

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Common Name	Maximum Detected Concentration[1]	Background Concentration[2]	CPC[3]	Industrial PRG[4]	Exceedance of PRG	FL General Worker STL[11]	Exceedance of FL STL
Metals (mg/kg)							
Aluminum	3,090	1,076	YES	NA[5]	NA	ND	ND
Arsenic	0.93	0.9	YES	3.31E+00	NO	3.16E+00	NO
Barium	121	8.98	YES	1.39E+05	NO	NA	NA
Cadmium	7.2	0.94	YES	2.04E+03	NO	6.21E+02	NO
Calcium	34,100	1,211	NO[6]	NA[5]	NA	NA	NA
Chromium	17.6	4.76	YES	3.36E+03	NO	1.60E+02	NO
Copper	90.9	2.38	YES	NA[5]	NA	7.16E+04	NO
Iron	3,750	849	NO[5]	NA[5]	NA	ND	ND
Lead	133	15.6	YES	1.00E+0-3[7]	NO	ND	ND
Manganese	24.3	17.2	YES	2.72E+05	NO	5.22E+03	NO
Mercury	0.1	0.1	NO[4]	6.12E+02	NO	NA	NA
Zinc	260	10.4	YES	6.12E+05	NO	5.51E+05	NO
Pesticides/Polychlorinated Biphenyls (μg/kg)							
4,4'-DDE	1	NA	YES	1.71E+04	NO	1.24E+03	NO
Dieldrin	13	NA	YES	3.62E+02	NO	2.69E+02	NO
alpha-Chlordane	2.9	NA	YES	4.46E+03	NO	3.21E+03	NO
gamma-Chlordane	3.6	NA	YES	4.46E+03	NO	3.21E+03	NO
Semivolatile Organic Compounds (μg/kg)							
2-Methylnaphthalene	11,000	NA	YES	2.81E+05	NO	2.03E+06	NO
Benzo(a)pyrene	210	NA	YES	7.94E+02	NO	5.04E+02	NO
Benzo(b)fluoranthene	26[9]	NA	YES	7.94E+02	NO	5.01E+03	NO
Benzo(g,h,i)perylene	150	NA	YES	NA[5]	NA	3.94E+07	NO
Benzo(k)fluoranthene	17[9]	NA	YES	7.94E+02	NO	4.97E+03	NO
Chrysene	0.81[9]	NA	YES	7.94E+02	NO	5.03E+04	NO
Dibenz(a,h)anthracene	73	NA	YES	7.94E+02	NO	5.05E+02	NO
Indeno(1,2,3-cd)pyrene	17[9]	NA	YES	7.94E+02	NO	5.04E+03	NO

Table D-11
Comparison of Maximum Concentrations of Contaminants of Potential Concern for Public Health at PSC 2 to Industrial PRGS

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Common Name	Maximum Detected Concentration[1]	Background Concentration[2]	CPC[3]	Industrial PRG[4]	Exceedance of PRG	FL General Worker STL[11]	Exceedance of FL STL
Naphthalene	4,100	NA	YES	1.51E+05	NO	2E+07	NO
Pyrene	140	NA	YES	6.12E+07	NO	3.38E+07	NO
Volatile Organic Compounds (µg/kg)							
2-Butanone	24	NA	YES	6.62E+06	NO	4.91E+07	NO
4-Methyl-2-Pentanone	550	NA	YES	3.20E+05	NO	NA	NA
Acetone	70	NA	YES	1.39E+06	NO	1.25E+07	NO
Ethylbenzene	7	NA	YES	1.54E+07	NO	4.43E+07	NO
Xylene (total)	350	NA	YES	1.62E+08	NO	1.56E+08	NO

Notes: NA = not available.
CPC = chemical of potential concern.
ND = not determined by State of Florida

1. The detected concentration reflects the off-site laboratory samples (OU2SB00101, OU2SB00301, OU2SB00401, OU2SB00801, OU2SB01001, OU2SB1701, OU2SB02401, OU2SB03101, OU2SB04001, OU2SB06001) unless otherwise indicated.

2. The background concentration for each metal was calculated as two times the arithmetic mean (nondetects taken at one-half their value) using the background data set for 0-6" as provided in Appendix D.

3. Analyte is a CPC if the maximum detected concentration exceeds the background concentration and is not an essential nutrient.

4. The industrial PRG used for comparison is the lesser of the cancer or non-cancer PRG, as detailed in Appendix D.

5. Toxicity information was not available for this contaminant in IRIS, HEAST, or from ECAO Cincinnati (as of October 1993), and the PRG calculations could not be completed. Appendix D provides the detailed toxicity information.

6. Analyte is an essential nutrient and is therefore not included as a CPC.

7. The PRG for lead is based on Florida regulations that require cleanup to be set between 500 and 1,000 mg/kg. For purposes of this report, 500 mg/kg has been selected as the residential PRG and 1,000 mg/kg has been selected as the industrial PRG.

8. A toxicity equivalence factor (TEF) of 0.1 is applied to the maximum concentration to estimate the relative potency of the contaminant in relation to benzo(a)pyrene (USEPA, 1992a).

9. A toxicity equivalence factor of 0.01 is applied to the maximum concentration to estimate the relative potency of the contaminant in relation to benzo(a)pyrene (USEPA, 1992a).

11. Value is Florida Soil Target Level. Value shown is the lower of the soil target level based on Excess Cancer Risk of 1×10^{-6} and soil target level based on Hazard Index of 1 for general worker.

Table D-12
Comparison of Maximum Concentrations of Contaminants of Potential Concern for Public Health at PSC 41 in Surface Soil and Filter Media to Residential PRGs

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Common Name	Maximum Detected Concentration[1]	Background Concentration[2]	CPC[3]	Residential PRG[4]	Exceedance of PRG	FL Aggregate Resident STL[9]	Exceedance of FL Soil Target Level
Metals (mg/kg)							
Aluminum	2,560	1,076	YES	NA[5]	NA	ND	ND
Arsenic	61.1	0.9	YES	0.366	YES	7.11E-01	YES
Barium	451	8.98	YES	1.89E+04	NO	NA	NA
Cadmium	134	0.94	YES	270	NO	2.30E+02	NO
Calcium	4,850	1,211	NO[6]	NA[5]	NA	NA	NA
Chromium	5,310	4.76	YES	1,350	YES	1.99E+03	YES
Cobalt	20.7	1.74	YES	NA[5]	NA	ND	ND
Copper	334	2.38	YES	NA[5]	NA	1.98E+04	NO
Iron	9,750	849	NO[6]	NA[5]	NA	ND	ND
Lead	252	15.6	YES	500[7]	NO	ND	ND
Magnesium	227	58.3	NO[6]	NA[5]	NA	NA	NA
Manganese	252	17.2	YES	3.78E+04	NO	2.15E+03	NO
Mercury	12.2	0.1	YES	81	NO	NA	NA
Nickel	110	6.06	YES	5,400	NO	1.16E+00	YES
Selenium	1	0.28	YES	1,350	NO	NA	NA
Silver	110	1.18	YES	1,350	NO	NA	NA
Zinc	454	10.4	YES	8.10E+04	NO	1.57E+05	NO
Volatile Organic Compound (μg/kg)							
Acetone	20[8]	NA	YES	2.70E+07	NO	7.35E+06	NO

Notes: NA = not available.
CPC = chemical of potential concern.
ND = not determined by State of Florida

1. The frequency of detection and the range of sample quantitation limits reflect only the off-site laboratory samples collected within the walls of the drying bed (DDBSB00101, DDBSB00301, and DDBDB00401) unless otherwise indicated.

2. The background concentration for each metal was calculated as two times the arithmetic mean (non-detects taken at one-half their value) using the background data set for 0-6" as provided in Appendix D.

3. Analyte is a CPC if the maximum detected concentration exceeds the background concentration and is not an essential nutrient.

4. The residential PRG used for comparison is the lesser of the cancer or non-cancer PRG, as detailed in Appendix D.

5. Toxicity information was not available for this contaminant in IRIS, HEAST or from ECAO Cincinnati (as of October 1993), and the PRG calculations could not be completed. Appendix D provides the detailed toxicity information.

6. Analyte is an essential nutrient and is therefore not included as a CPC.

7. The PRG for lead is based on Florida regulations that require cleanup goals to be set between 500 and 1,000 mg/kg. For purposes of this report, 500 mg/kg has been selected as the residential PRG and 1,000 mg/kg has been selected as the industrial PRG.

8. The frequency of detection and the range of sample quantitation limits reflect only the off-site laboratory samples collected within the walls of the drying bed (DDBSB00201, DDBSB00601).

9. Value is Florida Soil Target Level. Value shown is the lower of the soil target level based on Excess Cancer Risk of 1×10^{-6} and soil target level based on Hazard Index of 1 for aggregate resident.

Table D-13
Comparison of Maximum Concentrations of Contaminants of Potential Concern for Public Health at PSC 41 in Subsurface Soil and Filter Media to Industrial PRGs

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Common Name	Maximum Detected Concentration[1]	Background Concentration[2]	CPC[3]	Industrial PRG[4]	Exceedance of PRG	FL General Worker STL[9]	Exceedance of FL STL
Metals (mg/kg)							
Aluminum	2,560	1,411	YES	NA[5]	NA	ND	ND
Arsenic	61.1	0.8	YES	3.31	YES	3.16E+00	YES
Barium	451	8.34	YES	1.39E+05	NO	NA	NA
Cadmium	134	1.08	YES	2,040	NO	6.21E+02	NO
Calcium	4,850	1050	NO[6]	NA[5]	NA	NA	NA
Chromium	5,310	4.5	YES	3,360	YES	1.6E+02	YES
Cobalt	20.7	1.76	YES	NA[5]	NA	ND	ND
Copper	334	2.84	YES	NA[5]	NA	7.16E+04	NO
Iron	9,750	757	NO[6]	NA[5]	NA	ND	ND
Lead	252	12.8	YES	1,000[7]	NO	ND	ND
Magnesium	299	49	NO[6]	NA[5]	NA	NA	NA
Manganese	524	14	YES	2.72E+05	NO	5.22E+03	NO
Mercury	12.2	0.1	YES	612	NO	NA	NA
Nickel	110	7.52	YES	4.08E+04	NO	3.24E+00	YES
Selenium	1	0.3	YES	1.02E+04	NO	NA	NA
Silver	110	1.2	YES	1.04E+04	NO	NA	NA
Zinc	454	12.8	YES	6.12E+05	NO	5.51E+05	NO
Volatile Organic Compound (µg/kg)							
Acetone	20[8]	NA	YES	1.39E+06	NO	1.25E+07	NO

Notes: NA = not available.
CPC = chemical of potential concern.
ND = not determined by State of Florida

1. The frequency of detection and the range of sample quantitation limits reflects only the off-site laboratory samples collected from within the drying beds (DDBSB00101, DDBSB00102, DDBSB00103, DDBSB00302, DDBSB00303, DDBSB00401, DDBSB00402, and DDBS00403) unless otherwise indicated.

2. The background concentration for each metal was calculated as two times the arithmetic mean (nondetects taken at one-half their value) using the background data set for 0-5' as provided in Appendix D.

3. Analyte is a CPC if the maximum detected concentration exceeds the background concentration and is not an essential nutrient.

4. The residential PRG used for comparison is the lesser of the cancer or non-cancer PRG, as detailed in Appendix D.

5. Toxicity information was not available for this contaminant in IRIS, HEAST or from ECAO Cincinnati (as of October 1993), and the PRG calculations could not be completed. Appendix D provides the detailed toxicity information.

6. Analyte is an essential nutrient and is therefore not included as a CPC.

7. The PRG for lead is based on Florida regulations that require cleanup goals to be set between 500 and 1,000 mg/kg. For purposes of this report, 500 mg/kg has been selected as the residential PRG and 1,000 mg/kg has been selected as the industrial PRG.

8. The frequency of detection and the range of sample quantitation limits reflect only the off-site laboratory samples collected from within the drying beds (DDBSB00201, DDBSB00502, DDBSB00601, and DDBSB00602).

9. Value is Florida Soil Target Level. Value shown is the lower of the soil target level based on Excess Cancer Risk of $1x10^{-6}$ and soil target level based on Hazard Index of 1 for general worker.

Table D-14
Comparison of Maximum Concentrations of Contaminants of Potential Concern for Public Health at PSC 43 in Surface Soil and Filter Media to Residential PRGS

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Common Name	Maximum Detected Concentration[1]	Background Concentration[2]	CPC[3]	Residential PRG[4]	Exceedance of PRG	FL Aggregate Resident STL[9]	Exceedance of FL STL
Metals (mg/kg)							
Aluminum	5,220	1,076	YES	NA[5]	NA	ND	ND
Arsenic	0.93	0.9	YES	3.66E-01	YES	7.11E-01	YES
Barium	604	8.98	YES	1.89E+04	NO	NA	NA
Cadmium	223	0.94	YES	2.70E+02	NO	2.30E+02	NO
Calcium	53,700	1,211	NO[6]	NA[5]	NA	NA	NA
Chromium	47,700	4.76	YES	1.35E+03	YES	1.99E+03	YES
Cobalt	178	1.74	YES	NA[5]	NA	ND	ND
Copper	470	2.38	YES	NA[5]	NA	1.96E+04	YES
Iron	5,860	849	NO[6]	NA[5]	NA	ND	ND
Lead	1,220	15.6	YES	5.00E+02[7]	YES	ND	ND
Magnesium	23,100	58.3	NO[6]	NA[5]	NA	NA	NA
Manganese	4,650	17.2	YES	3.78E+04	NO	2.15E+03	YES
Mercury	0.16	0.1	YES	8.10E+01	NO	NA	NA
Nickel	1,540	6.06	YES	5.40E+03	NO	1.16E+00	YES
Selenium	1	0.28	YES	1.35E+03	NO	NA	NA
Silver	256	1.18	YES	1.35E+03	NO	NA	NA
Sodium	191	227	NO[6]	NA[5]	NA	NA	NA
Zinc	1,130	10.4	YES	8.10E+04	NO	1.57E+05	NO
Volatile Organic Compound (μg/kg)							
Acetone	44[8]	NA	YES	2.70E+07	NO	7.35E+06	NO

Notes: NA = not available.
CPC = chemical of potential concern.
ND = not determined by State of Florida

1. The frequency of detection and the range of sample quantitation limits reflect only the off-site laboratory confirmation samples collected from 0-2" within the walls of the drying bed (IDBSB00101, IDBSB00501, IDBSB00701) unless otherwise indicated.

2. The background concentration for each metal was calculated as two times the arithmetic mean (nondetects taken at one-half their value) using the background data set for 0-6" as provided in Appendix D.

3. Analyte is a CPC if the maximum detected concentration exceeds the background concentration and is not an essential nutrient.

4. The residential PRG used for comparison is the lesser of the cancer or non-cancer PRG, as detailed in Appendix D.

5. Toxicity information was not available for this contaminant in IRIS, HEAST, or from ECAO Cincinnati (as of October 1993), and the PRG calculations could not be completed. Appendix D provides the detailed toxicity information.

6. Analyte is an essential nutrient and is therefore not included as a CPC.

7. The PRG for lead is based on Florida regulations that require cleanup goals to be set between 500 and 1,000 mg/kg. For purposes of this report, 500 mg/kg has been selected as the residential PRG and 1,000 mg/kg has been selected as the industrial PRG.

8. The frequency of detection and the range of sample quantitation limits reflect only the off-site laboratory samples collected from 0-2" within the walls of the drying bed (IDBSB00201, IDBSB00301, IDBSB00401, IDBSB00601) unless otherwise indicated.

9. Value is Florida Soil Target Level. Value shown is the lower of the soil target level based on Excess Cancer Risk of 1×10^{-6} and soil level based on Hazard Index of 1 for aggregate resident.

Table D-15
Comparison of Maximum Concentrations of Contaminants of Potential Concern for Public Health at PSC 43 in Subsurface Soil and Filter Media to Industrial PRGS

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Common Name	Maximum Detected Concentration[1]	Background Concentration[2]	CPC[3]	Residential PRG[4]	Exceedance of PRG	FL General Worker STL[9]	Exceedance of FL STL
Metals (mg/kg)							
Aluminum	7,950	1,411	YES	NA[5]	NA	ND	ND
Arsenic	0.94	0.8	YES	3.31E+00	NO	3.16E+00	NO
Barium	604	8.34	YES	1.39E+05	NO	NA	NA
Cadmium	484	1.08	YES	2.04E+03	NO	6.21E+02	NO
Calcium	53,700	1,050	NO[6]	NA[5]	NA	NA	NA
Chromium	47,700	4.5	YES	3.36E+03	YES	1.60E+02	YES
Cobalt	178	1.76	YES	NA[5]	NA	ND	ND
Copper	470	2.84	YES	NA[5]	NA	7.16E+04	NO
Iron	5,860	757	NO[6]	NA[5]	NA	ND	ND
Lead	1,220	12.8	YES	1.00E+03[7]	YES	ND	ND
Magnesium	23,100	49	NO[6]	NA[5]	NA	NA	NA
Manganese	4,650	14	YES	2.72E+05	NO	5.22E+03	NO
Mercury	0.16	0.1	YES	6.12E+02	NO	NA	NA
Nickel	1,540	7.52	YES	4.08E+04	NO	3.24E+00	YES
Selenium	1	0.3	YES	1.02E+04	NO	NA	NA
Silver	256	1.2	YES	1.02E+04	NO	NA	NA
Zinc	1,130	12.8	YES	6.12E+05	NO	5.51E+05	NO
Volatile Organic Compound (μg/kg)							
Acetone	44[8]	NA	YES	1.39E+06	NO	1.39E+06	NO

Notes: NA = not available.
CPC = chemical of potential concern.
ND = *not determined by State of Florida*

1. The frequency of detection and the range of sample quantitation limits reflect only the off-site laboratory samples collected within the walls of the drying bed (IDBSB00101, IDBSB00501, IDBSB00602, IDBSB00701, IDBSB00802) unless otherwise indicated.

2. The background concentration for each metal was calculated as two times the arithmetic mean (nondetects taken at one-half their value) using the background data set for 0-6" as provided in Appendix D.

3. Analyte is a CPC if the maximum detected concentration exceeds the background concentration and it is not an essential nutrient.

4. The residential PRG used for comparison is the lesser of the cancer or non-cancer PRG, as detailed in Appendix D.

5. Toxicity information was not available for this contaminant in IRIS, HEAST, or from ECAO Cincinnati (as of October 1993), and the PRG calculations could not be completed. Appendix D provides the detailed information.

6. Analyte is an essential nutrient and is therefore not included as a CPC.

7. The PRG for lead is based on Florida regulations that require cleanup goals to be set between 500 and 1,000 mg/kg. For purpose of this report, 500 mg/kg has been selected as the residential PRG and 1,000 mg/kg has been selected as the Industrial PRG.

8. The frequency of detection and the range of sample quantitation limits reflect only the off-site laboratory samples collected within the walls of the drying bed (IDBSB0201, IDBSB0202, IDBSB0301, IDBSB0402, IDBSB0401, IDBSB00601) unless otherwise indicated.

9. Value represents Soil Target Level. Value shown is the lower of the soil target level based on Excess Cancer Risk of $1x10^{-6}$ and soil target level based on Hazard Index of 1 for general worker.

APPENDIX E

Ecological Risk Evaluation Supporting Documentation

The Potential Toxicity of Heavy Metals in Soils

Metals in soils are potentially toxic to soil dwelling organisms. Earthworms have been eliminated from soils because of copper contamination (Rhee, 1975) and serious sublethal effects have been demonstrated at environmentally realistic concentrations (Ma, 1984, as cited in Beyer, 1990).

In general, the primary ecological concern with heavy metals in soils is the potential transfer of metals from the soils to terrestrial invertebrates or plants. For example, cadmium in soils can be greatly concentrated in the tissues of earthworms. A typical concentration factor (concentration in earthworms, dry weight, to concentration in soil, dry weight) is 21 (Beyer, 1990). Lead is concentrated to a lesser extent with a reported concentration factor of 0.66. The metals concentrated in earthworm tissue may result in toxic exposures for animals consuming the earthworms (Beyer, 1990). The metals may also be accumulated into the tissues of the insectivores, which would result in exposures for predators of the insectivores. The following brief discussions for three heavy metals address some of the available information on the biological transport and potential toxicity of metals in soils.

Cadmium Soils contained 6.0 ppm cadmium and earthworms contained 79 ppm cadmium (dry weight); moles had 224 ppm in their kidneys (dry weight) and 227 ppm in their livers (dry weight)(Ma, 1987).

Earthworms collected from a golf course treated with fungicides containing cadmium and composted sewage sludge contained an average concentration of 48 ppm (dry weight) cadmium. Male European quail fed the earthworms as 50 percent of their diet accumulated 14 ppm and the females 18 ppm in their kidneys (dry weight) (Pimentel and others, 1984). Doses as low as 10 mg/kg and 21 mg/kg administered orally to laboratory mammals and birds, respectively, are associated with adverse reproductive effects (Table E-1).

Zinc Concentrations of zinc added artificially to control litter showed negative effects on laboratory populations of woodlice at concentrations as low as 1,600 mg/kg (Beyer and others, 1984; Beyer and Anderson, 1985). Zinc is lethal to laboratory rodents at a reported oral dose of 2510 mg/kg (Table E-1).

Lead Lead added to artificial soil litter at concentration of 12,800 mg/kg was toxic to laboratory populations of woodlice (Beyer and others, 1984; Beyer and Anderson, 1985). Lead is lethal to birds at oral doses as low as 24 mg/kg body weight and mammals as low as 12 mg/kg (Table E-1).

Available Standards

Domestic wastewater treatment sludges in Florida are classified into three grades. Grade 1 sludge is the least contaminated with metals, grade 2 sludge is moderately contaminated, and grade 3 sludge is the most contaminated. A Grade 3 sludge cannot be spread on land used for growing agricultural crops. The criteria for Grade 3 sludge are cadmium >100 mg/kg copper >3,000 mg/kg, lead >1,500 mg/kg, nickel >500 mg/kg or zinc >10,000 mg/kg (FDEP, 1985).

