RECORD OF DECISION OPERABLE UNIT 6 SITE 11 NAS CECIL FIELD FL
9/1/1998
TETRA TECH

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Record of Decision
for
Operable Unit 6
Site 11
Naval Air Station Cecil Field
Jacksonville, Florida

Southern Division
Naval Facilities Engineering Command
Contract Number N62467-94-D-0888
Contract Task Order 0039

September 1998

049812/P

RECORD OF DECISION

FOR

OPERABLE UNIT 6
SITE 11
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

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

Submitted by:
Brown & Root Environmental
661 Andersen Drive
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Pittsburgh, Pennsylvania 15220

CONTRACT NUMBER N62467-94-D-0888
CONTRACT TASK ORDER 039

SEPTEMBER 1998

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LIST OF ACRONYMS AND ABBREVIATIONS

ABB-ES	ABB Environmental Services
ARAR	Applicable or Relevant and Appropriate Requirement
bgs	below ground surface
BHC	benzene hexachloride
BRA	Baseline Risk Assessment
BRAC	Base Realignment and Closure
B&R Environmental	Brown & Root Environmental
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
cfm	cubic feet per minute
CLEAN	Comprehensive Long-term Environmental Action Navy
COPCs	chemicals of potential concern
DBCP	1,2-dibromo-3-chloropropane
DDD	dichlorodiphenyldichloroethane
DDE	dichlorodiphenyldichloroethene
DDT	dichlorodiphenyltrichoroethene
EE	Envirodyne Engineers
ELCR	excess lifetime cancer risk
FDEP	Florida Department of Environmental Protection
FFA	Federal Facility Agreement
FS	Feasibility Study
GAC	granular activated carbon
gpm	gallons per minute
HDPE	high-density polyethylene
HI	Hazard Index (non-cancerous)
HQ	Hazard Quotient (non-cancerous)
IAS	Initial Assessment Study
IRA	Interim Remedial Action
μg/kg	microgram per kilogram
μg/L	microgram per liter
mg/kg	milligram per kilogram
NAS	Naval Air Station
NCP	National Oil and Hazardous Substance Pollution Contingency Plan
NPL	National Priority List

OU	Operable Unit
PCBs	polychlorinated biphenyls
RA	Remedial Action
RAB	Restoration Advisory Board
RAO	Remedial Action Objective
RBC	risk-based concentration
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act
SCGs	Soil Cleanup Goals (Florida)
SOUTHNAVFACENGCOM	Southern Division, Naval Facilities Engineering Command
SVOCs	semi-volatile organic compounds
TAL	Target Analyte List
TBC	To Be Considered
TCE	Trichloroethene
TCL	Target Compound List
U.S. EPA	United States Environmental Protection Agency
UST	underground storage tank
VOCs	volatile organic compounds
yd^3	cubic yard

1.0 DECLARATION FOR THE RECORD OF DECISION

1.1 SITE NAME AND LOCATION

Site 11, Golf Course Pesticide Disposal Area, Operable Unit (OU) 6, is located in a wooded area between the 11th fairway and 17th green of the Fiddler's Green Golf Course at Naval Air Station (NAS) Cecil Field, Jacksonville, Florida.

1.2 STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action (RA) for Site 11, at NAS Cecil Field, Jacksonville, Florida, which was chosen in accordance with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (40 Code of Federal Regulations 300) (U.S. Environmental Protection Agency [U.S. EPA], 1990). This decision document was prepared in accordance with U.S. EPA guidance documents for the preparation of decision documents (U.S. EPA, 1991 and U.S. EPA, 1992). This decision is based on the Administrative Record for Site 11, OU 6.

The U.S. EPA and the State of Florida concur with the selected remedy.

1.3 ASSESSMENT OF THE SITE

Actual or potential releases of hazardous substances from this site, if not addressed by implementing the response action selected in this Record of Decision (ROD), may present an imminent and substantial endangerment to public health, welfare, or the environment. Unacceptable human health risks EXIST if the groundwater from the surficial aquifer was used as a potable water source. Unacceptable human health risks could also result from exposure to soil. There are no unacceptable ecological risks at this site.