Table E-1
Summary of Ingestion Toxicity Data for Terrestrial Wildlife

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Metal	Test Species	Test Type	Duration	Effect	Oral LD_{50} (mg/kg/BW)	LOAEL (mg/kgBW/day)	Reference
Cadmium	Rat	Oral	NR	Reproductive effects		155	RTECS, 1993
	Rat	Oral	NR	Reproductive effects		220	RTECS, 1993
	Rat	Oral	NR	Reproductive effects		21.5	RTECS, 1993
	Rat	Oral	NR	Reproductive effects		23	RTECS, 1993
	[illegible]	Single oral dose		Mortality	250		Eisler, 1985
	Rat	Oral	NR	Mortality	225		RTECS, 1993
	Mouse	Oral	NR	Mortality	890		RTECS, 1993
	Mouse	Oral	NR	Reproductive effects		448	RTECS, 1993
	Mouse	Oral	NR	Reproductive effects		1,700	RTECS, 1993
	Guinea pig	Single oral dose		Mortality	150		Eisler, 1985
	Mallard	Oral (subchronic)	90 days	Egg production suppressed		10	Eisler, 1985
Copper	Rat	Single oral dose		Reproductive effects		152	NIOSH, 1985 and RTECS, 1993
	Rat	Oral	NR	Reproductive effects		1.5	RTECS, 1993
	Rat	Oral	NR	Reproductive effects		1.2	RTECS, 1993
	Mallard	Oral (subchronic)	29 days	NOAEL for survivorship		10.5[b]	Demayo et al., 1982
Iron	Rat	Single oral dose	NR	Mortality	319		Sax, 1984
	Mouse	Single oral dose	NR	Mortality	979		Sax, 1984
	Guinea pig	Single oral dose	NR	Mortality	1,200		Sax, 1984
Lead	Rat	Oral	NR	Reproductive effects		790	RTECS, 1993
	Rat	Oral	NR	Reproductive effects		1,140	RTECS, 1993

Table E-1 (Continued)
Summary of Ingestion Toxicity Data for Terrestrial Wildlife

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Metal	Test Species	Test Type	Duration	Effect	Oral LD_{50} (mg/kg/BW)	LOAEL (mg/kgBW/day)	Reference
	Rat	Oral	NR	Reproductive effects		520	RTECS, 1993
	Rat	Oral	NR	Reproductive effects		1,100	RTECS, 1993
	Rat	Single oral dose		Mortality	12		Eisler, 1988
	Rat	Oral (subchronic)	12-14 days	Decreased fetal body weight		2.5	McClain and Becker, 1972
	Mouse	Oral	NR	Reproductive effects		1,120	RTECS, 1993
	Mouse	Oral	NR	Reproductive effects		6,300	RTECS, 1993
	Mouse	Oral	NR	Reproductive effects		300	RTECS, 1993
	Mouse	Oral	NR	Reproductive effects		4,800	RTECS, 1993
	Domestic animal	Oral	NR	Reproductive effects		662	RTECS, 1993
	Mammal	Oral	NR	Reproductive effects		2,118	RTECS, 1993
	Mallard	Single oral dose		Mortality	107		Eisler, 1988
	Japanese quail	Single oral dose		Mortality	24.6		Eisler, 1988
	Starling	Oral (acute)	11 days	Reduced food consumption		2.8	Eisler, 1988
Manganese	Mouse	Oral (subchronic)	90 days	Delayed growth of testes		140	ATSDR, 1990
	Mouse	Oral (chronic)	103 weeks	Mortality		4,050	ATSDR, 1990
	Rat	Single oral dose	NR	Mortality	410		ATSDR, 1990
	Rat	Oral (acute)	20 days	Mortality	225		ATSDR, 1990
	Rat	Oral (subchronic)	20 days	Decreased litter weight during gestation		3,100[b]	ATSDR, 1990
	Rat	Oral (chronic)	103 weeks	Mortality		930	ATSDR, 1990
	Guinea pig	Single oral dose	NR	Mortality	400		USEPA, 1984

Table E-1 (Continued)
Summary of Ingestion Toxicity Data for Terrestrial Wildlife

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Metal	Test Species	Test Type	Duration	Effect	Oral LD_{50} (mg/kg/BW)	LOAEL (mg/kgBW/day)	Reference
	Monkey	Oral (chronic)	18 months	Weakness, rigidity		25	ATSDR, 1990
Mercury	Mouse	Single oral dose		Mortality	22		NIOSH, 1985
	Mouse	Oral (subchronic)	Day 6-17 (gest)	Stillbirths and neonatal death		4	Suzuki, 1979
	Rat	Oral (subchronic)	Day 6-14 (gest)	Retarded fetus growth		4	Suzuki, 1979
	Rat	Oral (chronic)	NR	Reduced fertility		0.5	Eisler, 1987
	Rat	Single oral dose		Mortality	18		NIOSH, 1985
	Pig	Oral (subchronic)	Pregnancy	High incidence of stillbirths		0.5	Eisler, 1987
	Mule deer	Single oral dose		Mortality	17.9		Eisler, 1987
	River otter	Single oral dose		Mortality	2		Eisler, 1987
	Mink	Single oral dose		Mortality	1		Eisler, 1987
	Dog	Oral (subchronic)	Pregnancy	High incidence of stillbirths		0.1	Eisler, 1987
	House sparrow	Single oral dose		Mortality	12.6		Eisler, 1987
	Rock dove	Single oral dose		Mortality	22.8		Eisler, 1987
	Chicken	Single oral dose		Mortality	20		Fimreite, 1979
	Bantam chicken	Single oral dose		Mortality	190		Fimreite, 1979
	Prairie chicken	Single oral dose		Mortality	11.5		Eisler, 1987
	Chukar	Single oral dose		Mortality	26.9		Eisler, 1987
	Corturnix	Single oral dose		Mortality	11		Eisler, 1987
	Mallard	Oral	NR	Reproduction, behavior		0.064	USEPA, 1993

Table E-1 (Continued)
Summary of Ingestion Toxicity Data for Terrestrial Wildlife

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Metal	Test Species	Test Type	Duration	Effect	Oral LD_{50} (mg/kg/BW)	LOAEL (mg/kgBW/day)	Reference
	Black duck	Oral (subchronic)	28 weeks	Reproduction inhibited		0.22[a]	Eisler, 1987
	Fulvous whistling duck	Single oral dose		Mortality	37.8		Eisler, 1987
	Northern bob-white	Single oral dose		Mortality	23.8		Eisler, 1987
	Bobwhite quail	Oral (acute)	5 days	Mortality	523		Hill et al., 1975
	Japanese quail	Single oral dose		Mortality	14.4		Eisler, 1987
	Gray partridge	Single oral dose		Mortality	17.6		Eisler, 1987
	Gray pheasant	Oral (subchronic)	30 days	Reduced reproductive ability		0.64	Eisler, 1987
	Ring-necked pheasant	Single oral dose		Mortality	11.5		Eisler, 1987
Selenium	Rat	Oral	NR	Mortality	6,700		RTECS, 1993
	Mouse	Oral	NR	Reproductive effects		134	RTECS, 1993
	Mallard	Oral (subchronic)	3 months	Reduced hatchability		1.75	Eisler, 1985
Zinc	Rat	Single oral dose		Mortality	2,510		RTECS, 1993
	Rat	Oral (subchronic)	NR	Kidney toxicity		160	Llobet, et al., 1988

Notes: LD50 = dose resulting in 50% mortality in test population
BW = body weight
LOAEL = Lowest Observed Adverse Effect Level
NR = not reported

a) Converted to dose per kilogram body weight by multiplying by ingestion and dividing by body weight.
b) Estimated by applying a LOAEL-NOAEL ratio of 5 (Newell et al., 1987).

Potential Ecological Receptors, PSCs 2, 41, and 43

The plants and animals characteristic of the NAS Jacksonville area were identified as part of the ecological evaluation for Operable Unit 1 (ABB-ES, 1992). The areas of PSCs 2, 41, and 42 are mostly composed of pavement, gravel, or mowed grass. PSC 2 is devoid of any vegetation. Pine plantations and some scrub and brush areas (old field) are, however, present on some of the surrounding areas. Lists of plants expected in pine flatwoods and old field habitats are listed in Table E-2. Wildlife species expected in the vicinity of NAS Jacksonville are listed in Table E-3.

Table E-2
Characteristic Flora of Major Vegetative Cover Types

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Common Name	Scientific Name
PINE FLATWOODS COMMUNITY	
Red Maple	*Acer rubrum*
Brown sedge	*Andropogon virginiana*
Jack-in-the-pulpit	*Arisaema triphyllum*
Pineland three-awn	*Aristida stricta*
Cross vine	*Bignonia capreolata*
Pignut hickory	*Carya glabra*
Buttonbush	*Cephalanthus occidentalis*
Hawthorne	*Crataegus sp.*
Gallberry	*Ilex glabra*
Yaupon	*Ilex vomitoria*
Sweet gum	*Liquidambar styraciflua*
Japanese honeysuckle	*Lonicera japonica*
Honesuckle	*Lonicera sp.*
Fetterbush	*Lyonia lucida*
Staggerbush	*Lyonia mariana*
Bigleaf magnolia	*Magnolia grandiflora*
Cinnamon fern	*Osmunda cinnamonea*
Panic grass	*Panicum sp.*
Virginia creeper	*Parthenocissus quinquefolia*
Slash pine	*Pinus elliottii*
Longleaf pine	*Pnus palustris*
Resurrection fern	*Polypodium polypoides*
Bracken fern	*Pteridium aquilinum*
Chapman oak	*Quercus chapmanni*
Turkey oak	*Quercus laevis*
Diamond-leaf oak	*Quercus laurifolia*
Water oak	*Quercus nigra*
Oaks	*Quercus sp.*
Shining sumac	*Rhus coppalina*
Dewberry	*Rubus trivialis*
Bramble	*Rubus sp.*
Saw palmetto	*Serenoa repens*
Catbriar	*Smilax bona-nox*
Greenbriar	*Smilax glauca*
Bullbriar	*Smilax rotundifolia*
Greenbriar	*Smilax sp.*
Fern	*Thelypteris kunthii*
Spanish moss	*Tilandsia usneoides*

Table E-2 (Continued)
Characteristic Flora of Major Vegetative Cover Types

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Common Name	Scientific Name
PINE FLATWOODS COMMUNITY (continued)	
Poison ivy	*Toxicodendron radicans*
Muscadine grape	*Vitis rotundifolia*
Virgnia chain fern	*Woodwardia virginica*
OLD FIELD COMMUNITY	
Mimosa	*Albizia julibrissin*
Wild onion	*Allium canadense*
Ragweed	*Ambrosia artemissifolia*
Peppervine	*Ampelopsis arborea*
Black-stemmed spleenwort	*Asplenium resiliens*
Aster	*Aster sp.*
Groundsel-tree	*Baccharis halmifolia*
Spanish needles	*Bidens pilosa*
Beauty berry	*Callicarpa americana*
Trumpet creeper	*Campsis radicans*
Sedge	*Carex sp.*
Butterfly pea	*Centrosema virginianum*
Thistle	*Circium sp.*
Twig rush	*Cladium sp.*
Leather flower	*Clematis crispa*
Nettle	*Cnidoscolus stimulosus*
Dayflower	*Commelina erecta*
Rattlebox	*Crotalaria sp.*
Dodder	*Cuscuta gronovii*
Queen Anne's Lace	*Daucus carota*
White-bracted sedge	*Dichromena sp.*
Crab grass	*Digitaria sp.*
Air yam	*Dioscorea bulbifera*
Fleabane	*Erigeron quercifolius*
Dog fennel	*Eupatorium capillifolium*
Flat-topped goldenrod	*Euthama minor*
Wild geranium	*Geranium carolinianum*
Innocence	*Hedyotis procumbens*
Water pennywort	*Hydrocotyle umbellata*
St. Johns wort	*Hypericum gentianoides*
Cat's ear	*Hypochoeris radicata*
Blindweed	*Ipomoea sp.*
Southern red cedar	*Juniperus virginiana*
Canada rush	*Juncus canadensis*

Table E-2 (Continued)
Characteristic Flora of Major Vegetative Cover Types

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville, Florida

Common Name	Scientific Name
Rush	*Juncus sp.*
Field peppergrass	*Lepidium virginicum*
Japanese climbing fern	*Lygodium japonicum*
Chinaberry	*Melia azedarach*
Tall white clover	*Meliota alba*
White mulberry	*Morus alba*
Primrose	*Oenothera laciniata*
Sorrel	*Oxalis sp.*
Panic grass	*Panicum sp.*
Passion flower	*Passiflora incarnata*
Mistletoe	*Phorodendron serotinum*
Capeweed	*Phyla nodiflora*
Carolina laurel cherry	*Prunus caroliniana*
Bracken fern	*Pteridium aquilinum*
Myrtle oak	*Quercus myrtifolia*
Bristly locust	*Robinia hispidus*
Staghorn sumac	*Rhus typhina*
Southern dewberry	*Rubus trivialis*
Dock	*Rumex crispus*
Sabal palm	*Sabal palmetto*
Lyre-leaved mint	*Salvia lyrata*
Elderberry	*Sambucus canadensis*
Chinese tallow tree	*Sapium sebiferum*
Rattlebox	*Sesbania sp.*
Horse nettle	*Solanum carolinense*
Sow thistle	*Sonchas asper*
Orchid	*Spiranthes sp.*
Hedge nettle	*Stachys floridana*
Spiderwort	*Tradescantia virginiana*
Clovers	*Trifolium sp.*
Winged Elm	*Ulums alata*
Vervain	*Verbena brasiliensis*
Muscadine grape	*Vitis rotundifolia*
Yellow-eyed grass	*Xyris sp.*
Spanish bayonnet	*Yucca aloifolia*
Southern prickly ash	*Zanthoxylum clava-herculis*
Broom grass	*Andropogon virginicus*

Table E-3
Wildlife Expected or Observed in the Vicinity of NAS Jacksonville

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville Florida

AMPHIBIANS	
Mole salamander	*Ambystoma talpoideum*
Oak toad[1]	*Bufo quercicus*
Southern toad[1]	*Bufo terrestris*
Florida cricket frog	*Acris gryllus dorsalis*
Gray treefrog	*Hyla chrysoscelis*
Bird-voiced treefrog	*Hyla avivoca*
Green treefrog[1]	*Hyla cinerea*
Southern peeper[1]	*Hyla crucifer bartamiana*
Pine woods treefrog	*Hyla femoralis*
Barking treefrog	*Hyla gratiosa*
Squirrel treefrog[1]	*Hyla squirella*
Little grass frog	*Limnaeodus ocularis*
Southern chorus frog	*Pseudacris nigrita nigrita*
Ornate chorus frog	*Pseudacris ornata*
Eastern narrowmouth toad	*Gastrophryne carolinensis*
Eastern spadefoot	*Scaphiopus holbrooki*
Southern dusky salamander	*Desmognathus auriculatus*
Dwarf salamander	*Eurycea quadridigitata*
Slimy salamander[1]	*Plethodon glutinosus*
Rusty mud salamander	*Pseudotriton montanus floridanus*
Florida gopher frog	*Rana areolata aesopus*
Bullfrog	*Rana catesbeiana*
Green frog	*Rana clamitans clamitans*
Pig frog	*Rana grylio*
River frog	*Rana heckscheri*
Southern leopard frog[1]	*Rana sphenocephala*
Striped newt	*Notophthalmus perstriatus*
Central newt	*Notophthalmus viridescens louisianensis*
Narrow-striped dwarf siren	*Pseudobranchus striatus*
Lesser siren	*Siren intermedia*
REPTILES	
Scarlet snake	*Cemophora coccinea copei*
Southern black racer	*Coluber constrictor priapur*
Southern ringneck snake	*Diadophis punctatus punctatur*
Indigo snake	*Drymarchon corais*
Corn snake	*Elaphe guttata*

Table E-3 (Continued)
Wildlife Expected or Observed in the Vicinity of NAS Jacksonville

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville Florida

REPTILES (continued)	
Yellow rat snake	*Elphe obsoleta quadrivattata*
Mud snake	*Farancia abacura abacura*
Rainbow snake	*Farancia erytrogramma*
Eastern hognose snake	*Heterodon platyrhinos*
Southern hognose snake	*Heterodon simus*
Common kingsnake	*Lampropeltis getulus*
Eastern milksnake	*Lampropeltis triangulum elapsoides*
Coachwhip	*Masticophis flagellum flagellum*
Rough green snake	*Opheodrys aestivus*
Florida pine snake	*Pituophis melanoleucus mugitur*
Striped crayfish snake	*Regina alleni*
Glossy crayfish snake	*Regina rigida rigida*
Pine woods snake	*Rhadinaea flavilata*
Florida brown snake	*Storeria dekayi victa*
Southern redbelly snake	*Storeria occipitomaculata obscura*
Southeastern crowned snake	*Tantilla relicta*
Southern ribbon snake	*Thamnophis sauritus sackeni*
Eastern coral snake	*Micrurus fulvius fulvius*
Florida redbelly turtle[1]	*Pseudemys nelsoni*
Cooter	*Pseudemys floridana peninsylaris*
Eastern box turtle	*Terrapene carolina*
Green anole[1]	*Anolis carolinensis*
Southern fence lizard	*Sceloporus undulatus undulatus*
Peninsula mole skink	*Eumeces egregius*
Southeastern five-lined skink[1]	*Eumeces inexpectatus*
Broadhead skink[1]	*Eumeces laticeps*
Ground skink	*Scincella lateralis*
Six-lined racerunner	*Cnemidophorus sexlineatus*
Gopher tortoise[1]	*Gopherus polyphemus*
Eastern diamondback	*Crotalus adamanteus*
Pigmy rattlesnake	*Sistrurus miliarus barbouri*
BIRDS	
Cooper's hawk	*Accipiter cooperii*
Sharp-shinned hawk	*Accipiter striatus*
Red-tailed hawk	*Buteo jamaicensis*
Red-shouldered hawk	*Buteo lineatus*

Table E-3 (Continued)
Wildlife Expected or Observed in the Vicinity of NAS Jacksonville

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville Florida

BIRDS (continued)	
Broad-winged hawk	*Buteo platypterus*
Northern harrier	*Circus cyaneus*
American swallow-tailed kite	*Elandides forficatus*
Bald eagle	*Haliaeetus leucocephalus*
Osprey	*Pandion haliaetus*
Cedar waxwing	*Bombycilla cedrorum*
Chuck-will's-widow	*Caprimulgus carolinensis*
Whip-poor-will	*Caprimulgus vociferus*
Common nighthawk	*Chordeiles minor*
Turkey vulture[1]	*Cathartes aura*
Black vulture[1]	*Coragyps atratus*
Brown creeper	*Certhia americana*
Semipalmated plover	*Charadrius semipalmatus*
Killdeer[1]	*Charadrius vociferus*
Black-bellied plover	*Pluvialis squatarola*
Rock dove[1]	*Columba livia*
Common ground-dove	*Columbina passerina*
Mourning dove[1]	*Zenaida macroura*
Common crow[1]	*Corvus brachyrhynchos*
Fish crow[1]	*Corvus ossifragus*
Blue jay[1]	*Cyanocitta cristata*
Yellow-billed cuckoo	*Coccyzus americanus*
Henslow's sparrow	*Ammodramus henslowii*
Le Conte's sparrow	*Ammodramus leconteii*
Grasshopper sparrow	*Ammodramus savannarum*
Northern cardinal[1]	*Cardinalis cardinalis*
American goldfinch	*Carduelis tristis*
Purple finch	*Carpodacus purpureus*
Blue grosbeak[1]	*Guiraca caerulea*
Dark-eyed junco	*Junco hyemalis*
Swamp sparrow	*Melospiza georgiana*
Song sparrow[1]	*Melospiza melodia*
Savannah sparrow	*Passerculus sandwichensis*
Painted bunting	*Passerina ciris*
Rufous-sided towhee[1]	*Pipilo erythrophthalmus*
Vesper sparrow	*Pooecetes gramineus*
Chipping sparrow	*Spizella passerina*

Table E-3 (Continued)
Wildlife Expected or Observed in the Vicinity of NAS Jacksonville

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville Florida

BIRDS (continued)	
Field sparrow	*Spizella pusilla*
White-throate sparrow	*Zonotrichia albicollis*
Merlin	*Falco columbarius*
Peregrine falcon	*Falco peregrinus*
Barn swallow	*Hirundo rustica*
Tree swallow	*Iridoprocne bicolor*
Purple martin	*Progne subis*
Northern rough-winged swallow	*Stelgidopteryx seripennis*
Red-winged blackbird[1]	*Agelaius phoeniceus*
Rusty blackbird	*Euphagus carolinus*
Brewer's blackbird	*Euphagus cyanocephalus*
Northern oriole	*Icterus galbula*
Orchard oriole	*Icterus spurius*
Brown-headed cowbird[1]	*Molothrus ater*
Boat-tailed grackle[1]	*Quiscalus major*
Common grackle[1]	*Quiscalus quiscula*
Eastern meadowlark	*Sturnella magna*
Loggerhead shrike[1]	*Lanius ludovicianus*
Herring gull[1]	*Larus argentatus*
Laughing gull[1]	*Larus atricilla*
Ring-billed gull[1]	*Larus delawarensis*
Great black-backed gull	*Larus marinus*
Bonaparte's gull[1]	*Larus philadelphia*
Caspian tern	*Sterna caspia*
Forster's tern	*Sterna forsteri*
Common tern[1]	*Sterna hirundo*
Royal tern	*Sterna maxima*
Cray catbird[1]	*Dumatella carolinesis*
Northern mockingbird[1]	*Mimus polyglottus*
Brown thrasher[1]	*Toxostoma rufum*
Tufted titmouse[1]	*Parus bicolor*
Carolina chickadee[1]	*Parus carolinensis*
Yellow-rumped warbler[1]	*Dendroica coronata*
Priarie warbler	*Dendroica discolor*
Yellow-throated warbler	*Dendroica dominica*
Palm warbler[1]	*Dendroica palmarum*
Pine warbler[1]	*Dendroica pinus*

Table E-3 (Continued)
Wildlife Expected or Observed in the Vicinity of NAS Jacksonville

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville Florida

BIRDS (continued)	
Common yellowthroat	*Geothylpis trichas*
Swainson's warbler	*Limnothlypis swainsonii*
Black-and white warbler[1]	*Mniotilta varia*
Northern parula	*Parula americanca*
Prothonotary warbler	*Protondtaria citrea*
Ovenbird	*Seiuris aurocpillus*
Orange-crowned warbler	*Vermivora celata*
Double-crested cormorant[1]	*Phalacrocorax auritus*
Common bobwhite	*Colinus virginianus*
Wild turkey[1]	*Meleagris gallopavo*
Spotted sandpiper[1]	*Actitis macularis*
Ruddy turnstone	*Arenaria interpres*
Dunlin	*Calidris alpina*
Red knot	*Calidris canutus*
Pectoral sandpiper	*Calidris melanotos*
Least sandpiper	*Calidi minutilla*
Semipalmated sandpiper	*Calidris pusilla*
Common snipe	*Capella gallinago*
Willet	*Catoptrophorus semipalmatus*
Sanderling	*Crocethia alba*
Short-billed dowitcher	*Limnodromus griseus*
Long-billed dowitcher	*Limnodromus scolopaceus*
Marbled godwit	*Limosa fedoa*
Whimbrel	*Numenius phaeopus*
American woodcock	*Scolopax minor*
Lesser yellowlegs	*Tinga flavipes*
Greater yellowlegs	*Tinga melanoleuca*
Solitary sandpiper	*Tringa solitaria*
Red-breasted nuthatch	*Sitta canadensis*
White-breasted nuthatch	*Sitta carolinensis*
Brown-headed nuthatch	*Sitta pusilla*
Short-eared owl	*Asio flammeus*
Great horned owl	*Bubo virginianus*
Eastern screech owl	*Otus asio*
Barred owl	*Strix varia*
European starling[1]	*Sturnus vulgaris*
Blue-grey gnatcatcher[1]	*Polioptila caerulea*

Table E-3 (Continued)
Wildlife Expected or Observed in the Vicinity of NAS Jacksonville

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville Florida

BIRDS (continued)	
Ruby-crowned kinglet[1]	*Regulus calendula*
Golden-crowned kinglet	*Regulus satrapa*
Summer tanager	*Piranga rubra*
Ruby-throated hummingbird	*Archilochus colubris*
Marsh wren	*Cistothorus palustris*
Sedge wren	*Cistothorus platensis*
Carolina wren	*Thryothorus ludvicianus*
House wren[1]	*Troglodytes aedon*
Winter wren	*Troglodytes troglodytes*
Hermit thrush	*Catharus guttata*
Eastern bluebird	*Sialia sialis*
American robin[1]	*Turdus migratorius*
Eastern wood pewee	*Contopus virene*
Flycatcher[1]	*Empidonax sp.*
Acadian flycatcher	*Empidonax virescens*
Great crested flycatcher[1]	*Myiarchus crinitus*
Eastern phoebe	*Sayornis phoebe*
Eastern kingbird	*Tyrannus tyrannus*
Common barn owl	*Tyto alba*
Yellow-throated vireo	*Vireo flavifrons*
White-eyed vireo[1]	*Vireo griseus*
Red-eyed vireo	*Vireo olivaceus*
Solitary vireo[1]	*Vireo solitarius*
American kestrel[1]	*Falco sparverius*
MAMMALS	
Gray fox	*Urocyon cinereoarenteus*
Nutria	*Myocastor coypus*
White-tailed deer[1]	*Odocoileus virginianus*
Eastern wood rat	*Neotoma floridana*
Marsh rice rat	*Oryzomys palustris*
Cotton mouse	*Peromyscus gossypinus*
Golden mouse	*Peromyscus nuttalli*
Old field mouse	*Peromyscus polionotus*
Eastern harvest mouse	*Reithrodontomys humulis*
Hispid cotton rat[1]	*Sigmodon hispidus*
Nine-banded armadillo[1]	*Dasypus novemcinctus*

Table E-3 (Continued)
Wildlife Expected or Observed in the Vicinity of NAS Jacksonville

Focused RI/FS, Operable Unit 2
Naval Air Station Jacksonville
Jacksonville Florida

MAMMALS (continued)	
Virginia oppossum[1]	*Didelphis virginiana*
Bobcat	*Lynx rufus*
Southeastern pocket gopher	*Geomys pinetis*
Eastern cottontail[1]	*Sylvilagus floridanus*
Marsh rabbit	*Sylvilagus palustris*
House mouse	*Mus musculus*
Norway rat	*Rattus norvegicus*
Striped skunk	*Mephitis mephitis*
Eastern spotted skunk	*Spilogale putorius*
Raccoon[1]	*Procyon lotor*
Southern flying squirrel	*Glaucomys volans*
Grey squirrel	*Sciurus carolinensis*
Sherman's fox squirrel	*Sciurus niger shermani*
Short-tailed shrew	*Blarina brevicauda*
Least shrew	*Cryptotis parva*
Southeastern shrew	*Sorex longirostris*
Eastern mole	*Scalopus aquaticus*
Big brown bat	*Eptesicus fuscus*
Red bat	*Lasiurus borealis*
Hoary bat	*Lasiurus cinereus*
Northern yellow bat	*Lasiurus intermedius*
Semiole bat	*Lasiurus seminolus*
Southeastern bat	*Myotis austroriparius*
Eastern pipistrelle	*Pipistrellus subflavus*
Eastern big-eared bat	*Plecotus rafinesquii*

[1]Observed (or signs observed) at OU 1 by ABB-ES personnel.

Mammals identified based on regional distribution reported for northeastern Florida (Burt and Grossenheider, 1976).

Birds identified based on reported distribution for northeastern Florida (Peterson, 1980).

Reptiles and amphibians identified based on speciman records for Duval County, Florida (Ashton and Ashton, 1988b and 1991)

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TITLE

14-Day Survival Test With The Earthworm, *Eisenia foetida*

CONTRACT NUMBER

DDC 93-030

AUTHOR

Jeff Wheat

REPORT DATE

November 10, 1993

PERFORMING LABORATORY

Toxikon Environmental Sciences
106 Coastal Way
Jupiter, Florida 33477

LABORATORY PROJECT ID

J9310001

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SUMMARY

Sponsor:	ABB Environmental Services 2590 Executive Center Circle East Berkley Building Tallahassee, Florida 32301
Study Director:	Jeff Wheat; (407) 575-1890
Location of Study:	Toxikon Environmental Sciences 106 Coastal Way Jupiter, Florida 33477
Location of Raw Data and Final Report:	ABB Environmental Services Tallahassee, Florida
Test Substance:	Soil Sample
Test Species:	Earthworm (*Eisenia foetida*); Approximately 60 days old. Mean weight was 0.35 ± 0.07 g.
Source of Organisms:	Carolina Biological Supply, Burlington, North Carolina
Condition at Study Initiation:	Earthworms appeared to be in good physical condition at test initiation.
Dilution Soil:	Artificial soil (10% Peat, 20% Clay and 70% Sand) with an initial pH of 6.1
Nominal (Measured TPH) Concentrations:	Control (53 mg/kg TPH), 1% (533 mg/kg TPH), 3% (1035 mg/kg TPH), 10% (3700 mg/kg TPH), 30% (11300 mg/kg TPH) and 100% (42400 mg/kg TPH)
Experimental Test Dates:	October 20 to November 3, 1993
Study Length:	14 days
Results:	The 7-day LC50 was 54.8% (21889 mg/kg TPH based upon measured concentrations) with 95 percent confidence limits of 30% (11300

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mg/kg TPH) and 100% (42400 mg/kg TPH).

The 14-day LC50 was 50.5% (19999 mg/kg TPH based upon measured concentrations) with 95 percent confidence limits of 30% (11300 mg/kg TPH) and 100% (42400 mg/kg TPH). The 7-day and 14-day NOEC's were both 1% (533 mg/kg TPH) based upon mortality.

1.0 INTRODUCTION

A 14-day earthworm survival test was conducted at Toxikon Environmental Sciences, Jupiter, Florida, to determine the toxicity of a contaminated soil to the earthworm. Eisenia foetida. The criterion for effect was death. Results of the test are expressed as 7-day and 14-day median lethal concentrations (LC50), the concentration of contaminated soil estimated to be lethal to 50 percent of the test organisms at the specified time.

All data related to this study will be maintained by ABB Environmental Sciences, Tallahassee, Florida.

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2.0 MATERIALS AND METHODS

2.1 Test Substance

The test substance, a contaminated soil sample, was received at Toxikon Environmental Sciences on October 19, 1993 in two 1-gallon translucent white plastic jars labeled "Date: 10/18/93; Time: 1444; Collected by: FB & MCL; Sampling Site: 002; Sample ID: U2SB08101; Sample Type: Grab; Tests Required: Toxicity analysis (earthworm study); Preservative: 4°C." The test soil was dark colored, with a very strong petroleum odor. The test substance was stored in the dark at 4°C until used.

Test concentrations are reported as percent (%) mixture of control soil and test soil and as milligrams/kilogram (mg/kg) total petroleum hydrocarbon (TPH).

2.2 Test Species

Adult earthworms, Eisenia foetida, exhibiting a clitellum were obtained from a commercial supplier (Carolina Biological Supply, Burlington, North Carolina). Upon arrival, earthworms were transferred to worm culture trays which contained approximately 500 g of commercially supplied worm bedding each. Each tray contained approximately 100 earthworms and was placed in a temperature controlled room until used for the test. The holding period was 20 days. The worms were counted in the trays selected for use in the test just prior to test initiation. No mortalities were observed. The temperature during this holding period ranged from 19.2 to 21.3°C. The adults were maintained on a diet of worm food mixture obtained from Carolina Biological Supply. At the termination of the test, control earthworms were individually weighed. The mean weight was 0.35 ± 0.07 g with a range of 0.21 to 0.57 g.

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2.3 Soil Preparation

The control soil was comprised of 10% 2.3-mm sieved Canadian sphagnum peat moss, 20% colloidal kaolinite clay and 70% grade 70 silica sand. The 100% moisture capacity of a subsample of this soil mixture was determined to be 81.37 mL per 100 g of dried sample. Based upon this result ,the soil used for the study was adjusted to 75% saturation by the addition of 61.0 mL deionized water per 100 g.

The moisture content of a sample of test soil as received was determined to be 14.9% or 14.9 mL per 100 g of dried sample. Based upon this, it was necessary to add 31.6 mL of deionized water per 100 g of non-dried soil to achieve 75% saturation.

2.4 Test Methods

Methods for the 14-day survival test with earthworms were those described in EPA's test protocol entitled: "Protocols for Short Term Toxicity Screening of Hazardous Waste Sites."; EPA Document Number: EPA/600/3-88/029.

Concentrations for the 14-day test were specified by the sponsor to be 1, 3, 10, 30 and 100 percent on a weight:weight basis of test soil and control soil. The aforementioned concentrations were prepared by placing appropriate amounts of the moisture-adjusted control soil and test soil in a glass container and mixing thoroughly. A 40-g subsample was taken from each mixing jar and submitted for analysis of TPH. Also, a small subsample was used to determine initial soil pH of each treatment. For the test, 200 g of each treatment were weighed into each of four replicate glass jars.

The 14-day test was initiated on October 20, 1993 with the impartial addition of earthworms to all test containers until 10 earthworms were distributed to each container. The earthworms were added within one hour following preparation of the test concentrations and monitoring of the initial soil pH. The test containers were 1-quart glass canning jars containing 200 g of soil which provided a soil depth of 5 centimeters. All test containers were covered during the test and were positioned in a single water bath in order to maintain a target temperature of 20 ± 2°C. The test was conducted under continuous fluorescent lighting at an intensity ranging between 7.2 and 8.8 microEinsteins per square meter per second (approximately 600 to 733 lux) as measured by a LI-COR, Inc. Model LI-189 Quantum/Radiometer/Photometer equipped with a 2π sensor.

Each test container was visually inspected daily and any observations were noted. Actual survival was physically verified on days 7 and 14. Any cocoons found were counted and removed. Any abnormalities in the behavior or physical appearance of the earthworms were also noted at this time. Earthworms were not fed during the test. Test pH was monitored at test initiation and termination utilizing a Fisher Scientific Accumet pH 1002 meter. The diurnal temperature range of one control soil replicate was continuously monitored using a Micronta minimum/maximum thermometer. Temperature of the water bath was monitored hourly with a Ryan Instruments temperature data logging device.

2.5 Chemical Sampling and Analysis

Soil samples (40 g each) were collected from the controls and all five test treatments at test initiation to determine TPH concentrations. Samples were stored at 4°C until they were shipped to Toxikon Corporation's chemistry laboratory located in West Palm Beach, Florida for analysis. The method used for analysis was EPA Method 481.1/9073.

2.6 Statistical Analyses

Based on results of the test, the 7- and 14-day LC50 values and their 95 percent confidence limits were calculated. The LC50 values were estimated by a computer program (Wheat, 1989) using the following statistical methods: moving average angle, probit, logit and non-linear interpolation. Confidence limits for LC50 values determined by non-linear interpolation were calculated by binomial probability. The method selected for reporting the test results was determined by the characteristics of the data, i.e., the presence or absence of 0-percent and 100-percent mortality and the number of concentrations in which mortalities between 0 and 100 percent occurred (Stephan, 1977).

3.0 RESULTS AND DISCUSSION

The measured concentrations of TPH at the initiation of the 14-day exposure were 53, 533, 1035, 3700, 11300 and 42400 mg/kg in the control, 1%, 3%, 10%, 30% and 100% treatments, respectively (Table 1).

Mortality of earthworms exposed for 14 days to the soil treatments ranged from 0 percent at the 1% (533 mg/kg TPH) test concentration to 100 percent at the 100% (42400 mg/kg TPH) test concentration (Table 2). There was no mortality in the control. During the conduct of this test, 44 cocoons were recovered from the control treatment and 21 were recovered from the 1% treatment. No cocoons were observed in any other treatment. It was noted when the worms were physically counted that on day 7, worms in the 30% treatment were found intertwined in the soil as opposed to actively travelling through the soil. On day 14, worms in the 10% and 30% treatments were noted to be actively trying to flee the soil when placed on the counting tray.

Based upon the characteristics of the data, linear interpolation was used to calculate the 7- and 14-day LC50s. The 7-day LC50 of this test soil was 54.8% (21889 mg/kg TPH) with 95 percent confidence limits of 30% and 100% (11300 and 42400 mg/kg TPH). The 14-day LC50 of this test soil was 50.5% (19999 mg/kg TPH) with 95 percent confidence limits of 30% and 100% (11300 and 42400 mg/kg TPH) (Table 3). A slope of the toxicity curve could not be determined. The no-observed-effect concentration (NOEC) based upon a lack of mortality was 1% (533 mg/kg TPH).

The mean measured test temperature during the 14-day exposure was 20.4°C and ranged from a minimum of 19.5 to a maximum of 21.4°C as measured in replicate A of the control (Table 4). The pH ranged from 6.1 to 6.8 at test initiation and from 6.0 to 7.1 at test termination (Table 5).

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REFERENCES

Stephan, C.E. 1977. Methods for Calculating an LC50. In: American Society for Testing and Materials (ASTM). Aquatic Toxicology and Hazard Evaluation, pp. 65 - 84, F.L. Mayer and J.L. Hamelink, Editors. ASTM STP 534, Philadelphia, Pennsylvania.

U.S. EPA. 1988. Protocols for Short Term Toxicity Screening of Hazardous Waste Sites. EPA 600/3-88/029. Section A.8.5, Earthworm Survival (Eisenia foetida), pp. 78-83.

Wheat, J.V. 1989. Basic program for computing sets of LC50 values adapted from the U.S. Environmental Protection Agency, Duluth, MN, August 1978.

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Table 2. Mortality of the Earthworm, Eisenia foetida, During a 14-Day Survival Test

Nominal Concentration (%)	Cumulative Number Dead (Percent Mortality)[a] Day 7		Day 14	
Control	0	(0)	0[b]	(0)
1	0	(0)	0	(0)
3	1	(2.5)	1	(2.5)
10	0	(0)	1[d]	(2.5)
30	0[c]	(0)	2[c,d]	(5)
100	40	(100)	40	(100)

[a] There were 40 earthworms exposed at each test treatment. The numbers represent the cumulative mortality for all replicates

[b] One earthworm was observed to be lethargic in the C replicate.

[c] Earthworms clumping together.

[d] Earthworms trying to flee soil.

Table 3. Calculated LC50 Values for The 14-Day Survival Test with the Earthworm, Eisenia foetida

Results Based Upon Nominal Concentrations

Exposure Period (Day)	LC50 (%)	95-Percent Confidence Limits (%)
7	54.8	30 - 100
14	50.5	30 - 100

Results Based Upon Measured TPH Concentrations

Exposure Period (Day)	LC50 (mg/kg)	95-Percent Confidence Limits (mg/kg)
7	21889	11300 - 42400
14	19999	11300 - 42400

Note: All LC50 values were calculated by linear interpolation and 95 percent confidence limits were calculated by binomial probability.

Table 4. Daily Temperature Measurements in the Control During a 14-Day Survival Test with the Earthworm, _Eisenia foetida_

	Temperature (°C)		
	Current	Minimum	Maximum
Day 0	20.7	N/A	N/A
Day 1	20.0	20.0	20.4
Day 2	20.2	19.6	20.4
Day 3	20.3	20.1	20.4
Day 4	20.4	20.2	20.5
Day 5	20.3	20.3	20.6
Day 6	20.3	20.2	20.6
Day 7	20.3	19.5	20.7
Day 8	---[a]		
Day 9	20.2	20.1	20.8
Day 10	20.4	20.1	20.7
Day 11	20.6	20.2	20.9
Day 12	20.7	20.4	21.3
Day 13	20.7	20.4	21.4
Day 14	20.5	20.3	20.8

[a] Readings were not taken on this day. Minimum/maximum values recorded on Day 9 encompass Day 8.

Table 5. pH Values During a 14-Day Survival Test with the Earthworm, *Eisenia foetida*

Nominal Concentrations (%)	PH Measurements Day 0	PH Measurements Day 14
Control	6.1	6.0
1	6.4	6.1
3	6.2	6.2
10	6.2	6.6
30	6.4	7.1
100	6.8	6.9

APPENDIX F

Feasibility Study Supporting Documentation

Sampling Costs for Alternatives for PSC 2, Former Fire-fighting Training Area
Focused RI/FS, Operable Unit 2
NAS Jacksonville, Jacksonville, Florida
October 1993

Alternatives 1 and 2, pretreatment

Analysis	# Water	Unit Cost	Subtotal	# Soil	Unit Cost	Subtotal	Total Cost for Analysis
TCLP	N/A	N/A	$0	17	$1,436.64	$24,423	$24,423
Total halogens	4	$60.50	$242	17	$60.50	$1,029	$1,271
Total VOA	7	$117.26	$821	19	$146.58	$2,785	$3,606

SUBTOTAL	$29,299
-- multiplier for fast turnaround time	1.75
TOTAL PRETREATMENT COST	**$51,274**

Alternative 3, post-treatment

Analysis	# Water	Unit Cost	Subtotal	# Soil	Unit Cost	Subtotal	Total Cost for Analysis
TPH	4	$87.95	$352	17	$117.26	$1,993	$2,345
PAH	4	$234.52	$938	19	$293.15	$5,570	$6,508
Total VOH	7	$117.26	$821	19	$146.58	$2,785	$3,606
TCLP metals	N/A	N/A	$0	17	$381.10	$6,479	$6,479
Total TCLP metals	4	$281.42	$1,313	19	$328.33	$6,238	$7,552

SUBTOTAL	$26,489
-- multiplier for fast turnaround time	1.75
TOTAL POST-TREATMENT COST	**$46,356**

All alternatives, remaining soil

Analysis	# Water	Unit Cost	Subtotal	# Soil	Unit Cost	Subtotal	Total Cost for Analysis
TPH	6	$87.95	$528	32	$117.26	$3,752	$4,280

SUBTOTAL	$4,280
-- multiplier for fast turnaround time	1.75
TOTAL COST TO DEMONSTRATE REMOVAL	$7,490

Sampling Costs for Alternatives for PSCs 41 and 43, Sludge Drying Beds
Focused RI/FS, Operable Unit 2
NAS Jacksonville, Jacksonville, Florida
October 1993

All alternatives, pretreatment or predisposal

Analysis	# Water	Unit Cost	Subtotal	# Soil	Unit Cost	Subtotal	Total Cost for Analysis
TCLP	N/A	N/A	$0	7	$1,436.64	$10,057	$10,057
Total halogens	3	$60.50	$182	7	$60.50	$424	$605

SUBTOTAL	$10,662
– multiplier for fast turnaround time	1.75
TOTAL PRETREATMENT COST	**$18,658**

Alternative 5, sampling of treated filter media

Analysis	# Water	Unit Cost	Subtotal	# Soil	Unit Cost	Subtotal	Total Cost for Analysis
TCLP	N/A	N/A	$0	7	$1,436.64	$10,057	$10,057

SUBTOTAL	$10,057
– multiplier for fast turnaround time	1.75
TOTAL POST-TREATMENT COST	**$17,599**

All alternatives, remaining filter media

Analysis	# Water	Unit Cost	Subtotal	# Soil	Unit Cost	Subtotal	Total Cost for Analysis
TCLP metals	N/A	N/A	$0	26	$381.10	$9,908	$9,908

SUBTOTAL	$9,908
– multiplier for fast turnaround time	1.75
TOTAL COST TO DEMONSTRATE REMOVAL	$17,340

Note: Free-phase LNAPL was detected in two of the five temporary wells: TPZ and TPZ-5. LNAPL thickness in TPZ-4 = 0.07 foot; in TPZ-5 + 1.09 feet.

Assume that free-phase LNAPL becomes mobile when soil TPH concentration detected in the onsite laboratory is 20,000 mg/kg TPH. (Note: This approach is consistent with field observations, i.e., locations OU2-SB-16 and OU2-SB-017 had field screening TPH concentrations of 150,000 mg/kg. These locations are approximately 0.5 foot and 1 foot, respectively, from TPZ-5, which was discovered to contain an approximate thickness of 1.09 feet of LNAPL.)

Field observations (as discussed in Section 3.2.1 (page 3-6) indicate that most TPH-contaminated soil is along the central portion of the fire-fighting training pit. Assume that this area is contaminated with free-phase LNAPL at an average thickness of 25 percent of the thickness at TPZ-5, and that the free-phase LNAPL occupies 20 percent of the void space in the soil. Assumptions for TPH mobility, LNAPL thickness, and soil porosity were based on a literature review of the references listed below:

- CONCAWE, 1979, de Pastrovich, T.L., Baradat, Y., Barthel, R., Chirelli, A., and Fussell, D.R., 1979, Protection of Groundwater from Oil Pollution. CONCAWE Report No. 3/79, The Hague, Netherlands, 61 p.
- Kramer, W.H., 1982, Groundwater Pollution From Gasoline, Ground Water Monitoring Review. Vol. 2(2), p. 18-22.
- Yaniga, P.M., 1982, Alternatives in Decontamination for Hydrocarbon-Contaminated Aquifers: Ground Water Monitoring Review, Vol. 2, p. 40-40.
- Yaniga, P.M., and Demko, D.J., 1983, Hydrocarbon Contamination of Carbonate Aquifers: Assessment and Abatement: In Proceedings of the National Water Well Association of Ground Water Scientists and Engineers Third National Symposium on Aquifer Restoration, P. 60-65.

Assume that the other areas contaminated with 20,000 mg/kg and greater TPH have only 20 percent as much free-phase LNAPL as the most highly contaminated area..

Thickness of LNAPL in TPZ-5 = $T_5 := 1.09 \cdot ft$

Average TPH thickness in contaminated area = $T_{avg} := T_5 \cdot 0.25$ therefore $T_{avg} = 0.27 \cdot ft$

Soil porosity = $n := 0.35$ (assumed value)

Length of highly contaminated area = $L_s := 115 \cdot ft$

Width of highly contaminated area = $W_s := 20 \cdot ft$

Volume of LNAPL in highly contaminated area = $V_s := T_{avg} \cdot n \cdot L_s \cdot W_s$ therefore $V_s = 1641 \cdot gal$

Volume of LNAPL in less contaminated area = $V_l := V_s \cdot 0.2$ therefore $V_l = 328 \cdot gal$

Total volume of LNAPL = $V_t := V_s + V_l$ therefore $V_t = 1969 \cdot gal$

Round to $V := 2000 \cdot gal$

Number of 55-gallon drums needed to contain LNAPL = $N_{drum} := \dfrac{V}{55 \cdot gal}$ $\therefore$ $N_{drum} = 36.36$

Round to N = 37 drums.

Alternative 41/43-SC-1, 41/43-SC-2

Assume that the area requiring restoration for this alternative is the sum of the areas of the domestic and the industrial sludge drying beds plus 20%.

Total length of domestic beds = $L_{db} := 250 \cdot ft$

Total width of domestic beds = $W_{db} := 50 \cdot ft$

Total length of industrial beds = $L_{ib} := 65 \cdot ft$

Total width of industrial beds = $W_{ib} := 18 \cdot ft$

Area requiring restoration for these alternatives = $A_{12} := \left(L_{db} \cdot W_{db} + L_{ib} \cdot W_{ib}\right) \cdot 1.2$

$A_{12} = 1823 \cdot yd^2$

Round to A_{12} = 1900 sq. yards

Weight of decontamination water to be disposed
NAS Jax OU 2 Page 1 of 1

Done By: DJS Job # 7559-50
Chkd. By: 5 Nov 1993

Assume that each alternative will generate $V_w := 1000 \cdot gal$ of decontamination water.

Density of water = $D_w := 62.4 \cdot \frac{lb}{ft^3}$

Weight of generated decon water = $W_w := V_w \cdot D_w$ $W_w = 8342 \cdot lb$

Round to W = 8400 lb

Weight of concrete pads to be disposed following remediation Done By: DJS Job # 7559-50
NAS Jax OU 2 Page 1 of 1 Chkd. By: 5 Nov 1993

Assume that density of concrete = $D_c := 150 \cdot \frac{lb}{ft^3}$ (Ref.: Roberson et al, Hydraulic Engineering, 1988)

Thickness of pads = $T_p := 0.5 \cdot ft$

Alternative 2-SC-3

Length of pad = $L_2 := 60 \cdot ft$ Width of pad = $W_2 := 80 \cdot ft$

Weight of concrete = $W_2 := L_2 \cdot W_2 \cdot T_p \cdot D_c$ $W_2 = 180 \cdot ton$

Alternative 41/43-SC-3

Length of pad = Width of pad = $L_{4143} := 120 \cdot ft$

Weight of concrete = $W_{4143} := L_{4143}^2 \cdot T_p \cdot D_c$ $W_{4143} = 540 \cdot ton$

Area to be cleared for installation of concrete pad Done By: DJS Job # 7559-50.TKE
Alternative 41/43-SC-3 Chk. By: Date: 3 Nov 1993

Assume: 1. 120' x 120' concrete pad would be constructed for laydown of onsite stabilization unit
2. Pad would be constructed east of PSC 41.
3. Areas 1 and 2 would need to be cleared of underbrush and some 3-4" diameter trees

Area 1:

$L_1 := 95 \cdot ft$ $W_1 := 120 \cdot ft$ $A_1 := L_1 \cdot W_1$ therefore $A_1 = 11400 \cdot ft^2$

Area 2:

$L_2 := 30 \cdot ft$ $W_2 := 45 \cdot ft$ $A_2 := L_2 \cdot W_2$ therefore $A_2 = 1350 \cdot ft^2$

Total Area: $A_T := A_1 + A_2$ therefore $A_T = 12750 \cdot ft^2$

VOLUME AND WEIGHT CALCULATIONS FOR PSC 41, DOMESTIC SLUDGE DRYING BEDS
FOCUSED RI/FS, OPERABLE UNIT 2
NAS JACKSONVILLE, FLORIDA
OCTOBER 1993

Volume estimates are based on record drawings of the drying beds, dated 1970.

Type of medium	Number	Length (feet)	Height (feet)	Width (feet)	Specific Volume (feet^3)	Specific Weight (lbs/ft^3)	Total Weight (tons)	Expansion Factor (%)	Bulk Volume (feet^3)	Bulk Volume (yard^3)
Cinder block walls	1	895.00	3.50	0.75	2349	100	117	130%	3054	113
R.I. Concrete Wall Footing	1	895.00	0.75	1.50	1007	180	91	130%	1309	48
R.I. Concrete Wall Cap	1	895.00	0.50	0.75	336	180	30	130%	436	16
R.I. Concrete Aprons	5	12.00	12.00	0.50	360	180	32	130%	468	17
R.I. Concrete Drive Ribbon	10	38.50	0.50	2.50	481	180	43	130%	626	23
R.I. Concrete Splash Plates	5	3.50	0.50	3.50	31	180	3	130%	40	1
Filter sand	5	50.00	0.60	50.00	7500	100	375	110%	8250	306
Filter medium gravel in each bed	5	50.00	0.25	50.00	3125	100	156	110%	3438	127
Filter coarse gravel	5	50.00	0.75	50.00	9375	100	469	110%	10313	382
Native soil (sand)	1	260.00	3.00	56.00	43680	100	2184	115%	50232	1860

	Specific Volume (feet^3)	Total Weight (tons)	Bulk Volume (feet^3)	Bulk Volume (yard^3)
TOTAL WEIGHT AND VOLUMES OF SURFACE (NONHAZARDOUS) DEBRIS (all concrete except for footing)	3557	226	4624	171
TOTAL WEIGHT AND VOLUMES OF MEDIA TO BE TREATED AND/OR DISPOSED (filter sand and gravels)	63680	3184	72232	2675
TOTAL WEIGHT AND VOLUMES OF SUBSURFACE (HAZARDOUS) DEBRIS (concrete footings)	1007	91	1309	48

Note: If hazardous concrete is crumbled or crushed upon removal, it would be treated and/or disposed with the filter media.

VOLUME AND WEIGHT CALCULATIONS FOR PSC 43, INDUSTRIAL SLUDGE DRYING BEDS
FOCUSED RI/FS, OPERABLE UNIT 2
NAS JACKSONVILLE, FLORIDA
OCTOBER 1993

Volume estimates are based on record drawings of improvements to the drying beds, dated 1976.