1.4 DESCRIPTION OF THE SELECTED REMEDY

This ROD is the final action for Site 11, OU 6. Final RODs have been approved for OUs 1, 2, 4, and 7. Remedial Investigations (RIs) and Baseline Risk Assessments (BRAs) have been completed for OUs 3, 5, 6, and 8.

The selected remedy addresses risk reduction in soil and groundwater at the site. Remedial alternatives selected for Site 11 include soil excavation and groundwater monitoring, which address the principal threats remaining at the site.

The major components of the selected remedy are:

- Excavation of soil contaminated above action levels for arsenic and 1,2-dibromo-3-chloropropane (DBCP). Excavated soil will be tested for Resource Conservation and Recovery Act (RCRA) hazardous characteristics. Depending on test results, excavated soil will be disposed of either at an offsite permitted RCRA Subtitle D (non-hazardous) or Subtitle C (hazardous) facility. Excavated areas will be backfilled with clean soil, graded and revegetated;

- Implementation of institutional controls, including deed restrictions, to limit the use of contaminated groundwater until natural processes reduce contaminant concentrations to acceptable levels;

- Long-term sampling and analysis of groundwater to monitor the decrease in contaminant concentrations resulting from natural processes until acceptable levels have been reached; and

- Review of site conditions and groundwater monitoring data every 5 years to verify the effectiveness of the remedy for the protection of human health and the environment.

1.5 STATUTORY DETERMINATIONS

The selected remedy is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action (RA), and is cost effective. The nature of the selected remedy for Site 11 is such that applicable or relevant and appropriate requirements (ARARs) will be met in the long-term as residual concentrations of DBCP and phenol in groundwater are reduced through natural attenuation. The remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable for the site. However, because treatment was not determined to be practicable to address the principal threats, this remedy does not satisfy the statutory preference for treatment as a principal element of the remedy. Because this remedy would result in hazardous substances remaining on site at concentrations above acceptable human health risk-based levels, a review will be conducted within 5 years of the commencement of the RA to ensure that the remedy continues to provide adequate protection of human health and the environment.

1.6 SIGNATURE AND SUPPORT AGENCY ACCEPTANCE OF THE REMEDY

David L. Porter, P.E.
Base Realignment and Closure
Environmental Coordinator

27 August 1998
Date

2.0 DECISION SUMMARY

2.1 SITE NAME, LOCATION, AND DESCRIPTION

NAS Cecil Field is located 14 miles southwest of Jacksonville, Florida (Figure 2-1). Most of NAS Cecil Field is located within Duval County with the southernmost part of the facility being located in northern Clay County.

NAS Cecil Field was established in 1941 and provides facilities, services, and material support for the operation and maintenance of naval weapons, aircraft and other units of the operation forces as designated by the Chief of Naval Operations. Some of the tasks required to accomplish this mission included operation of fuel storage facilities, performance of aircraft maintenance, operation and maintenance of engine repair facilities and test cells for turbo-jet engines, and support of special weapons systems.

NAS Cecil Field is scheduled for closure in 1999. Much of the facility will be transferred to the Jacksonville Port Authority. The facility will have multiple uses, but will be used primarily for aviation-related activities.

Land surrounding NAS Cecil Field is used primarily for forestry, with some agriculture and ranching. Small communities and individual homes are in the vicinity of NAS Cecil Field. The closest community, located on Nathan Hale Road, abuts the western edge of the facility. The nearest incorporated municipality, Baldwin, is approximately 6 miles northwest of the main facility entrance.

To the east of NAS Cecil Field, the rural area morphs into a suburban fringe bordering the major east and west roadways. Low commercial use, such as convenience stores, and low-density residential areas characterize the land use (ABB-ES, 1992). A development, called Village of Argyle, when complete, will consist of seven separate villages that will border NAS Cecil Filed to the south and southeast. A golf course and residential area also border NAS Cecil Field to the east (SOUTHNAVFACENGCOM, 1989).