Type of medium	Number	Length (feet)	Width (feet)	Depth (feet)	Specific Volume (feet^3)	Specific Weight (lbs/ft^3)	Total Weight (tons)	Expansion Factor (%)	Bulk Volume (feet^3)	Bulk Volume (yard^3)
Concrete wall, south side of beds	1	64.67	0.67	4	173.32	150	13.00	130%	225.31	8.34
Concrete wall, north side of beds	1	64.67	0.67	3.75	162.48	150	12.19	130%	211.23	7.82
Concrete walls within beds	5	18	0.67	4	241.20	150	18.09	130%	313.56	11.61
Concrete footings, north and south walls	2	64.67	2	0.67	173.32	150	13.00	130%	225.31	8.34
Concrete footings, walls within beds	5	18	2	0.67	120.60	150	9.05	130%	156.78	5.81
Concrete splash plate	1	64.67	1.67	0.33	35.64	150	2.67	130%	46.33	1.72
Concrete splash plate lip	1	64.67	0.33	0.5	10.67	150	0.80	130%	13.87	0.51
Filter sand in each bed	4	15.33	18	1	1103.76	120	66.23	115%	1269.32	47.01
Medium gravel in each bed	4	15.33	18	0.33	364.24	100	18.21	115%	418.88	15.51
Coarse gravel in each bed	4	15.33	18	0.75	827.82	100	41.39	115%	951.99	35.26

	Specific Volume (feet^3)	Total Weight (tons)	Bulk Volume (feet^3)	Bulk Volume (yard^3)
TOTAL WEIGHT AND VOLUMES OF SURFACE (NONHAZARDOUS) DEBRIS (all concrete except for footings)	623	47	810	30
TOTAL WEIGHT AND VOLUMES OF MEDIA TO BE TREATED AND/OR DISPOSED (filter sand and gravels)	2296	126	2640	98
TOTAL WEIGHT AND VOLUMES OF SUBSURFACE (HAZARDOUS) DEBRIS (concrete footings)	294	22	382	14

Note: If hazardous concrete is crumbled or crushed upon removal, it would be treated and/or disposed with the filter media.

SAMPLING PROTOCOL FOR PSC 2, FORMER FIRE-FIGHTING TRAINING AREA
FOCUSED RI/FS, OPERABLE UNIT 2
NAS JACKSONVILLE, JACKSONVILLE, FLORIDA
OCTOBER 1993

Alternative 1

Samples of the soil would need to be collected for characterization prior to offsite disposal. Typically, this cost is included as an approval fee for disposal. Information needed in order to characterize the waste stream was collected during the Focused RI.

Alternatives 2, 3

Use FDEP's "Guidelines for Assessment and Remediation of Petroleum-Contaminated Soils" as a guideline for types of analyses and numbers of samples to be collected.

Before soil is treated, it must be analyzed for the following parameters:

Parameter	USEPA or SW-846 Method
TPH	9073
Total VOH	8010
Total VOA	8020
TCLP toxicity	1311
Ignitability	1010 or 1020
Arsenic	by ICP
Cadmium	by ICP
Chromium	by ICP
Lead	by ICP
Total halogens (by bomb digestion)	300
Total metals (for TCLP metals)	various SW-846 methods

However, only analyses that need to be done during remedial action implementation are: TCLP, Total VOA by 8020, and total halogens. The other analyses were done during the Focused RI at PSC 2.

Approximate amount of soil to be removed from OU 2 = 3400 CY. Guidance states that 6 samples per 1500 CY removed should be collected, and 3 samples per 100 to 500 CY. Therefore, approximately

(6+6+3)		15	soil samples collected
	+	2	duplicates
	+	1	matrix spike (where applicable)
	+	1	matrix spike duplicate (where applicable)
		19	TOTAL SOIL SAMPLES

Assume samples would be collected over a 3-day period, so the following aqueous QA/QC samples would be collected:

+	3	equipment blanks

**SAMPLING PROTOCOL FOR PSC 2, FORMER FIRE-FIGHTING TRAINING AREA
FOCUSED RI/FS, OPERABLE UNIT 2
NAS JACKSONVILLE, JACKSONVILLE, FLORIDA
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+	1	field blank
+	3	trip blanks (where applicable)
	7	TOTAL WATER SAMPLES

After soil is treated, it must be analyzed for several parameters according to FDEP Guidelines. (Note: the offsite thermal treatment facility's analytical costs are included in their processing fees; thus, the number and types of samples listed apply to the onsite treatment option only, Alternative 2-SC-3). These parameters are:

Parameter	USEPA or SW 846 Method
TPH	9073
PAH	8270
Total VOH	8010
TCLP extract -- metals	various USEPA methods
Total TCLP metals	various SW 846 methods

The same number of soil and water samples would be collected following treatment, i.e.,

19	TOTAL SOIL SAMPLES (MS/MSDs when applicable)
7	TOTAL WATER SAMPLES (trip blanks when applicable)

Sampling of remaining soil to demonstrate efficacy of removal (FOR ALL ALTERNATIVES)

Remaining soil would be analyzed for TPH by USEPA Method 9073.

Assume that the area excavated is approximately the size of the fire-training pit. Samples would be collected at the same approximate locations as during the Focused RI. Therefore,

	29	locations of Focused RI soil samples
+	3	duplicates
	32	TOTAL SOIL SAMPLES

Assume that the samples would be collected over a 5-day period. The following aqueous QA/QC samples would be collected:

	5	equipment blanks
+	1	field blank
	6	TOTAL WATER SAMPLES

SAMPLING PROTOCOL FOR PSCs 41 and 43, SLUDGE DRYING BEDS
FOCUSED RI/FS, OPERABLE UNIT 2
NAS JACKSONVILLE, JACKSONVILLE, FLORIDA
OCTOBER 1993

Alternatives 4, 5, 6

Samples of the filter media would need to be collected for characterization prior to onsite or offsite treatment and/or disposal for all of the proposed alternatives.

Filter media must be analyzed for the following parameters:

Parameter	USEPA or SW-846 Method
TCLP toxicity	1311
Arsenic	by ICP
Cadmium	by ICP
Chromium	by ICP
Lead	by ICP
Total halogens (by bomb digestion)	300

HOWEVER, ONLY TCLP AND TOTAL HALOGENS WOULD NEED TO BE DONE BECAUSE OTHER METALS INFO WAS OBTAINED DURING THE FOCUSED RI.

Approximate amount of soil to be removed from OU 2 = 2800 CY. Assume that 1 sample would be collected for every 500 CY. Therefore

(6+6+3)		6	soil samples collected
	+	1	duplicate
		7	TOTAL FILTER MEDIA SAMPLES

Assume samples would be collected over a 2-day period, so the following aqueous QA/QC samples would be collected:

+	2	equipment blanks
+	1	field blank
	3	TOTAL WATER SAMPLES

Alternative 6

Filter media treated onsite would be sampled and analyzed for TCLP once the treatment process was complete. Assume that the same number of samples would be collected over the same time period:

7 TOTAL TREATED FILTER MEDIA SAMPLES
3 TOTAL WATER SAMPLES

The following "Draft Technical Memorandum for Preferred Remedial Alternative for PSCs 41 and 43, OU 2 (ABB-ES, 1994)" discusses the Interim Remedial Action for PSCs 41 and 43. This Draft Technical Memorandum was written as a performance criteria document, and therefore, was accepted as final. An IRA Workplan for PSCs 41 and 43 was prepared in December 1994 by Bechtel Environmental, Inc. The IRA was completed in 1995.

APPENDIX E

TECHNICAL MEMORANDUM FOR PREFERRED REMEDIAL ALTERNATIVE FOR POTENTIAL SOURCES OF CONTAMINATION 41 AND 43, DOMESTIC AND INDUSTRIAL SLUDGE DRYING BEDS (JANUARY 1994)

The following "Draft Technical Memorandum for Preferred Remedial Alternative for PSCs 41 and 43, OU 2 (ABB-ES, 1994)" discusses the Interim Remedial Action for PSCs 41 and 43. This Draft Technical Memorandum was written as a performance criteria document, and therefore, was accepted as final. An IRA Workplan for PSCs 41 and 43 was prepared in December 1994 by Bechtel Environmental, Inc. The IRA was completed in 1995.

DRAFT

TECHNICAL MEMORANDUM FOR PREFERRED REMEDIAL ALTERNATIVE FOR POTENTIAL SOURCES OF CONTAMINATION 41 AND 43, DOMESTIC AND INDUSTRIAL SLUDGE DRYING BEDS

OPERABLE UNIT 2

NAVAL AIR STATION JACKSONVILLE
JACKSONVILLE, FLORIDA

Unit Identification Code: N00207

Contract No. N62467-89-D-0317

Prepared by:

ABB Environmental Services, Inc.
2590 Executive Center Circle, East
Tallahassee, Florida 32301

Prepared for:

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Naval Facilities Engineering Command
2155 Eagle Drive
North Charleston, South Carolina 29418

Joel Murphy, Code 1853, Engineer-in-Charge

January 1994

FOREWORD

To meet its mission objectives, the U.S. Navy performs a variety of operations, some requiring the use, handling, storage, or disposal of hazardous materials. Through accidental spills and leaks and conventional methods of past disposal, hazardous materials may have entered the environment in ways unacceptable by today's standards. With growing knowledge of the long-term effects of hazardous materials on the environment, the Department of Defense initiated various programs to investigate and remediate conditions related to suspected past releases of hazardous materials at their facilities.

One of these programs is the Navy and Marine Corps Installation Restoration (IR) program. This program complies with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act. The Acts, passed by Congress in 1980 and 1986, respectively, established the means to assess and clean up hazardous waste sites for both private-sector and Federal facilities. These Acts are the basis for what is commonly known as the Superfund program.

Originally, the Navy's part of this program was called the Naval Assessment and Control of Installation Pollutants (NACIP) program. Early reports reflect the NACIP process and terminology. The Navy eventually adapted the program structure and terminology of the Navy IR program.

The Navy IR program is conducted in several stages as follows.

- The Preliminary Assessment identifies potential sites through record searches and interviews.

- A Site Inspection then confirms which areas contain contamination, constituting actual "sites." Together, the PA and SI steps were called the Initial Assessment Study under NACIP.

- Next, the Remedial Investigation and the Feasibility Study (RI/FS) together determine the type and extent of contamination, establish criteria for cleanup, identify and evaluate any necessary remedial action alternatives, and develop cost estimates of each alternative. As part of the RI/FS, a Risk Assessment is conducted to identify potential effects on human health and the environment to help evaluate remedial action alternatives.

- The selected alternative is planned and conducted in the Remedial Design and Remedial Action Stages. Monitoring then ensures the effectiveness of the effort.

The investigations of potential hazardous waste sites at Naval Air Station (NAS) Jacksonville, Florida, are presently being conducted under the Navy IR program and follow CERCLA guidelines. Earlier preliminary investigations had been conducted at NAS Jacksonville, Florida, under NACIP. In 1990, in coordination with the U.S. Environmental Protection Agency (USEPA) and the Florida Department of Environmental Protection (FDEP; formerly Florida Department of Environmental Regulation), the investigation of hazardous waste sites were formalized under a Federal Facility Agreement.

NAS Jacksonville, Florida, is conducting the investigation and cleanup of hazardous waste sites at their facility by working through the Southern Division, Naval Facilities Engineering Command (SOUTHNAVFACENGCOM). The USEPA and the FDEP oversee the Navy environmental program at NAS Jacksonville. All aspects of the program are conducted in compliance with State and Federal regulations, as ensured by the participation of these regulatory agencies.

Questions regarding the Navy IR program at NAS Jacksonville, Florida, should be addressed to Mr. Joel G. Murphy, Remedial Project Manger, Code 1853, at (803) 743-0577.

EXECUTIVE SUMMARY

ABB Environmental Services, Inc., under the Comprehensive Long-Term Environmental Action, Navy Contract No. N62467-89-D-0317, has completed a Focused Remedial Investigation (RI)/Feasibility Study (FS) in December 1993 for Potential Sources of Contamination (PSC) 2, 41, and 43 at Operable Unit 2, Naval Air Station (NAS) Jacksonville, Florida. The Focused RI/FS field activities were completed during May and June 1993 and the results are reported in the *Focused Remedial Investigation/Feasibility Study, Potential Sources of Contamination 2, 41, and 43, Operable Unit 2, Naval Air Station, Jacksonville, Florida* (ABB-ES, 1993). OU 2 is located in the northern portion of NAS Jacksonville and it has primarily been used for wastewater treatment. Its secondary use has been as a fire fighting training area. PSC 2 is the old fire fighting training area and PSCs 41 and 43 are the abandoned domestic and industrial sludge drying beds, respectively. Data gathered during the Focused RI were used to identify appropriate remedial alternatives for proposed interim Remedial Action (RA) that will reduce risks and be implemented while the overall RI/FS at OU 2 progresses.

This Technical Memorandum (TM) discusses the proposed interim RA for PSCs 41 and 43. The proposed interim RA for PSC 2 is presented in a separate TM.

The preferred remedial alternative for reduction of inorganic analytes at PSCs 41 and 43 consists of excavation of the filter media and contaminated soil, temporary storage of the filter media and soil for future solidification, reduction of contaminants on concrete structures that contacted hazardous material, transportation of nonhazardous debris to an offsite disposal facility, and restoration of excavations to grade.

The proposed interim RA for PSCs 41 and 43 presented in this TM is not intended to provide a permanent solution to all risks associated with the PSCs at OU 2. However, removal of these PSCs as the overall RI/FS for OU 2 progresses will reduce a portion of those risks, while maintaining an approach consistent with the broad remedial strategy for OU 2.

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DRAFT

GLOSSARY

AA	atomic adsorption
ABB-ES	ABB Environmental Services, Inc.
AOC	area of concern
ARARs	applicable or relevant and appropriate requirements
ASTM	American Society for Testing and Materials
BaP	benzo(a)pyrene
BDAT	Best Demonstrated Available Technology
bls	below land surface
BTEX	benzene, toluene, ethylbenzene, and xylenes
Btu	British thermal unit
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CLEAN	Comprehensive Long-Term Environmental Action, Navy
CLP	Contract Laboratory Program
COCs	contaminants of concern
CPCs	contaminants of potential concern
CRDL	contract required detection limit
CRQLs	contract required quantitation limits
DOD	Department of Defense
DOT	Department of Transportation
°F	degrees Fahrenheit
ECAO	Environmental Criteria Assessment Office
FAC	Florida Administrative Code
FDEP	Florida Department of Environmental Protection
FDER	Florida Department of Environmental Regulation
FEA	Focused Ecological Assessment
FFA	Federal Facility Agreement
FFS	Focused Feasibility Study
FQRA	focused qualitative risk assessment
FS	Feasibility Study
FSWP	Feasibility Study Work Plan
GAC	granular activated carbon
GC	gas chromatograph
gpm	gallons per minute
HEAST	Health Effects Assessment Summary Tables
HTRW	Hazardous, Toxic, and Radiological Waste
IAS	Initial Assessment Study
IDL	instrument detection limit
IR	Installation Restoration
IRIS	Integrated Risk Information System
IROD	Interim Record of Decision

GLOSSARY (Continued)

LC50	50 percent lethal concentrations
LDRs	land disposal restrictions
LNAPL	light nonaqueous-phase liquid
mg	milligrams
mg/ℓ	milligrams per liter
mg/kg	milligrams per kilogram
mg/kg/BW/day	milligram per kilogram of body weight per day
μg/kg	micrograms per kilogram
$\mu g/m^3$	micrograms per cubic meter
NAAQS	National Ambient Air Quality Standards
NACIP	Naval Assessment and Control of Installation Pollutants
NAS	Naval Air Station
NCP	National Oil and Hazardous Substances Contingency Plan
NEESA	Naval Energy and Environmental Support Activity
NOEC	no observed effect concentration
NPL	National Priority List
NSPS	New Source Performance Standards
NTR	Navy Technical Representative
O&M	operation and maintenance
OSHA	Occupational Safety and Health Act
OU	Operable Unit
PA	Preliminary Assessment
PAHs	polynuclear aromatic hydrocarbons
PCBs	polychlorinated biphenyls
PPE	personal protection equipment
ppm	parts per million
PRGs	preliminary remedial goals
PSCs	potential sources of contamination
RA	Risk Assessment
RAC	Remedial Action Contractor
RAOs	remedial action objectives
RCRA	Resource Conservation and Recovery Act
RfD	reference dose
RI/FS	Remedial Investigation/Feasibility Study
RPD	relative percent difference
SARA	Superfund Amendments and Reauthorization Act
SI	Site Inspection
SOUTHNAV-FACENGCOM	Southern Division, Naval Facilities Engineering Command
SQL	sample quantitation limit
SVOCs	semivolatile organic compounds
TAL	target analyte list
TCL	target compound list
TCLP	Toxicity Characteristic Leaching Procedure
TEF	toxicity equivalence factor

GLOSSARY (Continued)

TM	technical memorandum
TOC	total organic carbon
TPH	total petroleum hydrocarbons
TSD	temporary storage and disposal
TU	temporary unit
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
VOCs	volatile organic compounds
yd^3	cubic yard

1.0 INTRODUCTION

ABB Environmental Services, Inc. (ABB-ES), under the Comprehensive Long-Term Environmental Action, Navy (CLEAN) Contract No. N62467-89-D-0317, has conducted a Focused Remedial Investigation/Feasibility Study (RI/FS) for Potential Sources of Contamination (PSCs) 2, 41, and 43 on behalf of the Southern Division, Naval Facilities Engineering command (SOUTHNAVFACENGCOM) at Operable Unit (OU) 2, Naval Air Station (NAS) Jacksonville, Florida (Figure 1-1). OU 2 has historically been used as a wastewater treatment facility and is located in the northern portion of the base.(Figure 1-2). The Focused RI/FS field activities at OU 2 were completed in 1993 and results reported in the *Focused Remedial Investigation/Feasibility Study, Potential sources of Contamination 2, 41, and 43, Operable Unit 2, Naval Air Station, Jacksonville, Florida* (ABB-ES, 1993).

This Technical Memorandum (TM) presents a summary of the Focused RI findings and the preferred remedial alternative for only PSCs 41 and 43, the domestic and industrial sludge drying beds, respectively (Figure 1-3). A separate TM presents the Focused RI findings and remedial alternative for PSC 2. The Focused RI findings reported in the Focused RI/FS for PSCs 41 and 43 confirmed the presence of inorganic analytes in the soil and filter media at PSCs 41 and 43. The Focused Feasibility Study (FFS) developed the remedial objectives, screened appropriate source control technologies, and comparatively analyzed each remedial alternative for PSCs 41 and 43. The preferred remedial alternative for reduction of inorganic contamination consists of excavation of the filter media and contaminated soil, temporary storage of filter media and soil for future solidification, reduction of contaminants on concrete structures that contacted hazardous material, and transportation of non-hazardous debris to an offsite disposal facility.

Chapter 2.0 presents a brief overview of OU 2, including a summary of the history of the operable unit, results of the Focused RI for PSCs 41 and 43, the Remedial Action Objectives (RAOs), and the preferred remedial action.

Chapter 3.0 summarizes the existing site conditions and performance criteria for the interim Remedial Action (RA).

Appendix A contains site-specific illustrations showing site-specific illustrations showing sampling locations and the proposed interim RA layout.

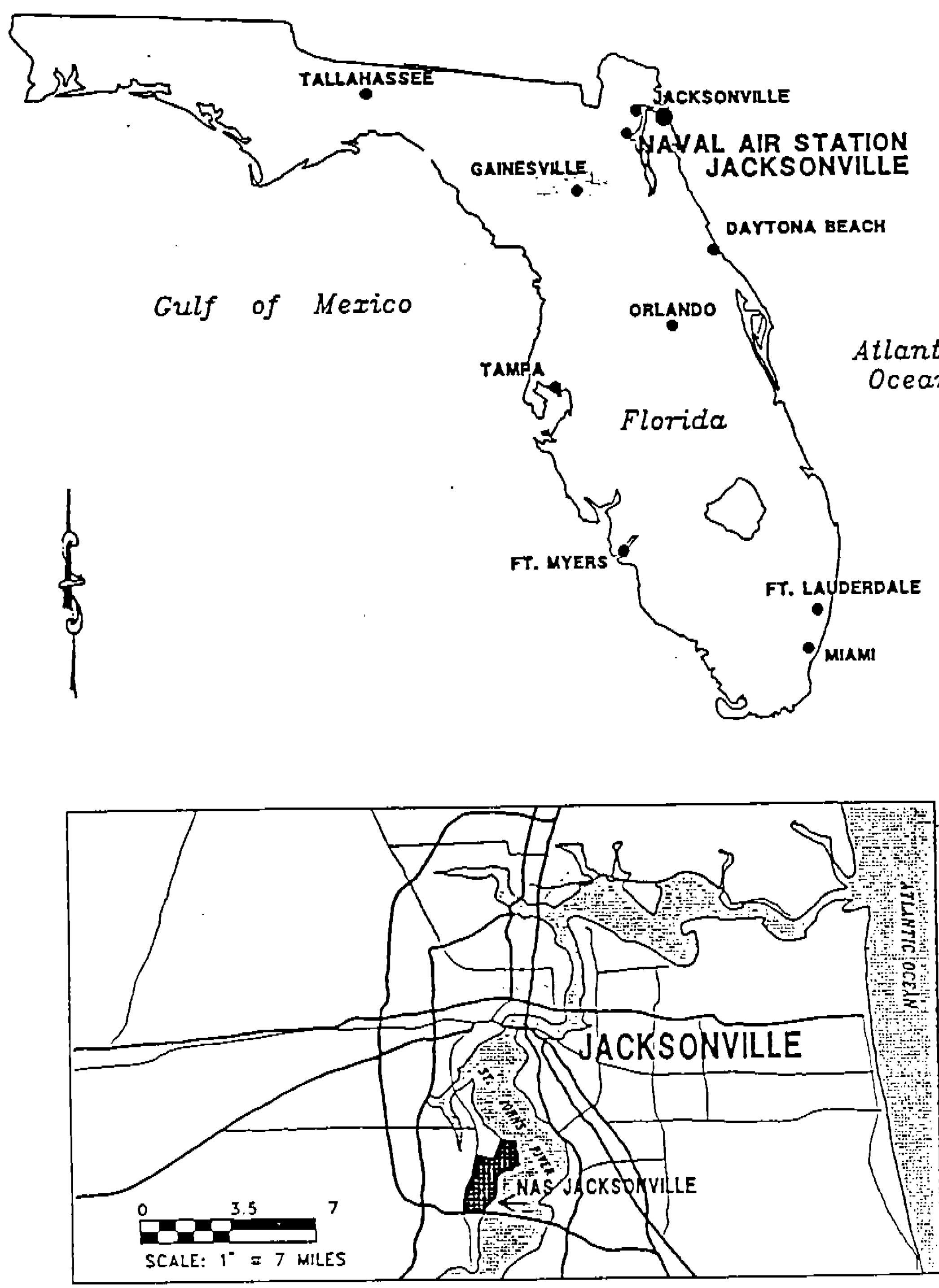


FIGURE 1-1
FACILITY LOCATION MAP
NAVAL AIR STATION
JACKSONVILLE, FLORIDA

TECHNICAL MEMORANDUM
FOR PSCs 41 AND 43 AT OU2

NAS JACKSONVILLE,
JACKSONVILLE, FLORIDA

8586-06 940128WEM

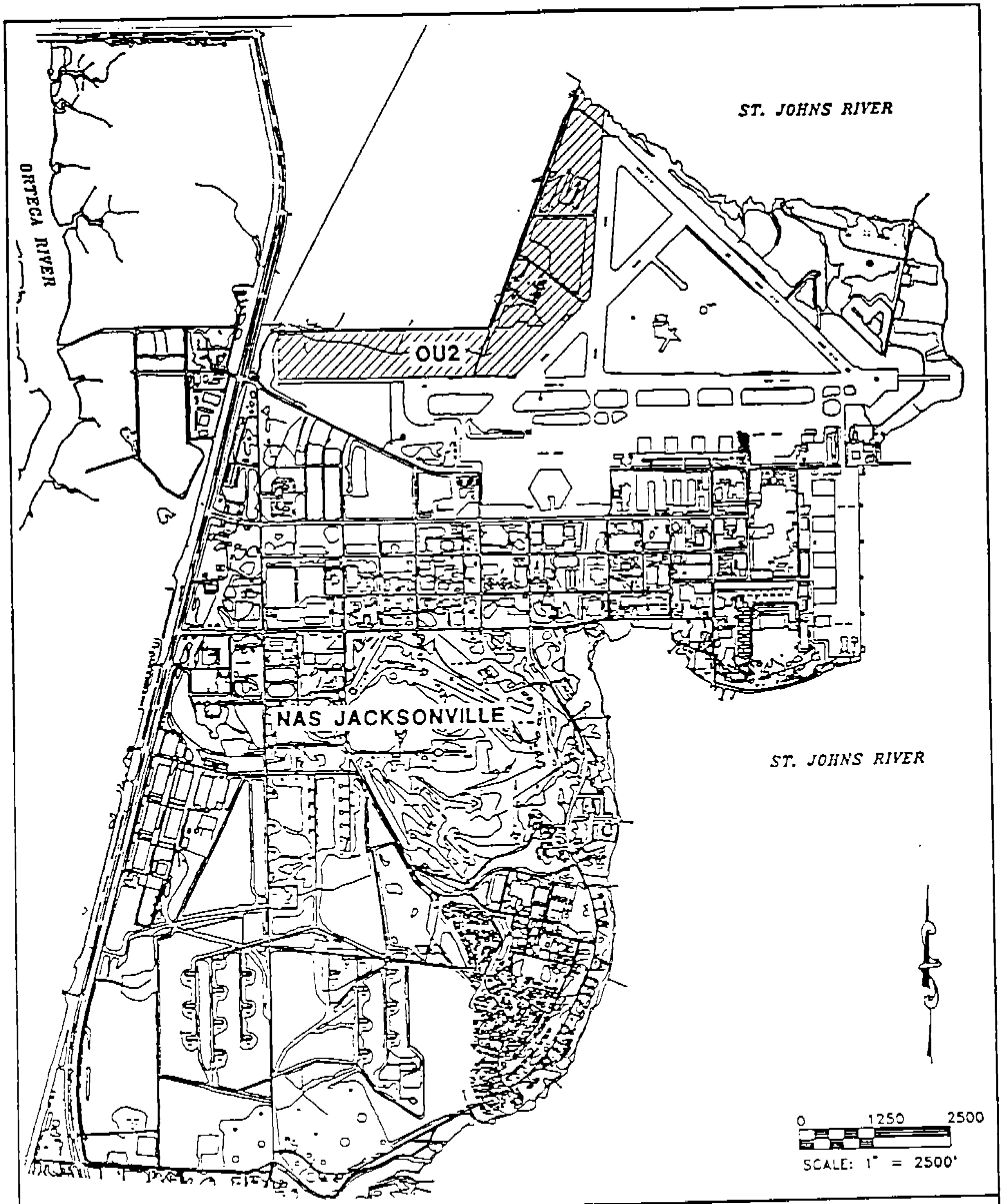


FIGURE 1-2
LOCATION OF OU2 AT
NAS JACKSONVILLE

TECHNICAL MEMORANDUM
FOR PSCs 41 AND 43 AT OU2

NAS JACKSONVILLE,
JACKSONVILLE, FLORIDA

8586-06 940128WEM

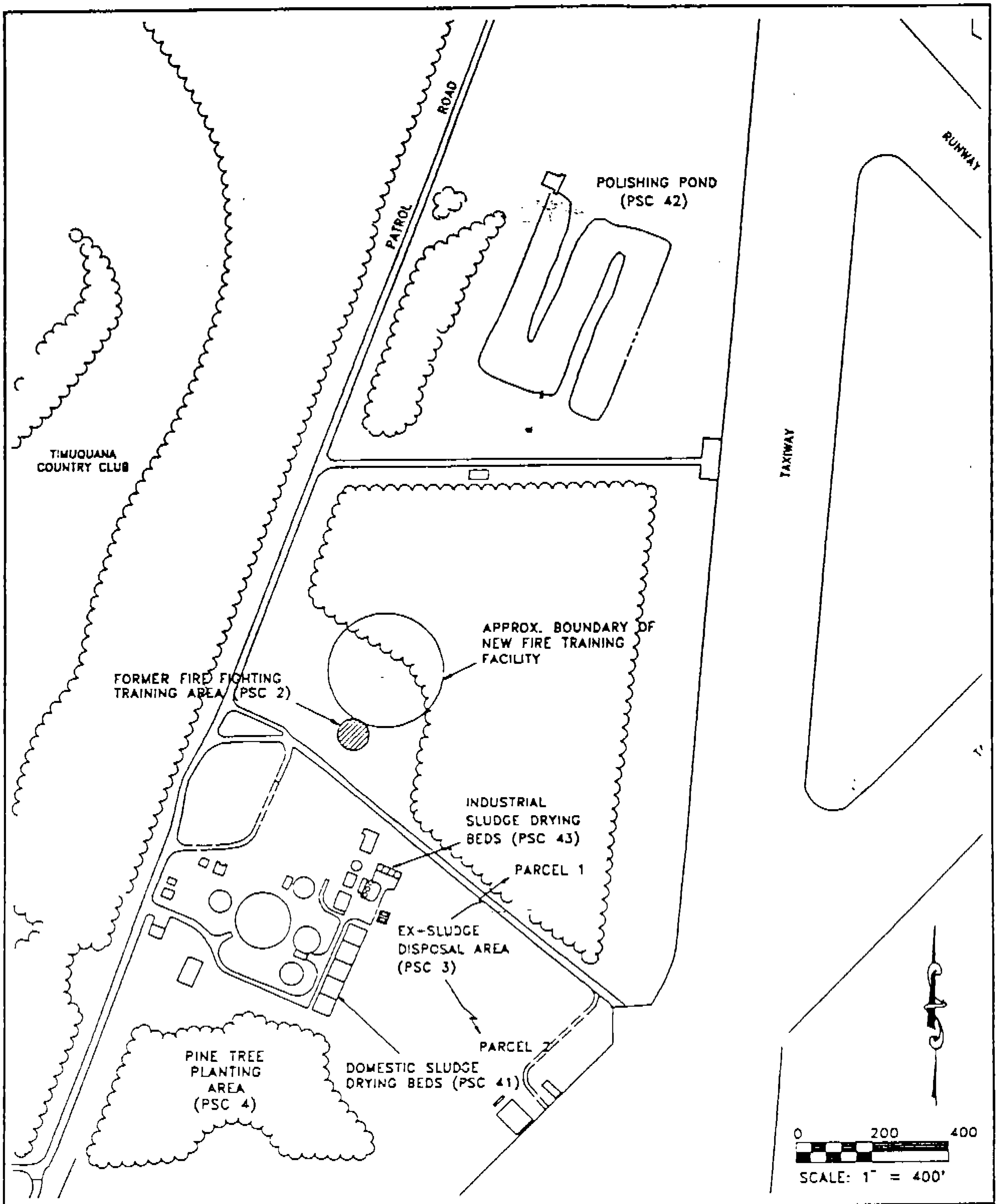


FIGURE 1-3
SITE LOCATION MAP

TECHNICAL MEMORANDUM
FOR PSCs 41 AND 43 AT OU2

NAS JACKSONVILLE,
JACKSONVILLE, FLORIDA

8586-06 940128WEM

2.0 OPERABLE UNIT 2 OVERVIEW

This chapter includes a brief history of OU 2 and discusses the results of the Focused RI/FS completed to support the selection of a remedial alternative for reduction of metals contamination at PSCs 41 and 43. More complete site and historical data can be found in the Focused RI/FS (ABB-ES, 1993) and the RI/FS Workplan (ABB-ES, 1992).

2.1 SITE HISTORY. OU 2 has been incorporated into NAS Jacksonville, and used for U.S. Navy operations since 1940. OU 2 is located the northern part of NAS Jacksonville (Figure 1-2) and has historically been used primarily for wastewater treatment. Its secondary use has been for fire fighting training. Contamination identified in PSC 41 (domestic sludge drying beds) and PSC 43 (industrial sludge drying beds) has potential risks to human and ecological receptors. Moreover, contamination identified in PSCs 41 and 43 is a potential source of groundwater contamination.

PSC 41 was constructed in 1970 to receive sludge from the wastewater treatment plant. Removed from service in 1987, the system consists of five unlined beds (each approximately 50 feet by 50 feet). The beds contain filter media (sand, fine gravel, and coarse gravel) and concrete structures that have come in contact with both domestic and industrial wastewater sludge (Appendix A). During operations approximately 300 cubic yards per year of dried sludge were removed from the domestic sludge drying bed annually

PSC 43 was constructed in 1980 to accept industrial wastewater sludge from electroplating operations (Appendix A). PSC 43 was removed from service in 1988, and consists of four beds (each approximately 15 feet by 18 feet) with filter media concrete structure similar to PSC 41.

During May and June 1993, ABB-ES conducted Focused RI/FS field activities at PSCs 2, 41, and 43. The results of the Focused RI/FS were presented in the *Focused Remedial Investigation/Feasibility Study, Potential Sources of Contamination 2,* *41, and 43, Operable Unit 2, Naval Air Station, Jacksonville, Florida* (ABB-ES, 1993).

2.2 RESULTS OF FOCUSED REMEDIAL INVESTIGATION (RI) FOR PSCS 41 AND 43, DOMESTIC AND INDUSTRIAL SLUDGE DRYING BEDS. A field investigation to assess the extent of contamination within the filter media and native soil at PSCs 41 and 43 was conducted to provide information necessary to complete a Focused Risk Assessment (RA) and a Focused FS. The information generated during this field effort for PSC 41 and 43 is intended to characterize the nature and extent of soil contamination at PSC 41 and 43 exclusively. Major tasks undertaken for both PSCs 41 and 43 during the field program include the following:

- Soil samples were collected from the surface to a depth of 4 feet below land surface (bls) within the beds and around the perimeter of the beds (Appendix A). These samples were screened for five inorganics (arsenic, cadmium, chromium, lead, and nickel), and volatile organic compounds (VOCs). Samples were also split for offsite analysis of Contract Laboratory Program (CLP) target compound list (TCL), target analyte list (TAL) compounds, and VOCs (Appendix A); and

- Concrete chip samples were collected from the walls surrounding the sludge drying beds (Appendix A).

A detailed discussion of the range of contamination of the filter media in both beds is presented in the Focused RI/FS report (ABB-ES, 1993). In summary, the results of the Focused RI for PSC 41 and 43 are as follows.

- Inorganic analyte contamination and low levels of acetone were detected in the filter media. Appendices B, C, and D present a summary of the analytical results from the Focused RI/FS. The analytical results of the concrete samples are also included in these appendices.

- The volume of contaminated filter media within and native soil directly beneath the beds is estimated (based on lengths, depths, and widths of the beds) to be 1,620 cubic yards (yd^3) of native soil for PSC 41, and

320 yd^3 of filter sand, 130 yd^3 of medium-sized gravel, and 380 yd^3 of coarse gravel for both PSCs 41 and 43. Calculations to support these estimations are presented in the Focused RI/FS. An estimated 114 tons of concrete debris, requiring hazardous waste management due to the debris coming in contact with listed wastes, and 274 tons of debris requiring solid waste management exist at both PSCs 41 and 43.

- Depth to groundwater ranges from 4 to 5 feet bls, and groundwater flows generally northeast in the surficial aquifer toward the St. Johns River (Figure 1-2).

Appendix D includes figures that present the sample locations and analytical results.

2.3 <u>REMEDIAL ACTION OBJECTIVES, GENERAL RESPONSE ACTION, AND PREFERRED INTERIM REMEDIAL ACTION</u>. This section describes the remedial action objective for source control at PSCs 41 and 43, the domestic and industrial sludge drying beds at OU 2, NAS Jacksonville as identified in the Focused RI/FS (ABB-ES, 1993).

The contaminated filter media and debris discussed in Section 2.1 are identified as potential sources of groundwater contamination at the site. The inorganic analytes identified also pose a risk to human and ecological receptors. Therefore, the remedial action objective proposed for the filter media, soil, and debris at PSCs 41 and 43 is to immobilize the inorganic analyte contamination of the filter media and debris at PSCs 41 and 43 to decrease exposure to human and ecological receptors.

To achieve this remedial objective, the preferred remedial alternative, identified after screening various technologies, is excavation of the filter media and identified native soils, followed by temporary onsite storage of filter media and native soils, treatment of contaminated debris, and offsite disposal of debris as solid waste. The filter media will be stored onsite until other PSCs with similar contaminants have been investigated. Upon completion of an investigation of related PSCs, a mobile soil stabilization unit will be used onsite to reduce metals contamination. Site restoration will be the final step in achieving the remedial objective.

The preferred alternative provides the most effective and efficient method of accomplishing this remedial objective. Onsite treatment of debris eliminates offsite transportation and disposal costs for management of hazardous waste, and long-term liability associated with landfilled hazardous wastes. Furthermore, combining the contaminated material from PSCs 41 and 43 with contaminated material from other PSCs containing similar inorganic analytes for eventual onsite stabilization will reduce overall cost.

3.0 INTERIM REMEDIAL ACTION

This section of the TM summarizes the elements of the proposed interim RA. The interim RA describes the assumptions, performance criteria, regulatory requirements, and methods. The intent of this section is not to define the means and methods for achieving the performance criteria, rather it serves as a guideline for the Remedial Action Contractor (RAC) for preparation of the necessary submittals for the interim RA.

3.1 GOAL AND OBJECTIVES. The goal of this proposed interim RA is to abate the source of potential human and ecological exposure to inorganic compound contamination identified in both the domestic and industrial sludge drying beds. The objectives of this action are:

- excavation of contaminated filter media and soil (to approximately 5 feet bls),
- stockpiling the contaminated filter media and soil for future stabilization and solidification,
- demolition of the existing sludge drying bed structures,
- decontamination of demolition debris in accordance with the debris rule,
- removal of nonhazardous debris to a solid waste disposal facility, and
- backfilling and compacting excavations with clean fill.

3.2 REMEDIAL ACTION CRITERIA. This section summarizes the basis of the conceptual design of the proposed interim RA. Assumptions are described when specific data were not available. The following considerations affect the implementation of the action:

- the construction of the sludge drying beds,
- the characteristics of the contaminated filter media and soil,
- the regulatory based performance standards, and
- site considerations.

Table 3-1 presents the physical criteria used as a basis for the proposed interim remedial action.

3.2.1 Characteristics of PSC 41, Domestic Sludge Drying Beds The system consists of five unlined beds, each measuring 50 by 50 feet (Appendix A, Figure A-1). The 3-foot-high containment walls and outside dikes are constructed of concrete blocks. The beds are underlain with (from the surface of the filter media) 7 inches of sand, 3 inches of fine gravel, and 6 to 12 inches of coarse gravel. An underdrain system consisting of three, 6-inch-diameter vitrified clay drain lines collected leachate from the beds and returned it to the headworks of the wastewater treatment plant.

Inorganic compound contamination was identified within the filter media, on the structure, and in the soil beneath the domestic sludge drying beds. Although the identified contamination shows definite stratification, the entire filter media volume will be considered contaminated.

3.2.2 Characteristics of PSC 43, Industrial Sludge Drying Beds Each of the four beds is approximately 15 by 18 feet and enclosed with concrete retaining walls (Appendix A). The bottoms of the beds are unlined. Filter media within the beds consist of, from the surface of the bed, a 12-inch sand layer, a 4-inch medium gravel layer, and a minimum 6-inch coarse gravel layer. A synthetic filter material separates the two gravel layers. The bottoms of each bed are sloped toward centralized perforated plastic leachate collection pipes that returned leachate to the headworks of the industrial wastewater treatment plant.

Inorganic compound contamination was identified within the filter media and on the structure of the industrial sludge drying beds. Although the identified

Table 3-1
Remedial Action Criteria

Technical Memorandum for Preferred
Remedial Alternative for PSCs 41 and 43
Operable Unit 2, NAS Jacksonville
Jacksonville, Florida

Soil Type	Fine Sand (yd^3)	
	PSC 41	PSC 43
Volumes:		
Concrete walls	87	22
Concrete footings	50	11
Concrete aprons, splash plates, and ribbons	32	2
Filter sand	280	40
Medium gravel	116	14
Coarse gravel	350	30
Native soil	1,620	N/A
Compaction	80 percent proctor	ASTM D-698

Notes: PSC = potential source of contamination.
yd^3 = square yard.
ASTM = American Society for Testing Materials.
N/A = not applicable.

contamination shows definite stratification, the entire filter media volume will be considered contaminated.

3.2.3 Description of the Contaminated Media Filter media present at the sludge drying beds include native soil (at the domestic sludge drying beds only), filter sand, medium-sized gravel (nominal diameter of 0.75 inch), and coarse gravel (nominal diameter of 1.5 inches). The volume of each medium was estimated based on the lengths and widths of the drying beds and on record drawings of cross sections of the beds that show the as-built thicknesses of each medium. It is estimated that in place volumes of 1,620 yd^3 of native soil, 320 yd^3 of filter sand, 130 yd^3 of medium-sized gravel, and 380 yd^3 of coarse gravel are contaminated. Calculations to support these estimates are provided in the Focused RI/FS (ABB-ES, 1993) and in Appendix E.

Debris present at the sludge drying beds includes concrete and cinder block. Much of the debris present is above grade and assumed to be nonhazardous. However, it was assumed that the concrete structures that came in contact with the listed wastes within the domestic and industrial sludge drying beds would require management as hazardous wastes. It is estimated that 114 tons of debris would require management as hazardous waste and that 274 tons would require management as solid waste. Volume and weight estimates were based on dimensions shown on record drawings. Calculations to support these volumes are provided in the Focused RI/FS (ABB-ES, 1993) and in Appendix E.

3.2.4 Regulatory Based Performance Standards The PSCs identified in this TM are being managed under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), and under the CERCLA OU 2 constitutes an Area Of Concern (AOC). Under the CERCLA moving, consolidating, and immobilizing hazardous wastes is permitted provided the wastes are not moved outside the AOC. By not moving the hazardous wastes outside the AOC, placement of the wastes has not occurred; therefore Resource Conservation and Recovery Act (RCRA) land disposal restrictions (LDR) are not considered applicable or relevant and appropriate requirements (ARAR) for this site.

An ARAR of note is the RCRA debris rule (40 Code of Federal Regulation [CFR] Part 268) which affects the disposal and treatment of the debris created from the demolition of the sludge drying bed structures. Additional regulatory criteria address waste management and health and safety. The RAC should also contact the applicable agencies in the City of Jacksonville and Duval County to determine their requirements that may be specific to the specific technical approach.

The RAC will be required to:

- protect workers and the public in accordance with the Occupational Safety and Health Act (OSHA), Occupational Health and Safety Regulations [29 CFR Part 1910]; and

- manage hazardous waste in accordance with the RCRA, 40 CFR Parts 148, 258, 260, 261, 262, 264, 265, 270, and 271.

<u>3.2.5 Site-Specific Considerations</u> The proposed remedial activities shall not impact remaining structures. The location of the contaminated filter media and soil stockpile will affect the approach and implementation of the proposed interim RA. Haulage routes to the stockpile area should be located to minimize the action's impact on existing structures. Several monitoring wells are located adjacent to the drying beds, the contractor should meet all local and State regulations if it is determined that the wells should be abandoned. Decontamination of debris should be accomplished within the excavation area with wastes generated during decontamination being recovered for disposal or stockpiled with the contaminated filter media. The temporary stockpile location for nonhazardous and decontaminated debris should be away from the hazardous waste stockpile.

<u>3.3 DESCRIPTION OF INTERIM REMEDIAL ACTION</u>. The proposed interim RA will consist of the excavation and stockpiling of contaminated filter media and soil, decontamination of the drying bed structures, demolition of the structures, disposal of debris, and restoration of the excavation.

<u>3.3.1 Submittals</u> The RAC will be responsible for preparing workplans and submittals that will describe the details of their means and methods for achieving the performance criteria as defined in the TM. The submittals will be subject to review comment and approval by the Navy Technical Representative

(NTR). The type, number, and form of the contractor submittals will be defined by the governing contract. Typical submittals are expected to be composed of the following:

- workplan describing scope of work, RAC technical approach, project organization, project cost, and schedule;
- Verification Sampling and Analysis Plan describing sample types and locations to measure effectiveness of the removal action;
- Comprehensive Quality Assurance Plan for sampling and analysis; and
- Health and Safety Plan describing hazards evaluation, engineering controls, and operational methods to minimize hazards to workers and the public.

3.3.2 Site Preparation Before any remedial activities occur at PSCs 41 and 43, several preliminary activities should be accomplished to ensure a safe and organized site. The access to PSCs 41 and 43 is generally restricted, but precautions should be taken to limit access to the PSCs during the remedial action. Fencing and/or signs should be posted to limit access from each direction. The field office should be set up in conjunction with the decontamination area, contaminated media stockpile area, and clean debris stockpile area. Other preparatory activities include:

- a startup meeting with base personnel, the RAC contractor, and NTR to discuss contractor requirements, remedial activities impact on the area (the NTR and the contractor will identify which monitoring wells will be abandoned, monitoring well abandonment will be coordinated with the St. Johns River Water Management District), and schedule;
- coordination of permits, subsurface utility clearances, and utility service with base personnel;
- notifing and obtaining necessary permits from local authorities (i.e., Florida Department of Environmental Protection [FDEP], St. Johns Water

River Management District, City of Jacksonville, Duval County, etc.) for activities planned for the site; and

- coordination of action with ongoing cleanup and investigative activities for OU 2.

3.3.3 Excavation of Contaminated Filter Media and Soil The proposed interim RA requires the contaminated filter media and soil be excavated and placed in a temporary stockpile. All filter media should be removed to a depth approximately to the bottom of the filter beds. For PSC 41, excavation will continue to a depth approximately 6 inches beyond the invert of the leachate collection pipes. Based upon confirmatory sampling results, the RAC may be required to excavate the industrial sludge drying beds to a similar depth. The excavation activities will be restricted to the vadose zone and the maximum depth of excavation will be limited to 5 feet bls. The horizontal extent of the excavations should extend to the drying bed structures. All obviously contaminated appurtenances located within the drying beds should be removed and during excavation activities and are considered a hazardous waste.

Monitoring of the water table in the area will be necessary to ensure a dry excavation. The removal action should be accomplished during a dry period to eliminate the need for any dewatering activities at the site. Contingency plans should be developed to ensure a dry excavation in the event of rain during removal activities. Excavations, decontamination areas, and stockpile areas should be constructed to control runoff and prevent rainwater from contacting any hazardous waste.

3.3.4 Temporary Stockpile Specifications Contaminated filter media and soils will be transported to the temporary stockpile located near PSCs 41 and 43. No free liquid will be transported or stockpiled. As mentioned in the previous section, contingency plans should be made to address liquids in the contaminated media and soil. Haulage distances are short and no contaminated media or soil will leave the exclusion zone provided at the site. Earthwork vehicles should be fully contained to prevent discharge of material to the extent practicable. A site visit is recommended by the RAC before specifying haulage equipment.

Contaminated filter media and soil will be temporarily stockpiled onsite for future solidification. The material will be field compacted during placement in lifts as specified in the RACs technical approach. The stockpile will be designed considering stability, wind and rain erosion, and infiltration. A geomembrane fully encapsulating the material is recommended to isolate hazardous material from the elements and prevent dispersion. Table 3-2 presents the recommended specifications for the geomembrane; however, the RAC may specify another method for temporary encapsulation of hazardous waste. The expected service life of the stockpile is approximately 18 months. Fencing to control access to the stockpile after completion is required. The RAC will identify any maintenance requirements for the temporary hazardous waste stockpile.

3.3.5 Decontamination of Debris After excavation of the contaminated filter media and soil, ABB-ES recommends decontamination of the sludge drying bed structures in accordance with the RCRA debris rule (40 CFR Section 268). Only surfaces of the structure that may have come in contact with the listed wastes need be decontaminated. Approved decontamination methods are presented in Table 3-3. The RAC will specify the decontamination technology in the technical approach section of the submittals. When selecting a decontamination procedure, the RAC should consider the applicability of the technology to the site, cost, and potential hazardous wastes generated during decontamination. If possible, hazardous wastes generated during decontamination should be incorporated into the proposed contaminated filter media and soils stockpile. ABB-ES recommends that the RAC select a "dry" technology for decontamination of debris, decontamination using water would create potential problems with water disposal. Protection of construction personnel during decontamination should be addressed in the Health and Safety Plan submittal.

At the completion of the decontamination of the sludge drying bed structures, confirmatory sampling of the excavation and structure will be required to assess the action. The sample types and locations will be specified in the RAC's Sampling and Analysis Plan.

3.3.6 Demolition of Structure and Disposal of Debris The RAC will be required to remove the existing sludge drying bed structures including concrete foundations, concrete block walls, underdrainage, and transfer piping. Appendix

Table 3-2
Recommended Geomembrane Property Specifications

Technical Memorandum for Preferred
Remedial Alternative for PSCs 41 and 43
Operable Unit 2, NAS Jacksonville
Jacksonville, Florida

Property	Test Method	Value	Units
Weight	ASTM D 2103	30 to 35	Pounds per 1,000 sq. ft.
3-inch tensile (md)	ASTM D 882	60 3,000	Pounds psi
3-inch elongation (md)	ASTM D 882	650	Percent
PPT tear strength	ASTM D 2582	23	Pounds
Cold crack	ASTM D 1709	-40	°F
Drop dart	ASTM D 1709	900	Grams
Hot air shrink 170 °F	ASTM D 1204	<2.0	Percent total area
Tongue Tear Test	ASTM D 2261	9	Pounds

Notes: ASTM = American Society for Testing and Materials.
sq. ft = square feet.
md = machine direction.
psi = pounds per square inch.
PPT = puncture-propagation tear.
°F = degrees Fahrenheit.

Table 3-3
Summary of RCRA Approved Debris Decontamination Technologies

Technical Memorandum for Preferred Remedial Alternative for PSCs 41 and 43
Operable Unit 2, NAS Jacksonville
Jacksonville, Florida

Extraction Technologies

- Physical Extraction
  - Abrasive blasting
  - Scarification, grinding, and planning
  - Spalling
  - Vibratory finishing
  - High pressure steam/water sprays
- Chemical Extraction
  - Water washing and spraying
  - Liquid phase solvent extraction
  - Vapor phase solvent extraction
- Thermal Extraction
  - High temperature metals recovery
  - Thermal desorption

Destruction Technologies

- Biodegradation
- Chemical Oxidation
- Chemical Reduction
- Thermal Destruction

Immobilization Technologies

- Microencapsulation
- Microencapsulation
- Sealing

A presents the cross section of both sludge drying beds. The cross sections identify major components of the sludge drying bed structures. The RAC will also cap and plug the drain to the lift station located on the north end of the domestic sludge drying beds. Drains from sludge digesters to sludge drying beds should be capped at the limits of the excavation. Appendix A shows the details of the sludge drying beds and appurtenances.