Site 11, Golf Course Pesticide Disposal Area, OU 6 is located in the southwest portion of NAS Cecil Field (Figure 2-1). The site is in a wooded area between the 11th fairway and 17th green of the Fiddler's Green Golf Course and the area of investigation is approximately 3 acres in size (Figures 2-2 and 2-3). Site 11 is relatively flat, with ground elevations ranging from approximately 75 to 76 feet according to the National Geodetic Vertical Datum of 1929. Much of the site is overgrown by low-level vegetation with a few slash pines. The site is crossed by a dirt road joining the 11th fairway and the 17th green.

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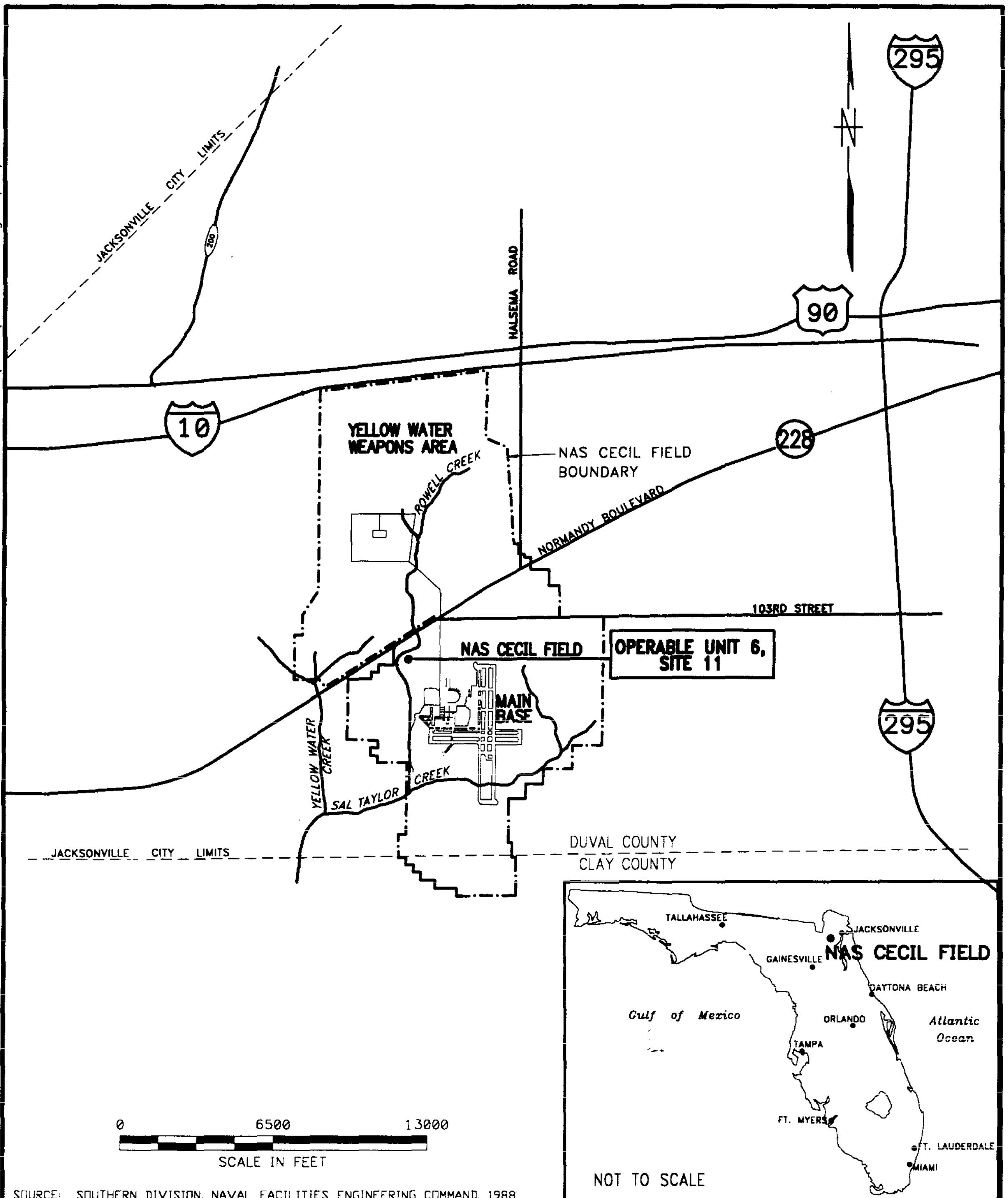

SOURCE: SOUTHERN DIVISION, NAVAL FACILITIES ENGINEERING COMMAND, 1988

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CHECKED BY	DATE		APPROVED BY	DATE 07/23/98
COST/SCHED-AREA			APPROVED BY	DATE
SCALE AS NOTED			DRAWING NO. FIGURE 2-1	REV. 1

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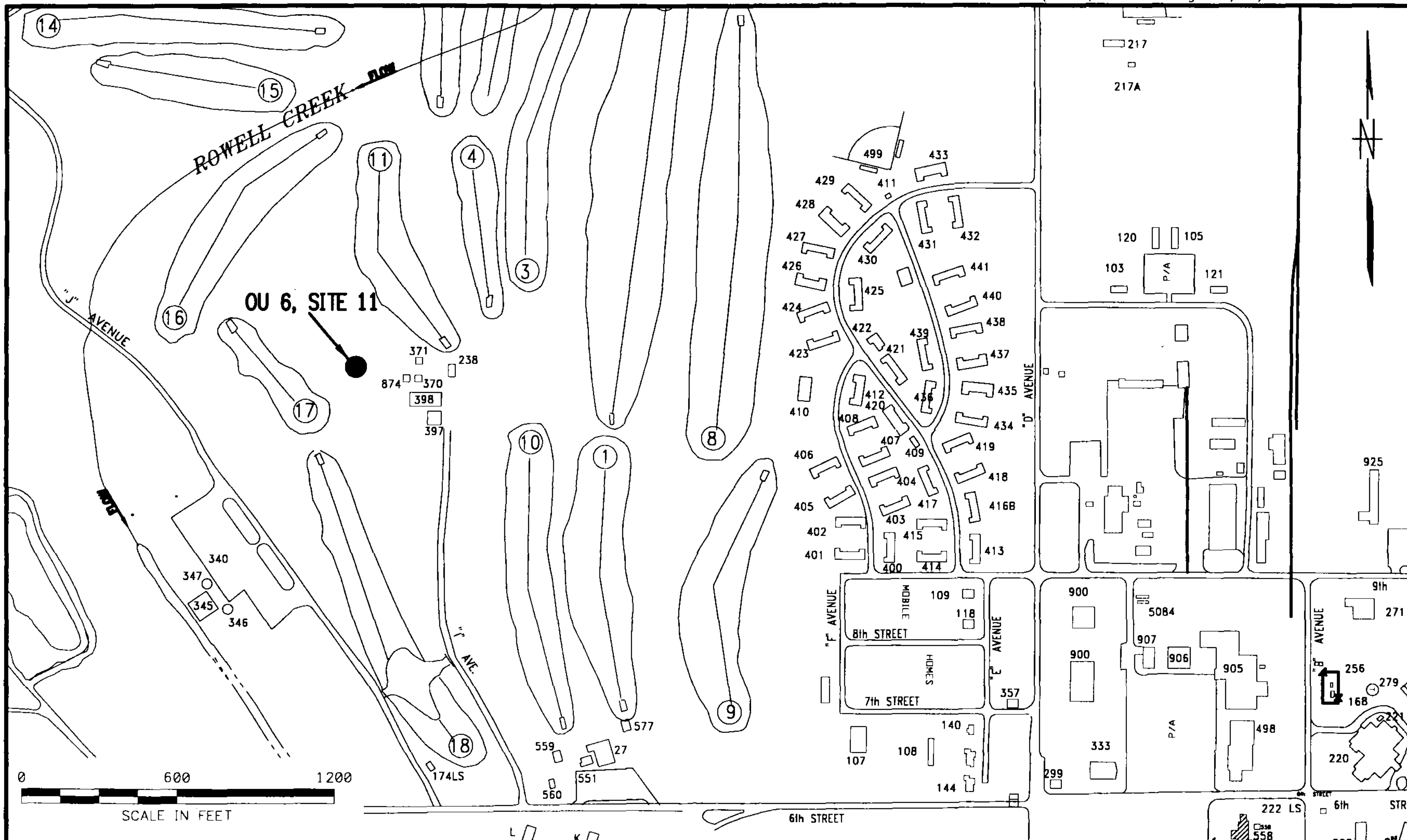