Nonhazardous debris should be temporarily stockpiled onsite in roll off containers. All nonhazardous debris will then be hauled by the contractor to a RCRA Subtitle D facility for disposal.

3.3.7 Restoration of Excavation Excavations created from removal activities at the site should be restored to a grade consistent with rainwater runoff surface features that exist at the site. Clean fill will be verified with sampling addressed in the Sampling and Analysis Plan. The fill will be compacted in loose lifts as specified in the RAC's technical approach submittal. Compaction will be verified to be at least 80-percent Proctor of American Society for Testing and Materials (ASTM) D-698. Once backfilled and compacted, the excavations will be seeded and stabilized to prevent erosion.

3.4 COST ESTIMATE. A detailed cost estimate for performing the work described herein will be required from candidate RACs prior to selection. The cost estimate should be consistent with the Hazardous, Toxic, and Radiological Waste (HTRW) Remedial Action Work Breakdown Structure (WBS) (Naval Energy and Environmental Support Activity [NEESA], 1992). The cost estimate should consider weather delays and use U.S. Government-approved per diem rates for travel. The estimate should provide sufficient detail to delineate the following direct costs:

- direct labor (wages and fringes),
- equipment,
- material,
- travel, and
- other direct costs.

Overhead and general and administrative will be shown separately. Contractor award fees will be a final "add-on" in the estimate.

REFERENCES

ABB Environmental Services, Inc. (ABB-ES), 1992, Remedial Investigation Feasibility Study Work Plan for OU-2 (Final), Volume 6, Navy Installation Restoration Program Plan, Naval Air Station, Jacksonville, Florida: December 1992.

ABB-ES, 1993, Focused Remedial Investigation/Feasibility Study, Potential Sources of Contamination (PSCs) 2, 41, and 43 at Operable Unit 2 (Final Draft), Naval Air Station, Jacksonville, Florida: December 1993.

Naval Energy and Environmental Support Activity (NEESA), 1992, Remedial Action Contracts Delivery Order Requirements Package Guide, Parts 1 & 2, (Working Draft): Port Hueneme, California, NEESA 20.2-062, August 1992.

APPENDIX A

DOMESTIC AND INDUSTRIAL SLUDGE DRYING BEDS, PSCS 41 AND 43, FIGURES

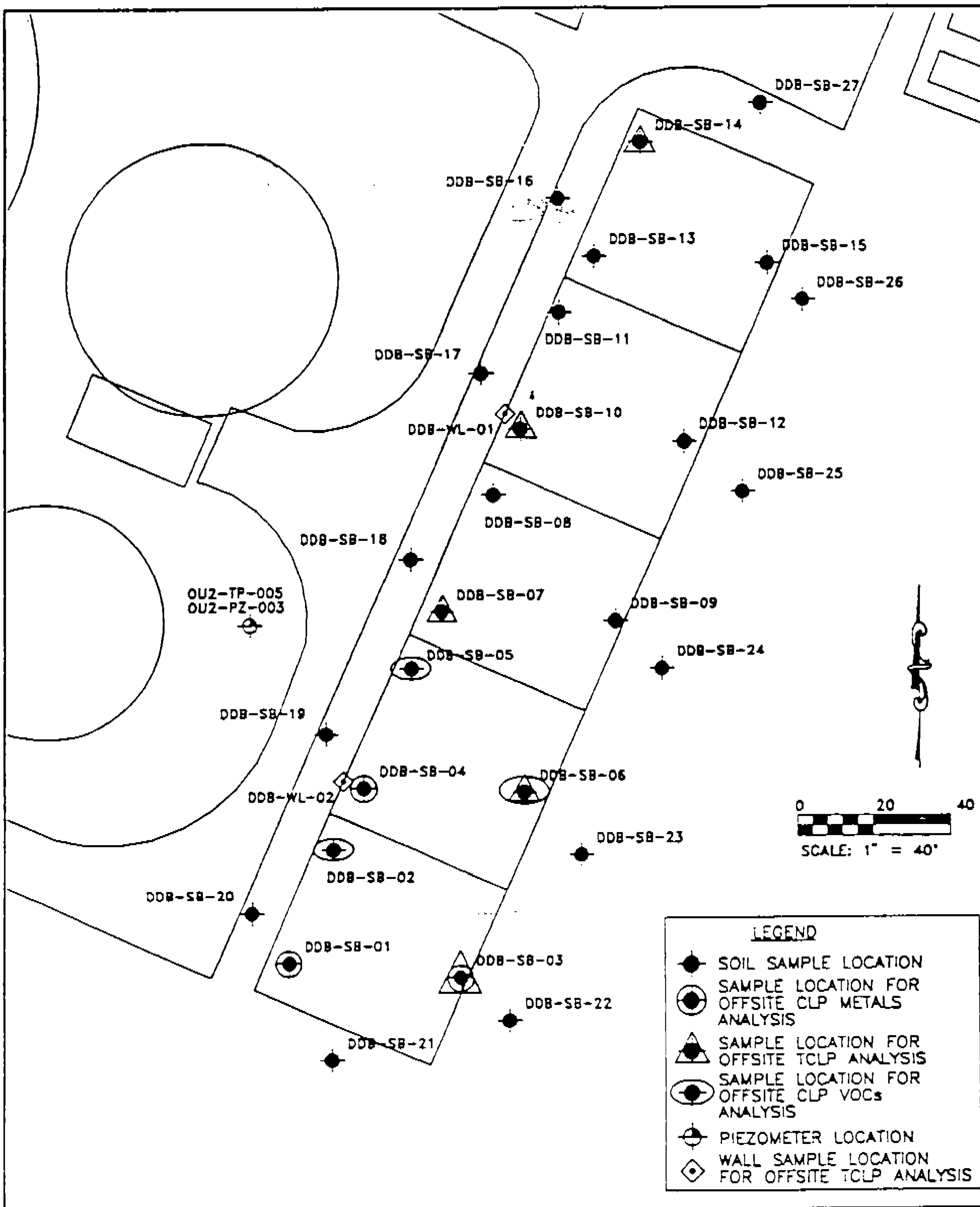


FIGURE A-1
DOMESTIC SLUDGE DRYING BEDS,
PSC 41, SOIL SAMPLING LOCATIONS

TECHNICAL MEMORANDUM
FOR PSCs 41 AND 43 AT OU2

NAS JACKSONVILLE,
JACKSONVILLE, FLORIDA

8586-06 940128WEM

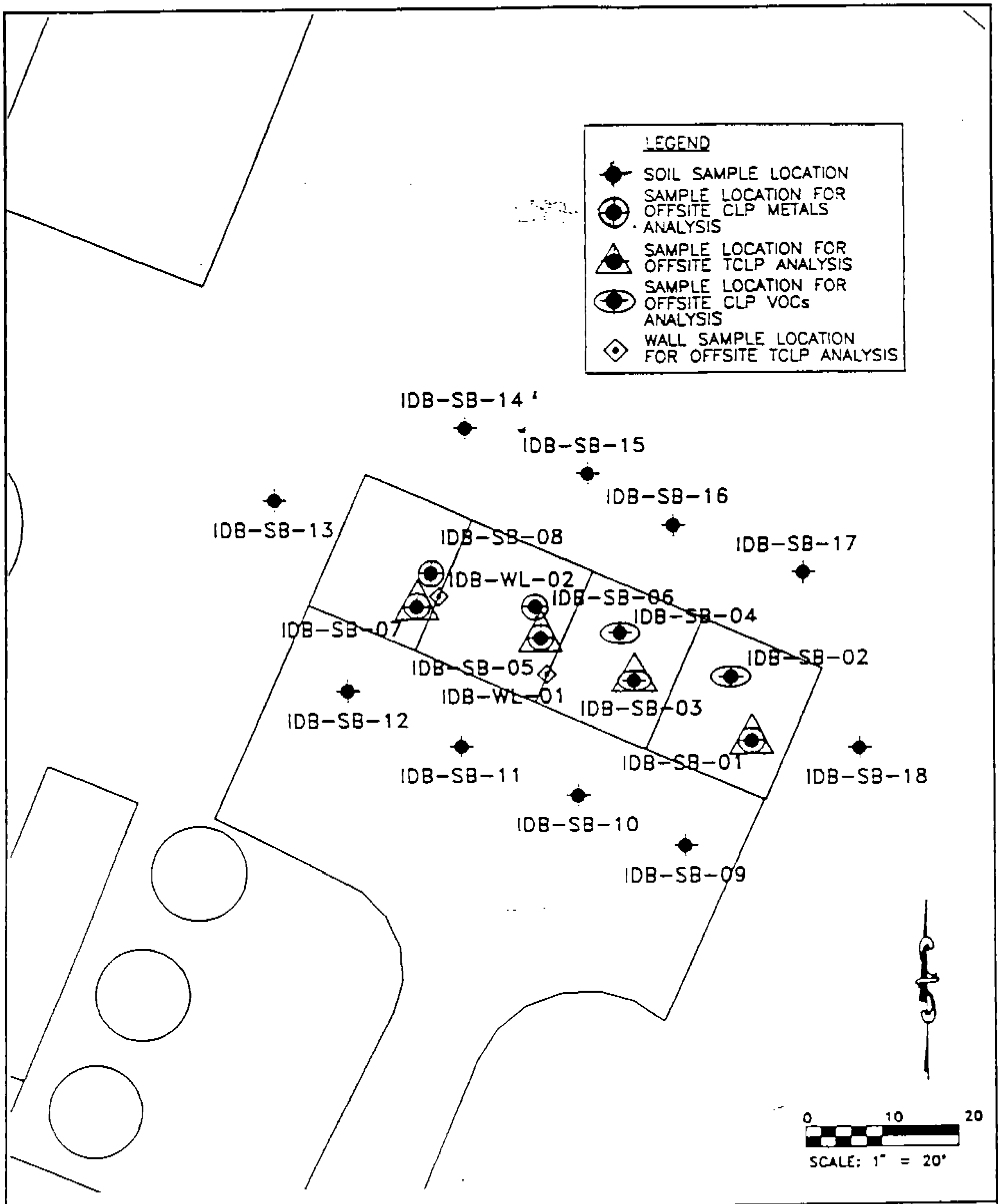


FIGURE A-2
INDUSTRIAL SLUDGE DRYING BEDS,
PSC 43, SOIL SAMPLING LOCATIONS

TECHNICAL MEMORANDUM
FOR PSCs 41 AND 43 AT OU2

NAS JACKSONVILLE,
JACKSONVILLE, FLORIDA

8586-06 940128WEM

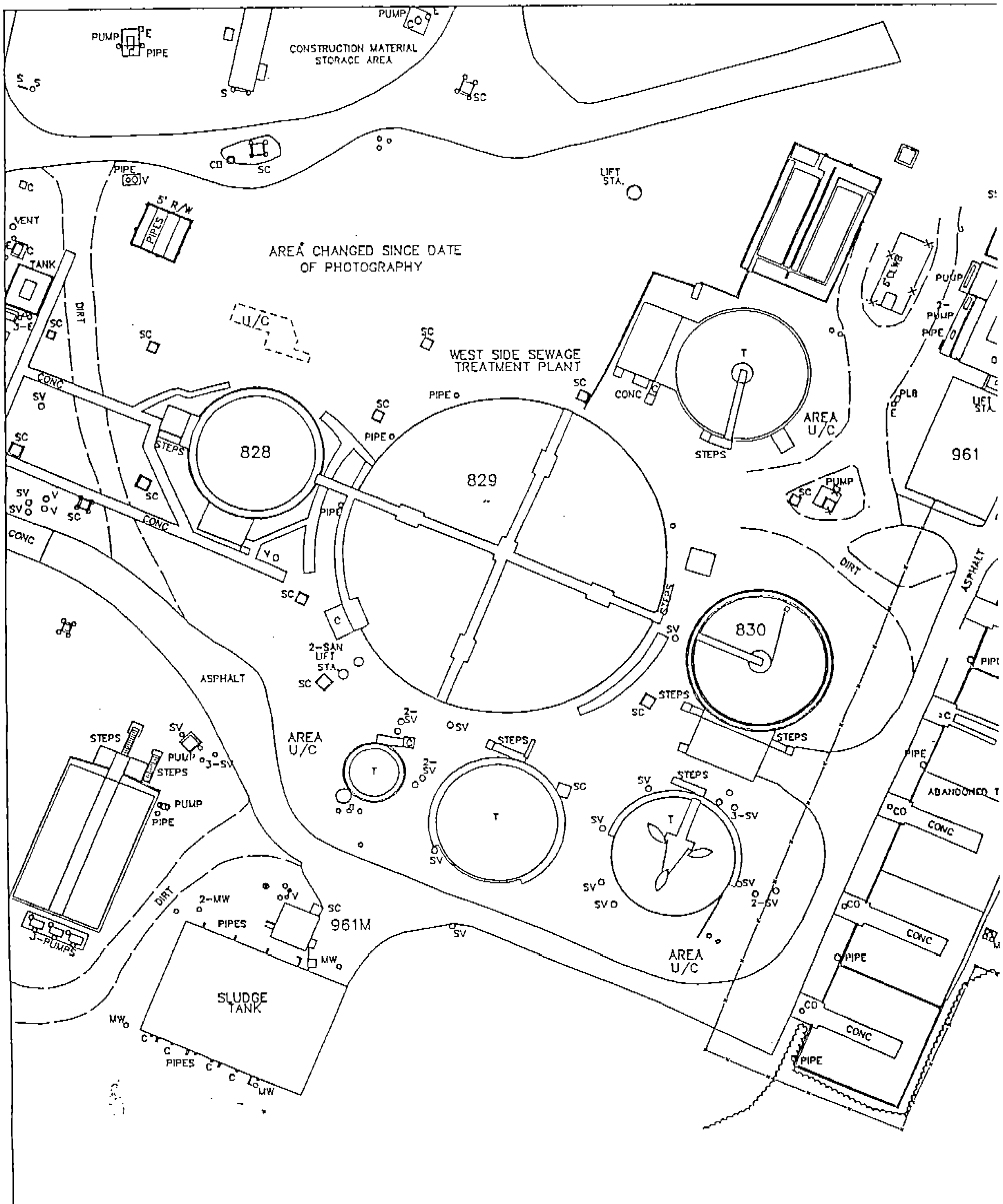
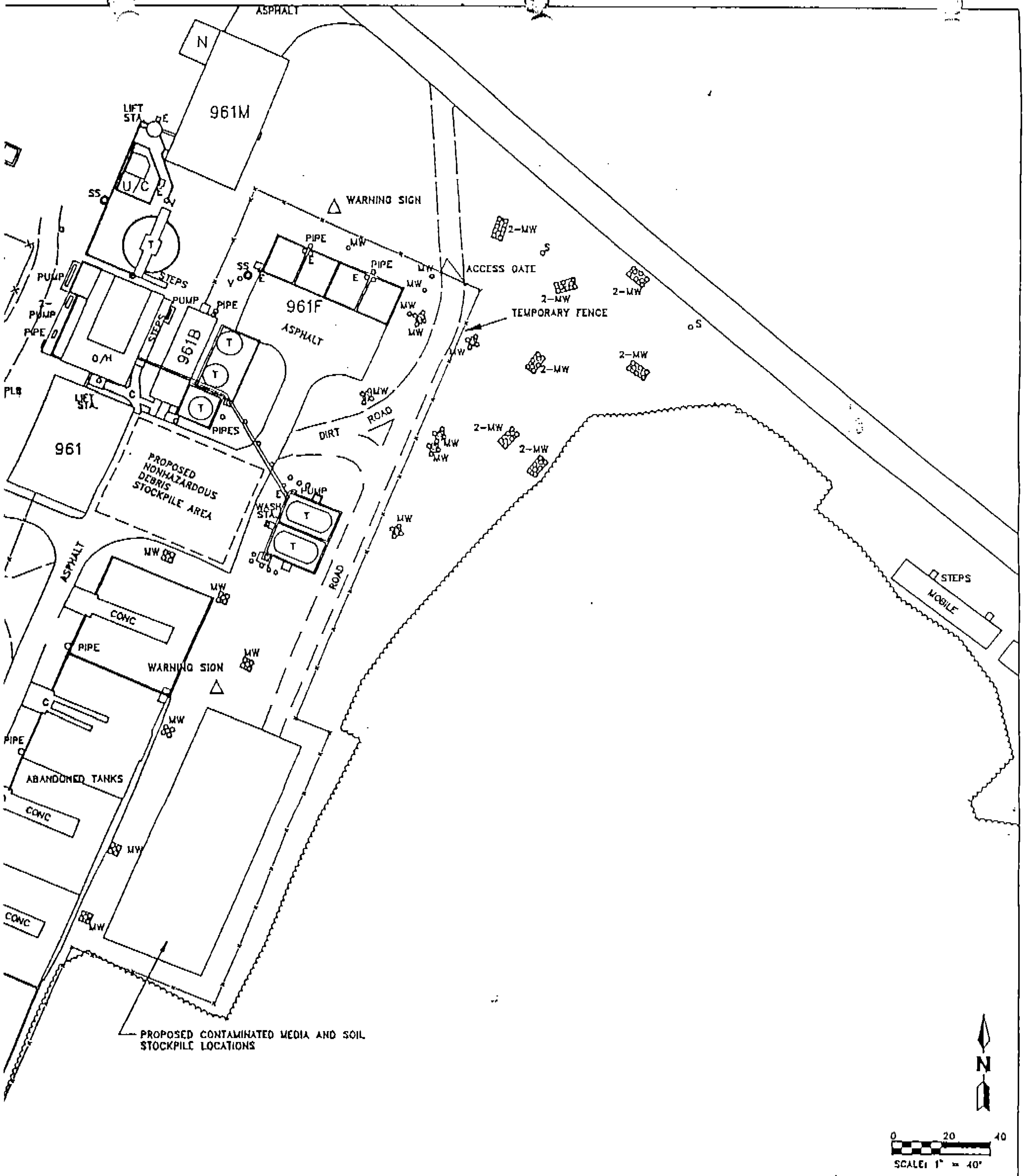

CONSTRUCTION MATERIAL
STORAGE AREA
AREA CHANGED SINCE DATE
OF PHOTOGRAPHY
WEST SIDE SEWAGE
TREATMENT PLANT
828
829
830
961
961M
SLUDGE
TANK
AREA
U/C
ASPHALT
DIRT
ABANDONED

Figure A-3



DEPARTMENT OF THE NAVY
SOUTHERN DIVISION NAVAL FACILITIES ENGINEERING COMMAND
CHARLESTON, SOUTH CAROLINA

PROJECT	OU2	
DRAWN	DRM	DATE 1-18-94
ENGR/DSGN		
CHECKED		
APPROVED		
APPROVED FOR NAVSTA		DATE
APPROVED FOR SDIV		DATE

PROPOSED INTERIM REMEDIAL ACTION SITE LAYOUT

SIZE	FSCM NO.		DWG NO.	
C	–		FIGURE A–3	–

SCALE UNLESS NOTED 1" = 40' SHEET 1 OF 1

APPENDIX B

OFFSITE LABORATORY DATA TABLES

Table B-1
Summary of Positive Detections in Soil Analytical Results, Target Compound List (TCL) Volatile Organics (Offsite)

Technical Memorandum for Preferred
Remedial Alternative for PSCs 41 and 43
Operable Unit 2, NAS Jacksonville
Jacksonville, Florida

Identifier	Depth (feet)	Acetone	Ethylbenzene	2-Butanone	4-Methyl-2-pentanone	Xylene (total)
Domestic Waste Sludge Drying Beds (PSC 41)						
DDBSB00601	0 to 1	20	–	–	–	–
Industrial Waste Sludge Drying Beds (PSC 43)						
IDBSB00301	0 to 1	44	–	–	–	–

Notes: Analytical results expressed in micrograms per kilogram (µg/kg) dry weight.
J = reported value is an estimated quantity.
TCL volatile organic compounds were also analyzed but were not detected in the following samples:
PSC 41: DDBSB00201, DDBSB00502, and DDBSB00602; and
PSC 43: IDBSB00201, IDBSB00202, IDBSB00203, IDBSB00401, IDBSB00402, and IDBSB00601.

Table B-2
Summary of Positive Detections in Soil Analytical Results, Target Analyte List Inorganics (Offsite)

Technical Memorandum for Preferred
Remedial Alternative for PSCs 41 and 43
Operable Unit 2, NAS Jacksonville
Jacksonville, Florida

Identifier	Depth (feet)	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron
Domestic Waste Sludge Drying Beds (PSC 41)												
DDBSB00101	0 to 1	1,090	--	--	--	--	9.6	2,460	206	--	21.4	1,810 J
DDBSB00102	1.5 to 3	792	--	--	--	--	--	--	6.6	--	--	466 J
DDBSB00103	3 to 4	82.1	--	--	--	--	--	--	--	--	--	19.1 J
DDBSB00301	0 to 1	2,560	--	61.1 J	451	--	134	4,850	5,310	20.7	334	9,750 J
DDBSB00302	1.5 to 3	369	--	0.62 J	--	--	4	1,660	4.4	--	--	640 J
DDBSB00303	3 to 4	659	--	0.88 J	--	--	--	--	--	--	--	483 J
DDBSB00401	0 to 1	2,520	--	1.5 J	56.1	--	28.5	2,220	375	--	59.3	3,950 J
DDBSB00402	1 to 2.5	419	--	0.73 J	--	--	14	1,360	--	--	8.5	176 J
DDBSB00403	2.5 to 3.5	174	--	--	--	--	--	--	--	--	--	120 J
Industrial Waste Sludge Drying Beds (PSC 43)												
IDBSB00101	0 to 2	2,590	--	0.94 J	67.6	--	223	36,200	15,000	56.3	141	2,180 J
IDBSB00501	0 to 2	2,610	--	--	604	--	98.3	15,500	7,050	28.9	93	2,870 J
IDBSB00602	1 to 2	228	--	--	--	--	--	--	4.8	--	--	37.3 J
IDBSB00701	0 to 2	5,220	--	0.84 J	--	--	--	53,700	47,700	178	470	5,860 J
IDBSB00802	2 to 2.2	7,950	--	--	--	--	23	--	264	--	14.7	727 J

See notes at end of table.

PRELIMINAY DRAFT

Table B-2 (Continued)
Summary of Positive Detections in Soil Analytical Results,
Target Analyte List Inorganics (Offsite)

Technical Memorandum for Preferred
Remedial Alternative for PSCs 41 and 43
Operable Unit 2, NAS Jacksonville
Jacksonville, Florida

Identifier	Depth (feet)	Lead	Magnesium	Manganese	Mercury	Nickel	Potassium	Selenium	Silver	Sodium	Vanadium	Zinc	Cyanide
Domestic Waste Sludge Drying Beds (PSC 41)													
DDBSB00101	0 to 1	23 J	--	36.2	--	20.7	--	--	5.4	--	--	54.3	--
DDBSB00102	1.5 to 3	8.5 J	--	16.6	--	--	--	--	--	--	--	9	--
DDBSB00103	3 to 4	4.5 J	--	--	--	--	--	--	--	--	--	--	--
DDBSB00301	0 to 1	252 J	227	252	12.2	110	--	1 J	110	--	--	454	--
DDBSB00302	1.5 to 3	4.2 J	--	69	--	18.7	--	--	--	--	--	20.2	--
DDBSB00303	3 to 4	2 J	--	--	--	--	--	--	--	--	--	--	--
DDBSB00401	0 to 1	58.1 J	181	176	0.3	73.7	--	--	10.1	--	--	222	--
DDBSB00402	1 to 2.5	4.4 J	--	524	--	52.8	--	--	--	--	--	59.3	--
DDBSB00403	2.5 to 3.5	2.3 J	--	--	--	--	--	--	--	--	--	--	--
Industrial Waste Sludge Drying Beds (PSC 43)													
IDBSB00101	[1]0 to 2	563 J	13,200	4,650	--	1,110	--	0.49 J	120	--	--	389	--
IDBSB00501	[1]0 to 2	444 J	4,850	1,660	--	518	--	0.43 J	42.2	--	--	292	--
IDBSB00602	1 to 2	2.1 J	--	8	--	--	--	--	--	--	--	--	--
IDBSB00701	[1]0 to 2	1,220 J	23,100	4,240	0.16	1,540	--	1 J	256	--	--	1,130	--
IDBSB00802	2 to 2.2	15.5 J	--	7.8	--	--	--	0.44 J	--	--	--	5.2	--

[1]Depth is inches, not feet.

Notes: Analytical results expressed in milligrams per kilogram (mg/kg) dry weight.
J = reported value is an estimated quantity.

PRELIMINARY DRAFT

Table B-3
Summary of Positive Detections in Soil Analytical Results, Toxicity Characteristic Leaching Procedure, Inorganics

Technical Memorandum for Preferred
Remedial Alternative for PSCs 41 and 43
Operable Unit 2, NAS Jacksonville
Jacksonville, Florida

Identifier	Depth (feet)	Arsenic	Barium	Cadmium	Chromium	Lead	Mercury	Selenium	Silver
TC Limits[1]		**5.0**	**100.0**	**1.0**	**5.0**	**5.0**	**0.2**	**1.0**	**5.0**
Domestic Waste Sludge Drying Beds (PSC 41)									
DDBSB00301	0 to 1	0.02	0.79	0.24	0.06	--	--	--	--
DDBSB00601	0 to 1	--	0.76	0.15	0.03	--	--	--	--
DDBSB00701	0 to 1.5	--	0.83	0.20	0.03	--	--	--	--
DDBSB01001	0 to 1	--	1.10	0.18	0.04	--	--	--	--
DDBSB01301	0 to 1	--	0.60	0.13	0.03	--	--	--	--
DDBWL00101	[2]	--	--	0.08	--	--	--	--	--
DDBWL00201	[2]	--	--	0.03	0.06	--	--	--	--
Industrial Waste Sludge Drying Beds (PSC 43)									
IDBSB00101	[3]0 to 2	--	0.22	0.04	3.65	--	--	--	--
IDBSB00301	[3]0 to 2	--	0.21	0.02	2.76	--	--	--	--
IDBSB00501	[3]0 to 2	--	0.27	0.02	2.42	--	--	--	--
IDBSB00701	[3]0 to 2	--	--	0.05	1.30	--	--	--	--
IDBWL00101	[2]	--	0.28	0.03	--	--	--	--	--
IDBWL00201	[2]	--	0.26	--	--	--	--	--	--

[1]Source: 40 Code of Federal Regulations (CFR) 261.24.
[2]Depth not applicable for wall samples.
[3]Depth is in inches, not feet.

Notes: Analytical results expressed in milligrams per liter (mg/ℓ) (Toxicity Characteristic Leaching Procedure [TCLP] extract).
TC = toxicity characteristic.
SB = soil boring samples.
WL = cement wall samples.

PRELIMINARY DRAFT

APPENDIX C

ONSITE LABORATORY (FIELD SCREENING) DATA TABLES

Field Screening Equipment

The following paragraphs provide brief summaries of the methods and equipment used for screening samples during the Focused Remedial Investigation (RI) field activities.

Atomic Absorption (AA) AA spectroscopy was used to screen for total soil arsenic, cadmium, chromium, lead, and nickel. Samples were brought to the field office, prepared that day, and analyzed the following day. Samples were analyzed with a Perkin-Elmer™ 3100 AA model spectrometer. Instrument detection limits in the low parts per million range were determined for each element.

Gas Chromatograph (GC) Samples were screened for purgeable volatile organics using a Hewlett Packard™ 5890 Series II GC in conjunction with a Tekmar™ LSC-2000 purge-and-trap system. The system is controlled by a microcomputer Chem Station™ connected to an HP LaserJet™ III printer. This system can detect volatile organic compounds (VOCs) in soil or water in the low parts per billion range. Samples were screened for the following purgeable VOCs: 1,1,1-trichloroethane, 1,1-dichloroethane, benzene, chlorobenzene, ethylbenzene, methylene chloride, tetrachloroethene, toluene, trichloroethene, vinyl chloride, cis-1,2-dichloroethene, m/p-xylene, o-xylene, and trans-1,2-dichloroethene.

Infrared (IR) Spectroscopy Samples were screened for total petroleum hydrocarbon (TPH) by IR spectroscopy using a Foxboro Miran™ fixed filter IR unit. The method protocol is adapted from U.S. Environmental Protection Agency (USEPA) Method 418.1, with a modified micro-extraction suitable for soil analysis. This method is used to determine gross contamination because of the large number of compounds that are collectively measured by this technique. These results may not directly correlate with routine laboratory analysis, e.g., target compound list (TCL) organics analysis, due to the better specificity of laboratory methods versus field methods.

Table C-1
Summary of Positive Detections in Soil Analytical Results, Field Screening Inorganics - Arsenic, Cadmium, Chromium, Lead and Nickel
Operable Unit 2

Technical Memorandum for Preferred
Remedial Alternative for PSCs 41 and 43
Operable Unit 2, NAS Jacksonville
Jacksonville, Florida

Identifier /Depth	Arsenic	Cadmium	Chromium	Lead	Nickel
Former Fire Fighting Training Area (PSC 2)					
OU2SB00101 /0-1'	–	–	2	2	–
OU2SB00301 /0-1'	–	–	8	30	–
OU2SB00401 /0-1'	–	–	18	22	–
OU2SB00801 /0-1'	12	–	10	40	–
OU2SB01001 /0-1'	–	–	16		–
OU2SB01701 /0-1'	2	20	20	310	14
OU2SB02001 /0-1'	–	–	4		4
OU2SB02401 /0-1'	–	–	6	40	6
OU2SB03101 /0-1'	–	–	18	18	10
OU2SB04001 /0-1'	–	–	42	6	12
OU2SB06301 /0-1'	–	4	12	34	10
OU2SB06601 /0-1'	–	–	14	6	–
Domestic Waste Sludge Drying Beds (PSC 41)					
DDBSB00101 /0-1'	8	8	180	6	16
DDBSB00102 /1.5-3'	24	8	6	–	16
DDBSB00103 /3-4'	8	–	4	–	–
DDBSB00201 /0-1'	16	6	400	12	–
DDBSB00202 /1.5-3'	16	2	16	–	6
DDBSB00203 /3-4'	6	–	6	–	–
DDBSB00301 /0-1'	58	170	6200	130	130
DDBSB00302 /1.5-3'	–	6	14	–	34
DDBSB00303 /3-4'	–	–	6	–	–
DDBSB00401 /0-1'	–	24	540	14	62
DDBSB00402 /1-2.5'	–	10	4	6	52
DDBSB00403 /2.5-3.5'	–	–	4	2	–
DDBSB00501 /0-1'	–	6	6	10	10
DDBSB00502 /1-2.5'	–	8	6	4	26
DDBSB00503 /2.5-3.5'	2	–	4	–	2
DDBSB00601 /0-1'	–	34	460 E	140	90
DDBSB00602 /1-2'	–	2	6	2	8
DDBSB00603 /2.5-3.5'	–	–	6	–	2
DDBSB00701 /0-1.5'	–	82	4100	310	94
DDBSB00702 /1.5-2.5'	–	–	10	2	–
DDBSB00703 /1.5-2.5'	–	4	12	6	18
DDBSB00801 /0-1'	42	36	450 E	280	130
DDBSB00802 /1-2.5'	40	8	40	4	22
DDBSB00803 /3-4'	52	–	2	–	–
DDBSB00901 /0-1'	32	36	480 E	360	90
DDBSB00902 /1-2.5'	6	2	4	–	–
DDBSB00903 /3-4	18	–	2	2	–
DDBSB01001 /0-1'	24	30	450 E	270	230
DDBSB01002 /1-3'	–	4	12	8	10
DDBSB01003 /3-4'	34	–	10	10	–

See notes at end of table.

Table C-1 (Continued)
Summary of Positive Detections in Soil Analytical Results, Field Screening
Inorganics - Arsenic, Cadmium, Chromium, Lead and Nickel
Operable Unit 2

Technical Memorandum for Preferred
Remedial Alternative for PSCs 41 and 43
Operable Unit 2, NAS Jacksonville
Jacksonville, Florida

Identifier /Depth	Arsenic	Cadmium	Chromium	Lead	Nickel
DDBSB01101 /0-1'	24	26	400 E	420	150
DDBSB01102 /1-2'	10	2	14	74	6
DDBSB01103 /3-4'	6	–	10	10	2
DDBSB01201 /0-1'	2	16	400 E	98	110
DDBSB01202 /1-2.5'	–	–	4	2	4
DDBSB01203 /3-4'	18	2	4	2	12
DDBSB01301 /0-1'	18	22	1300	74	36
DDBSB01302 /1-2.5'	24	2	16	120	12
DDBSB01303 /2.5-3.5'	6	–	8	12	6
DDBSB01401 /0-1'	12	6	74	36	16
DDBSB01402 /1-2'	46	–	6	8	8
DDBSB01403 /2-3'	–	–	6	6	–
DDBSB01501 /0-1'	16	88 E	1300	410	160
DDBSB01501D /0-1'	10	76	500 E	330	120 E
DDBSB01502 /1-2'	32	–	20	8	–
DDBSB01503 /2-3'	–	–	6	–	10
DDBSB01601 /0-1'	2	2	130	18	22
DDBSB01602 /2-4'	8	–	12	4	–
DDBSB01701 /0-1'	–	–	34	4	8
DDBSB01702 /2-4'	–	–	36	6	10
DDBSB01702D /2-4'	10	–	10	4	4
DDBSB01801 /0-1'	–	4	220	22	18
DDBSB01802 /2-3'	6	–	54	4	28
DDBSB01901 /0-1'	–	4	140	22	12
DDBSB01902 /2-4'	–	–	70	4	26
DDBSB02001 /0-1'	16	14	370 E	56	28
DDBSB02002 /2-3.5'	–	–	52	2	18
DDBSB02101 /0-1'	6	2	110	16	24
DDBSB02102 /0-1'	–	–	16	4	6
DDBSB02201 /0-1'	34	2	54	6	8
DDBSB02202 /2-3.5'	–	–	44	4	8
DDBSB02301 /0-1'	–	4	140	18	20
DDBSB02301D /0-1'	6	2	92	14	4
DDBSB02302 /2-3.5'	–	–	44	2	20
DDBSB02401 /0-1'	14	–	32	4	–
DDBSB02401D /0-1'	12	2	40	–	2
DDBSB02402 /2-4'	–	–	10	–	–
DDBSB02402D /2-4'	14	–	2	–	6
DDBSB02501 /0-1'	16	–	26	–	–
DDBSB02501D /0-1'	–	–	14	–	8
DDBSB02502 /2-3.5'	6	–	4	–	–
DDBSB02502D /2-3.5'	22	–	10	–	6
DDBSB02601 /0-1'	–	–	22	–	–
DDBSB02601D /0-1'	22	–	26	–	10

See notes at end of table.

Table C-1 (Continued)
Summary of Positive Detections in Soil Analytical Results, Field Screening
Inorganics - Arsenic, Cadmium, Chromium, Lead and Nickel
Operable Unit 2

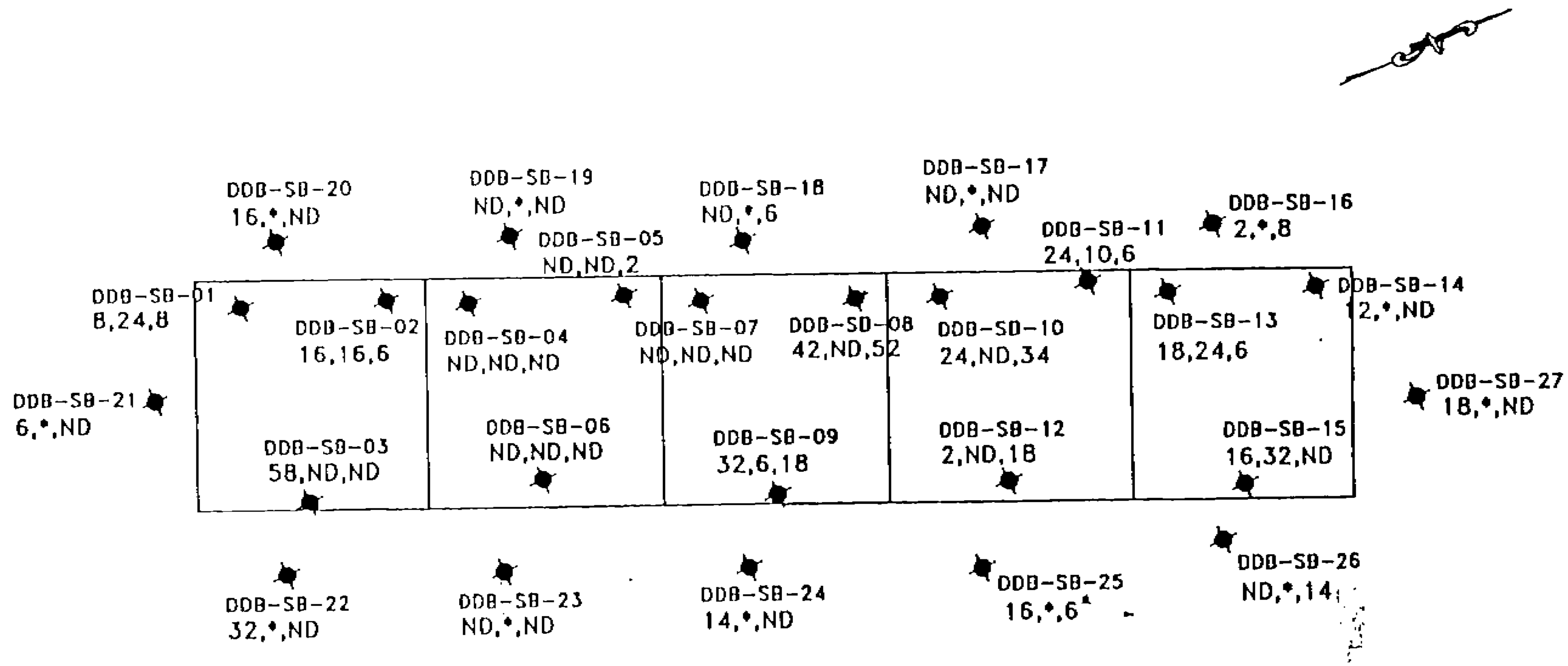
Technical Memorandum for Preferred
Remedial Alternative for PSCs 41 and 43
Operable Unit 2, NAS Jacksonville
Jacksonville, Florida

Identifier /Depth	Arsenic	Cadmium	Chromium	Lead	Nickel
DDBSB02602 /2-3.5'	14	–	6	–	–
DDBSB02701 /0-1'	18	–	22	–	–
DDBSB02702 /2-3'	–	–	8	–	–
Industrial Waste Sludge Drying Beds (PSC 43)					
IDBSB00101 /0-2"	–	150	13000	–	880
IDBSB00201 /0-1'	2	–	48	4	–
IDBSB00202 /1-2'	–	–	110	8	10
IDBSB00203 /2-3'	–	12	1600	46	80
IDBSB00301 /0-2"	–	100	6000	220	200
IDBSB00401 /2"-1.5'	–	–	88	10	14
IDBSB00402 /1.5-3.5'	12	–	140	–	–
IDBSB00403 /3.5-4'	–	10	100	22	–
IDBSB00501 /0-2"	–	86	6100	370	240
IDBSB00601 /2"-1'	6	–	28	–	–
IDBSB00602 /1-2'	12	–	14	–	–
IDBSB00602D /1-2'	18	–	4	2	–
IDBSB00603 /4'	–	66	110	8	16
IDBSB00603D /4'	–	34	110	28	2
IDBSB00701 /0-2"	–	380	19000	1200	3200
IDBSB00801 /2"-2'	–	–	100	–	6
IDBSB00802 /2"-2.2'	–	18	540	–	22
IDBSB00803 /4'	–	10	130	–	30
IDBSB00803D /4'	–	10	56	4	2
IDBSB00901 /0-1'	–	–	6	4	8
IDBSB00902 /3-5'	–	–	2	2	–
IDBSB01001 /0-1'	6	–	12	–	–
IDBSB01002 /3-5'	–	–	2	2	–
IDBSB01101 /0-1'	2	–	6	2	6
IDBSB01102 /3-5'	–	–	2	–	–
IDBSB01201 /0-1'	–	–	14	–	–
IDBSB01202 /3-5'	–	–	4	–	–
IDBSB01301 /0-1'	–	–	10	–	2
IDBSB01302 /2-3.5'	–	–	6	–	2
IDBSB01401 /0-1'	–	–	6	2	8
IDBSB01402 /2-3.5'	–	–	4	2	6
IDBSB01501 /0-1'	–	–	6	–	10
IDBSB01502 /2-3.5'	–	–	4	–	2
IDBSB01601 /0-1'	6	–	10	–	4
IDBSB01602 /2-3.5'	–	–	4	–	8
IDBSB01701 /0-1'	–	–	4	–	6
IDBSB01702 /2-3.5'	–	–	4	2	–
IDBSB01801 /0-1'	–	–	6	2	–
IDBSB01802 /2-3.5'	–	–	6	–	–

Notes: Analytical results expressed in mg/kg dry weight.
E = Analyte is detected at a concentration above the highest calibration standard.

APPENDIX D

FIELD SCREENING DATA FIGURES



NOTE:
ND – NON DETECT
X,Y,Z – CONCENTRATIONS OF ARSENIC IN mg/kg DETECTED IN SOIL AT 0'–1', 1'–2.5', 3'–4' BELOW SURFACE
• – SAMPLE NOT COLLECTED

0 20 40

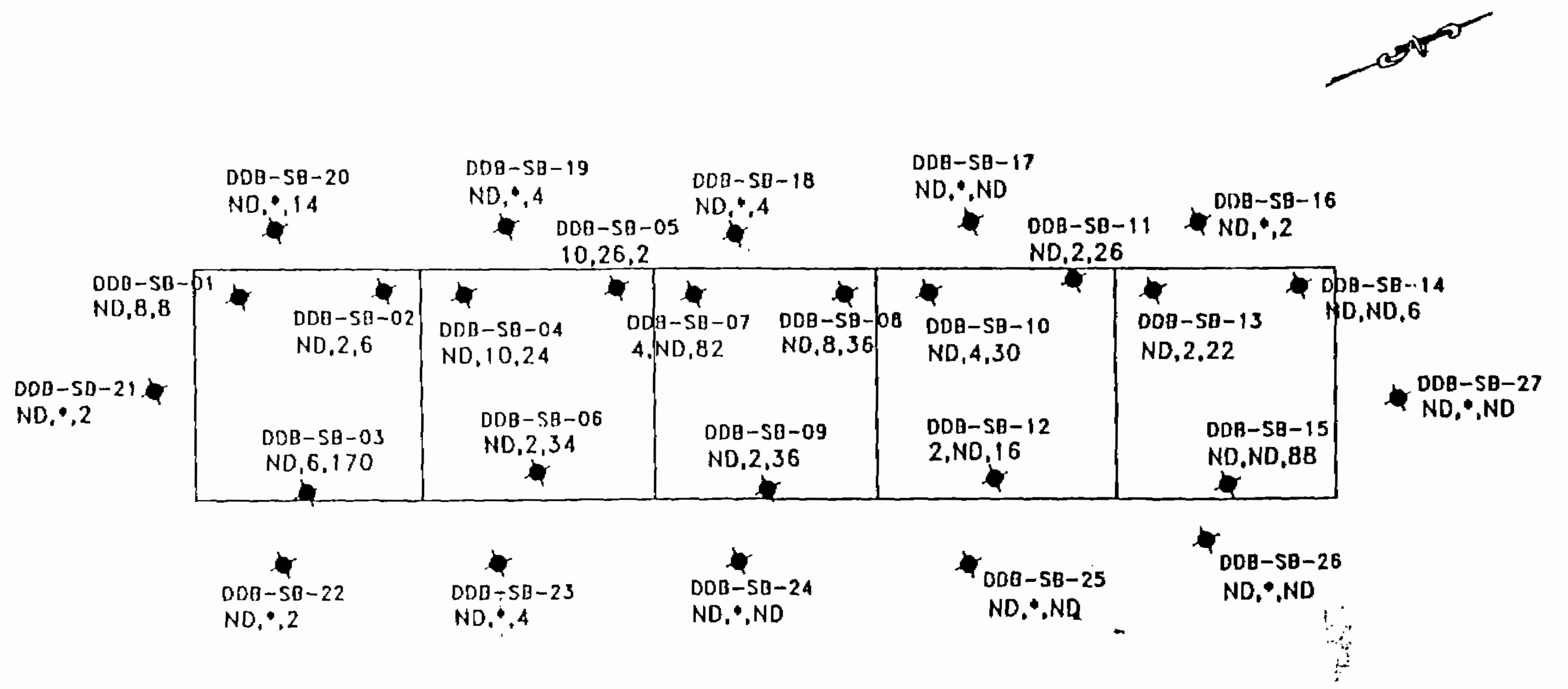
SCALE: 1" = 40'

FIGURE D-1
ONSITE ARSENIC RESULTS FOR DOMESTIC SLUDGE DRYING BEDS, PSC 41

TECHNICAL MEMORANDUM FOR PSCs 41 AND 43 AT OU2

NAS JACKSONVILLE, JACKSONVILLE, FLORIDA

8586-06 940128WEM



NOTE:
ND – NON DETECT
X,Y,Z – CONCENTRATIONS OF CADMIUM IN mg/kg DETECTED IN SOIL AT 0'-1', 1'-2.5', 3'-4' BELOW SURFACE
• – SAMPLE NOT COLLECTED

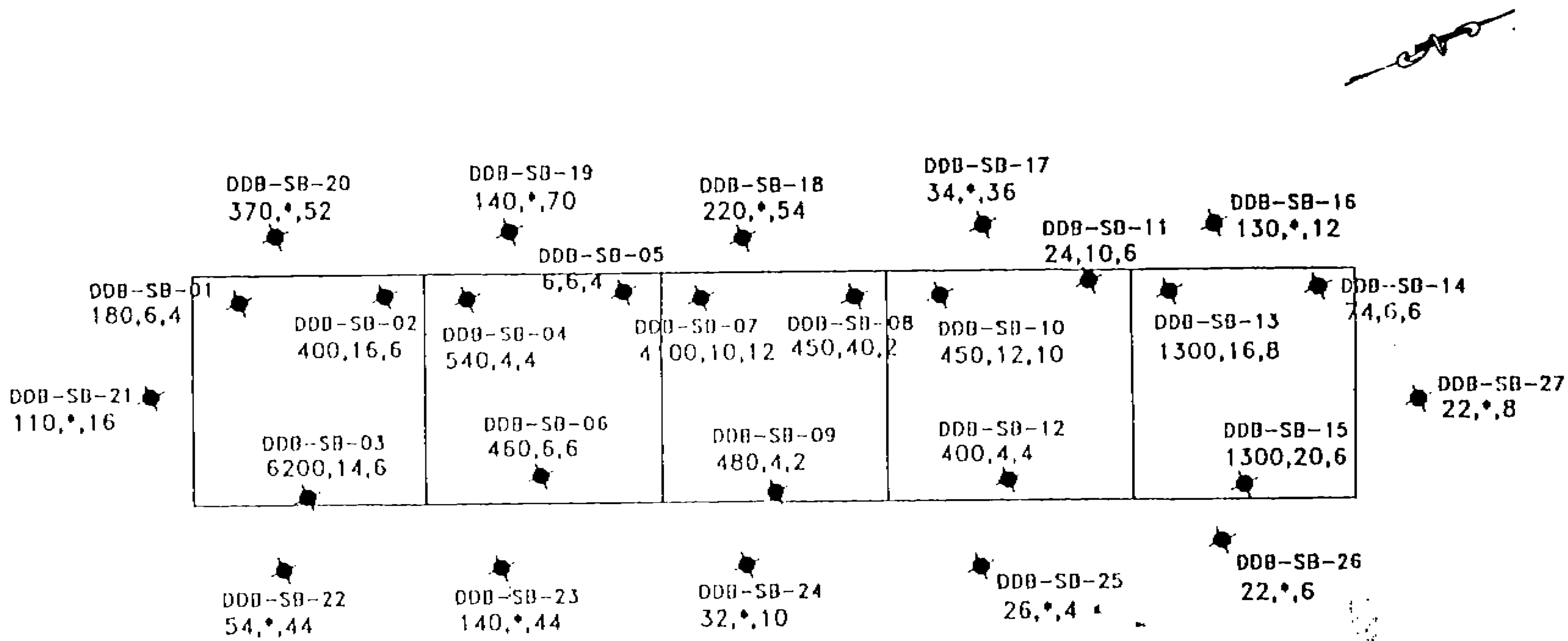
0 20 40
SCALE: 1" = 40'

FIGURE D-2
ONSITE CADMIUM RESULTS FOR DOMESTIC SLUDGE DRYING BEDS, PSC 41

TECHNICAL MEMORANDUM FOR PSCs 41 AND 43 AT OU2

NAS JACKSONVILLE, JACKSONVILLE, FLORIDA

8586-06 940128WEM



NOTE:
ND – NON DETECT
X,Y,Z – CONCENTRATIONS OF CHROMIUM IN mg/kg DETECTED IN SOIL AT 0'-1', 1'-2.5', 3'-4' BELOW SURFACE
• – SAMPLE NOT COLLECTED

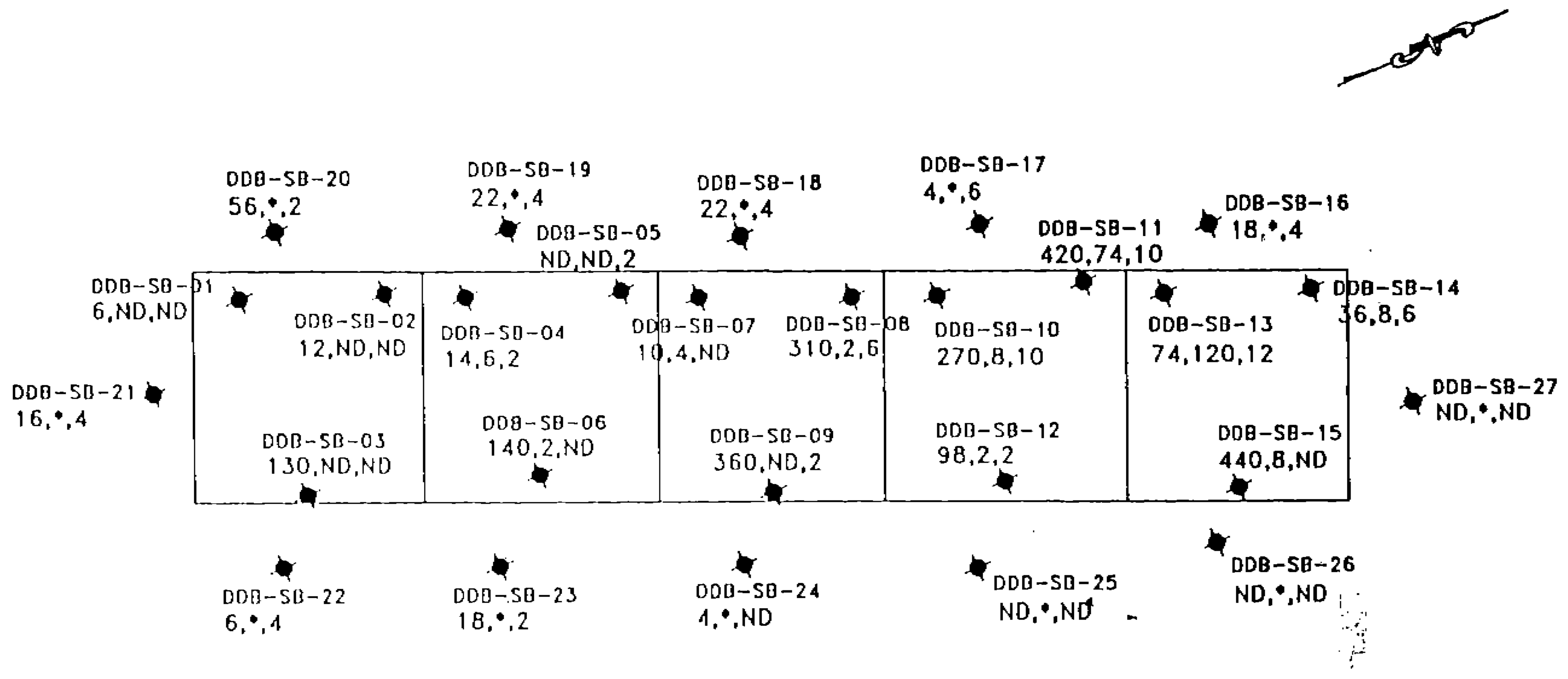
0 20 40
SCALE: 1" = 40'

FIGURE D-3
ONSITE CHROMIUM RESULTS FOR DOMESTIC SLUDGE DRYING BEDS, PSC 41

TECHNICAL MEMORANDUM FOR PSCs 41 AND 43 AT OU2

NAS JACKSONVILLE, JACKSONVILLE, FLORIDA

8586-06 940128WEM



NOTE:
ND – NON DETECT
X,Y,Z – CONCENTRATIONS OF LEAD IN mg/kg DETECTED IN SOIL AT 0'-1', 1'-2.5', 3'-4' BELOW SURFACE
• – SAMPLE NOT COLLECTED

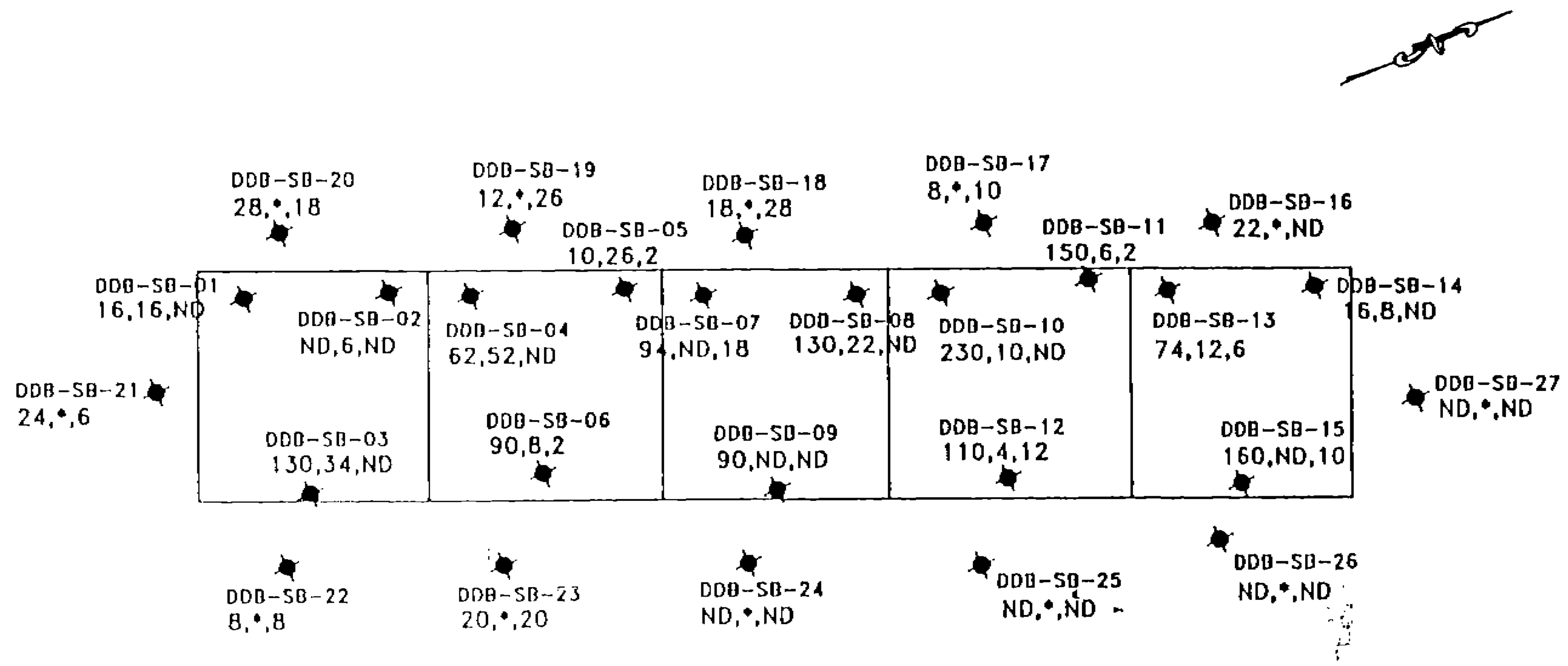
0 20 40
SCALE: 1" = 40'

FIGURE D-4
ONSITE LEAD RESULTS FOR DOMESTIC SLUDGE DRYING BEDS, PSC 41

TECHNICAL MEMORANDUM FOR PSCs 41 AND 43 AT OU2

NAS JACKSONVILLE, JACKSONVILLE, FLORIDA

8586-06 940126WEM



NOTE:
ND - NON DETECT
X,Y,Z - CONCENTRATIONS OF NICKEL IN mg/kg DETECTED IN SOIL AT 0'-1', 1'-2.5', 3'-4' BELOW SURFACE
* - SAMPLE NOT COLLECTED

0 20 40
SCALE: 1" = 40'

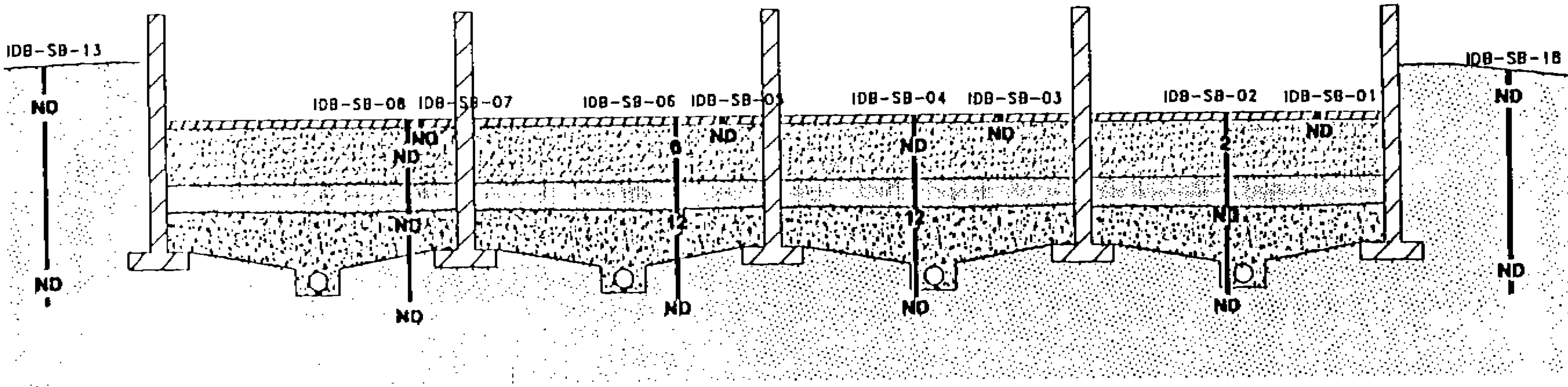
FIGURE D-5
ONSITE NICKEL RESULTS FOR DOMESTIC SLUDGE DRYING BEDS, PSC 41

SOUTHERN DIVISION NAVAL FACILITIES ENGINEERING COMMAND

TECHNICAL MEMORANDUM FOR PSCs 41 AND 43 AT OU2

NAS JACKSONVILLE, JACKSONVILLE, FLORIDA

8586-06 940128WEM



RESULTS (In mg/kg) FROM 0 TO 4 FT. BELOW SURFACE
NOTE: ND – NON-DETECT

0 5 10

SCALE: 1" = 10'
(APPROX.)

VERTICAL EXAGGERATION: 3:1

LEGEND

SAND

FINE GRAVEL

COARSE GRAVEL

NATIVE SOIL

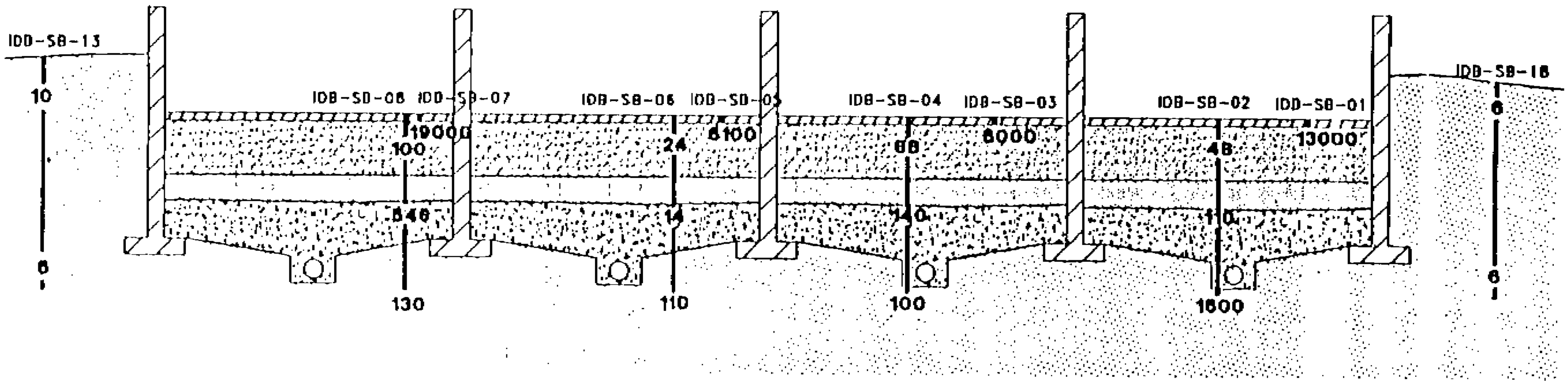
FIGURE D-6
ONSITE ARSENIC RESULTS FOR
INDUSTRIAL SLUDGE DRYING BEDS,
PSC 43

SOUTHERN DIVISION NAVAL FACILITIES ENGINEERING COMMAND

TECHNICAL MEMORANDUM
FOR PSCs 41 AND 43 AT OU2

NAS JACKSONVILLE,
JACKSONVILLE, FLORIDA

8586-06 940128WEM



RESULTS (In mg/kg) FROM 0 TO 4 FT. BELOW SURFACE
NOTE: ND – NON-DETECT

0 5 10
SCALE: 1" = 10'
(APPROX.)
VERTICAL EXAGGERATION: 3:1

LEGEND

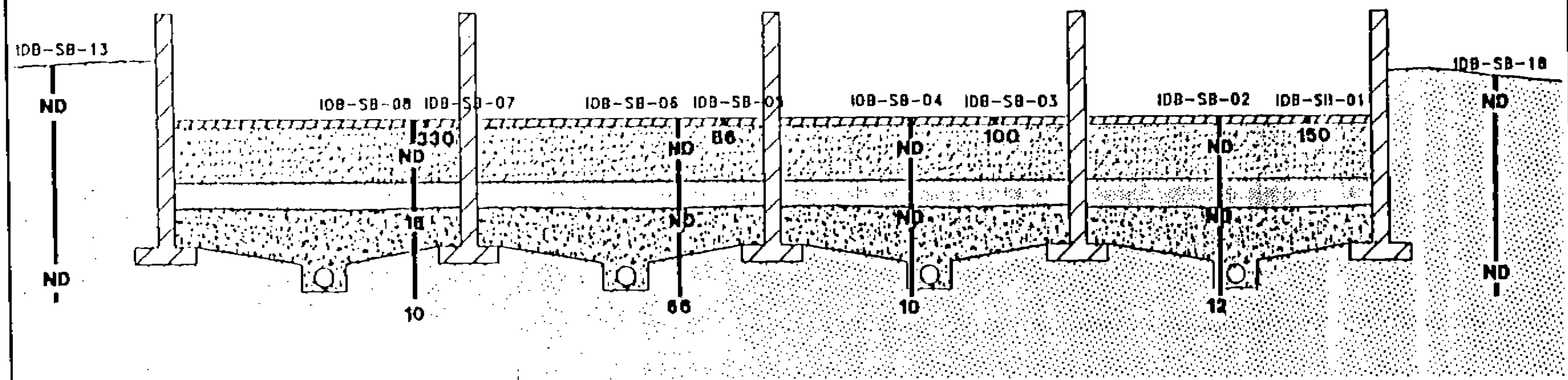
- SAND
- FINE GRAVEL
- COARSE GRAVEL
- NATIVE SOIL

FIGURE D-7
ONSITE CHROMIUM RESULTS FOR INDUSTRIAL SLUDGE DRYING BEDS, PSC 43

TECHNICAL MEMORANDUM FOR PSCs 41 AND 43 AT OU2

NAS JACKSONVILLE, JACKSONVILLE, FLORIDA

8586-06 940128WEM



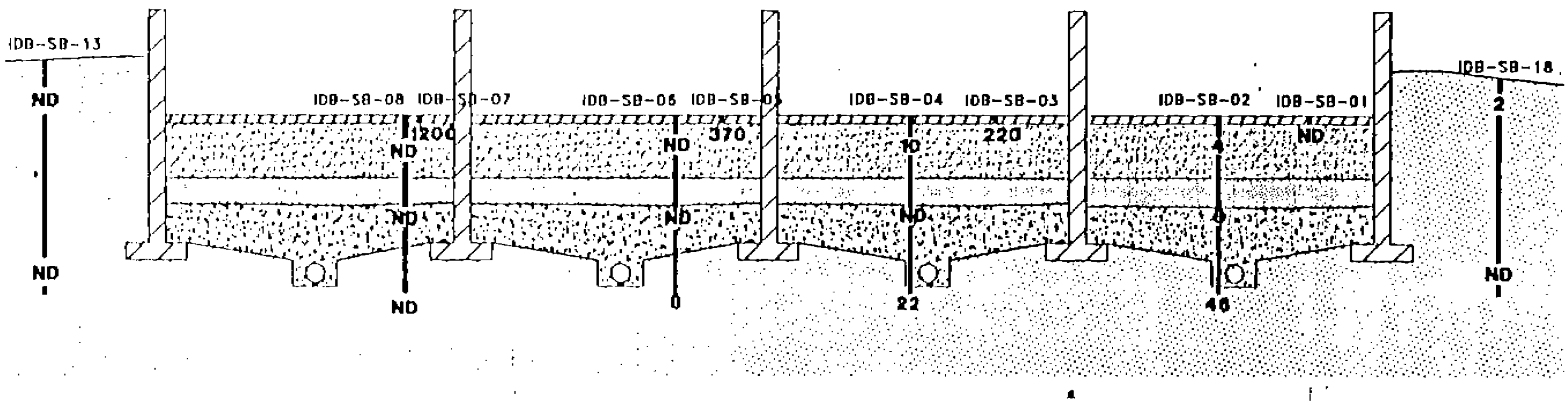
RESULTS (in mg/kg) FROM 0 TO 4 FT. BELOW SURFACE
NOTE: ND - NON-DETECT

FIGURE D-8
ONSITE CADMIUM RESULTS FOR INDUSTRIAL SLUDGE DRYING BEDS, PSC 43

TECHNICAL MEMORANDUM FOR PSCs 41 AND 43 AT OU2

NAS JACKSONVILLE, JACKSONVILLE, FLORIDA

8586-06 940128WEM



RESULTS (in mg/kg) FROM 0 TO 4 FT. BELOW SURFACE
NOTE: ND - NON-DETECT

0 5 10

SCALE: 1" = 10'
(APPROX.)
VERTICAL EXAGGERATION: 3:1

LEGEND

SAND

FINE GRAVEL

COARSE GRAVEL

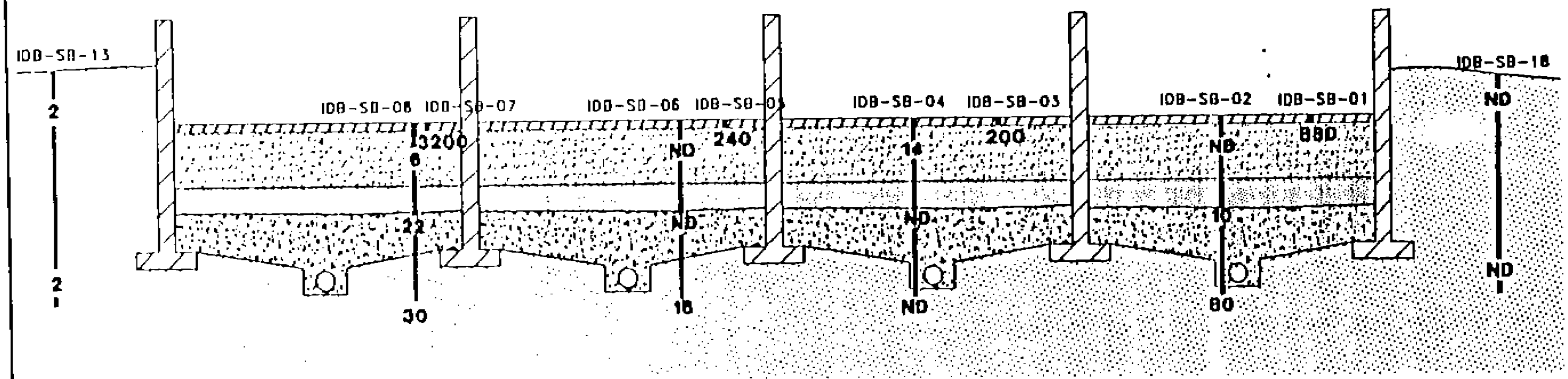
NATIVE SOIL

FIGURE D-9
ONSITE LEAD RESULTS FOR
INDUSTRIAL SLUDGE DRYING BEDS,
PSC 43

TECHNICAL MEMORANDUM
FOR PSCs 41 AND 43 AT OU2

NAS JACKSONVILLE,
JACKSONVILLE, FLORIDA

8586-06 940128WEM



RESULTS (in mg/kg) FROM 0 TO 4 FT. BELOW SURFACE
NOTE: ND – NON-DETECT

0 5 10
SCALE: 1" = 10'
(APPROX.)
VERTICAL EXAGGERATION: 3:1

LEGEND

- SAND
- FINE GRAVEL
- COARSE GRAVEL
- NATIVE SOIL

FIGURE D-10
ONSITE NICKEL RESULTS FOR
INDUSTRIAL SLUDGE DRYING BEDS,
PSC 43

TECHNICAL MEMORANDUM
FOR PSCs 41 AND 43 AT OU2

NAS JACKSONVILLE,
JACKSONVILLE, FLORIDA

8586-06 940128WEM

APPENDIX E

CALCULATIONS

VOLUME AND WEIGHT CALCULATIONS FOR PSC 41, DOMESTIC SLUDGE DRYING BEDS
FOCUSED RI/FS, OPERABLE UNIT 2
NAS JACKSONVILLE, FLORIDA
OCTOBER 1993

Volume estimates are based on record drawings of the drying beds, dated 1970.

Type of medium	Number	Length (feet)	Height (feet)	Width (feet)	Specific Volume (feet^3)	Specific Weight (lbs/ft^3)	Total Weight (tons)	Expansion Factor (%)	Bulk Volume (feet^3)	Bulk Volume (yard^3)
Cinder block walls	1	895.00	3.50	0.75	2349	100	117	130%	3054	113
R.I. Concrete Wall Footing	1	895.00	0.75	1.50	1007	180	91	130%	1309	48
R.I. Concrete Wall Cap	1	895.00	0.50	0.75	336	180	30	130%	436	16
R.I. Concrete Aprons	5	12.00	12.00	0.50	360	180	32	130%	468	17
R.I. Concrete Drive Ribbon	10	38.50	0.50	2.50	481	180	43	130%	626	23
R.I. Concrete Splash Plates	5	3.50	0.50	3.50	31	180	3	130%	40	1
Filter sand	5	50.00	0.60	50.00	7500	100	375	110%	8250	306
Filter medium gravel in each bed	5	50.00	0.25	50.00	3125	100	156	110%	3438	127
Filter coarse gravel	5	50.00	0.75	50.00	9375	100	469	110%	10313	382
Native soil (sand)	1	260.00	3.00	56.00	43680	100	2184	115%	50232	1860

	Specific Volume (feet^3)	Total Weight (tons)	Bulk Volume (feet^3)	Bulk Volume (yard^3)
TOTAL WEIGHT AND VOLUMES OF SURFACE (NONHAZARDOUS) DEBRIS (all concrete except for footing)	3557	226	4624	171
TOTAL WEIGHT AND VOLUMES OF MEDIA TO BE TREATED AND/OR DISPOSED (filter sand and gravels)	63680	3184	72232	2675
TOTAL WEIGHT AND VOLUMES OF SUBSURFACE (HAZARDOUS) DEBRIS (concrete footings)	1007	91	1309	48

Note: If hazardous concrete is crumbled or crushed upon removal, it would be treated and/or disposed with the filter media.

VOLUME AND WEIGHT CALCULATIONS FOR PSC 43, INDUSTRIAL SLUDGE DRYING BEDS
FOCUSED RI/FS, OPERABLE UNIT 2
NAS JACKSONVILLE, FLORIDA
OCTOBER 1993

Volume estimates are based on record drawings of improvements to the drying beds, dated 1976.

Type of medium	Number	Length (feet)	Width (feet)	Depth (feet)	Specific Volume (feet ^ 3)	Specific Weight (lbs/ft ^ 3)	Total Weight (tons)	Expansion Factor (%)	Bulk Volume (feet ^ 3)	Bulk Volume (yard ^ 3)
Concrete wall, south side of beds	1	64.67	0.67	4	173.32	150	13.00	130%	225.31	8.34
Concrete wall, north side of beds	1	64.67	0.67	3.75	162.48	150	12.19	130%	211.23	7.82
Concrete walls within beds	5	18	0.67	4	241.20	150	18.09	130%	313.56	11.61
Concrete footings, north and south walls	2	64.67	2	0.67	173.32	150	13.00	130%	225.31	8.34
Concrete footings, walls within beds	5	18	2	0.67	120.60	150	9.05	130%	156.78	5.81
Concrete splash plate	1	64.67	1.67	0.33	35.64	150	2.67	130%	46.33	1.72
Concrete splash plate lip	1	64.67	0.33	0.5	10.67	150	0.80	130%	13.87	0.51
Filter sand in each bed	4	15.33	18	1	1103.76	120	66.23	115%	1269.32	47.01
Medium gravel in each bed	4	15.33	18	0.33	364.24	100	18.21	115%	418.88	15.51
Coarse gravel in each bed	4	15.33	18	0.75	827.82	100	41.39	115%	951.99	35.26

	Specific Volume (feet ^ 3)	Total Weight (tons)	Bulk Volume (feet ^ 3)	Bulk Volume (yard ^ 3)
TOTAL WEIGHT AND VOLUMES OF SURFACE (NONHAZARDOUS) DEBRIS (all concrete except for footings)	623	47	810	30
TOTAL WEIGHT AND VOLUMES OF MEDIA TO BE TREATED AND/OR DISPOSED (filter sand and gravels)	2296	126	2640	98
TOTAL WEIGHT AND VOLUMES OF SUBSURFACE (HAZARDOUS) DEBRIS (concrete footings)	294	22	382	14

Note: If hazardous concrete is crumbled or crushed upon removal, it would be treated and/or disposed with the filter media.