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CHECKED BY	DATE		APPROVED BY	DATE 07/23/98
COST/SCHED-AREA			APPROVED BY	DATE
SCALE AS NOTED			DRAWING NO. FIGURE 2-2	REV. 0

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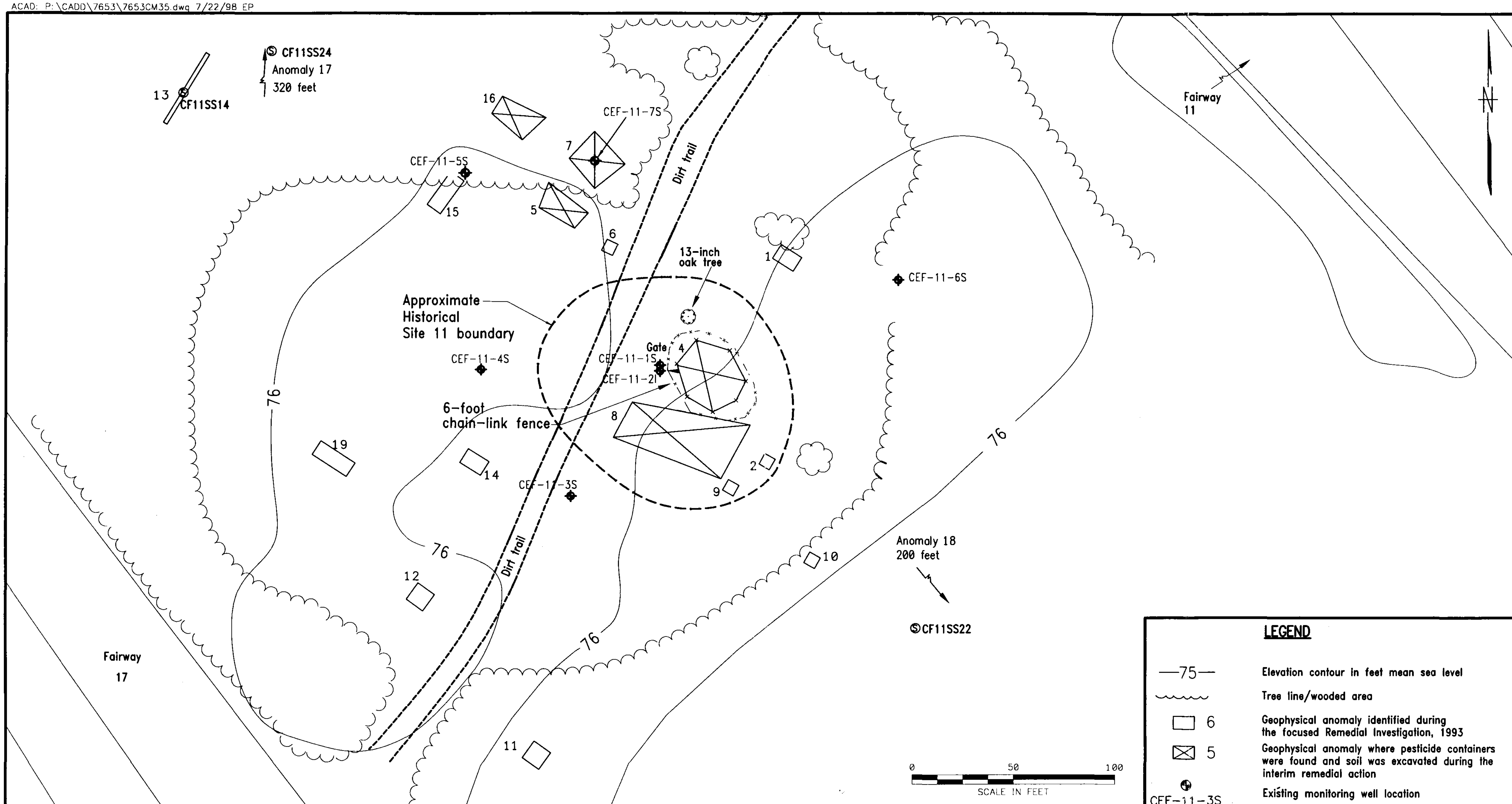

NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

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CHECKED BY BER DATE 4/27/98
COST/SCHED-AREA
SCALE AS NOTED

SURFACE FEATURE AND SITE TOPOGRAPHY RECORD OF DECISION OPERABLE UNIT 6, SITE 11 NAVAL AIR STATION, CECIL FIELD JACKSONVILLE, FLORIDA

CONTRACT NO. 7653
APPROVED BY DATE 07/23/98
APPROVED BY DATE
DRAWING NO. FIGURE 2-3
REV. 0

FORM CADD NO. SDIV_BH.DWG - REV 0 - 1/20/98

2.2 SITE HISTORY AND ENFORCEMENT ACTIVITIES

NAS Cecil Field was placed on the National Priority List (NPL) by the U.S. EPA and the Office of Management and Budget in December 1989. A Federal Facility Agreement (FFA) was signed by the Florida Department of Environmental Protection (FDEP) (formerly Florida Department of Environmental Regulation), the U.S. EPA, and the Navy in 1990. Following this, remedial response activities at NAS Cecil Field were conducted under CERCLA authority. OU6 (Site 11) is one of 8 operable units identified as needing further investigation.

From the early 1970s until 1978, Site 11 was used by Fiddler's Green Golf Course maintenance personnel for the disposal of empty, partially full, and full pesticide, fungicide, and herbicide containers. Containers were reportedly buried in a pit approximately 40 feet wide by 40 feet long. The containers were allowed to accumulate for several months before being crushed with a front-end loader and buried. The exact location of the disposal pit is unknown.

In 1978, a new pesticide facility (Building 397) was built as part of the golf course maintenance complex. Upon completion of the new facility, two or three 30-gallon drums of unused pesticides, of which at least one was DBCP (trade name Nemagon™), and approximately 10 to 15 full 5-gallon containers of pesticides, herbicides, and fungicides were discarded and buried at Site 11. Many of these containers were in various stages of decomposition, lacked identification labels, and were unusable at the new facility. Once the move to the new maintenance facility was made, use of Site 11 for disposal of pesticides, herbicides and fungicides was discontinued.

An Initial Assessment Study (IAS) conducted at Site 11 indicated that approximately two to four empty, unrinsed, 5-gallon containers were discarded at the site each month and it was estimated that approximately 200 to 450 containers were buried in the disposal pit (EE, 1985).

A focused Remedial Investigation/Feasibility Study (RI/FS) was conducted in 1993 and 1994 to evaluate source control alternatives as part of an Interim Remedial Action (IRA). Field investigations performed for this RI/FS included a geophysical survey, excavation of test pits to investigate geophysical anomalies, and the sampling and analysis of product found in partially full or leaking pesticide containers. Forty-one empty pesticide containers, 7 full or partially full containers, and three 50-pound bags of powder were found during the RI. Pesticides, including alpha-benzene hexachloride (alpha-BHC), gamma-BHC, toxaphene, DBCP, and 2,4-dichlorophenoxyacetic acid were detected in liquid samples collected from the pesticide containers. Parathion and DBCP were detected in soil samples from Site 11. Source control alternatives were evaluated and excavation of contaminated soil and debris, followed by offsite disposal at solid waste and RCRA-hazardous waste landfills, was selected as the interim remedy.

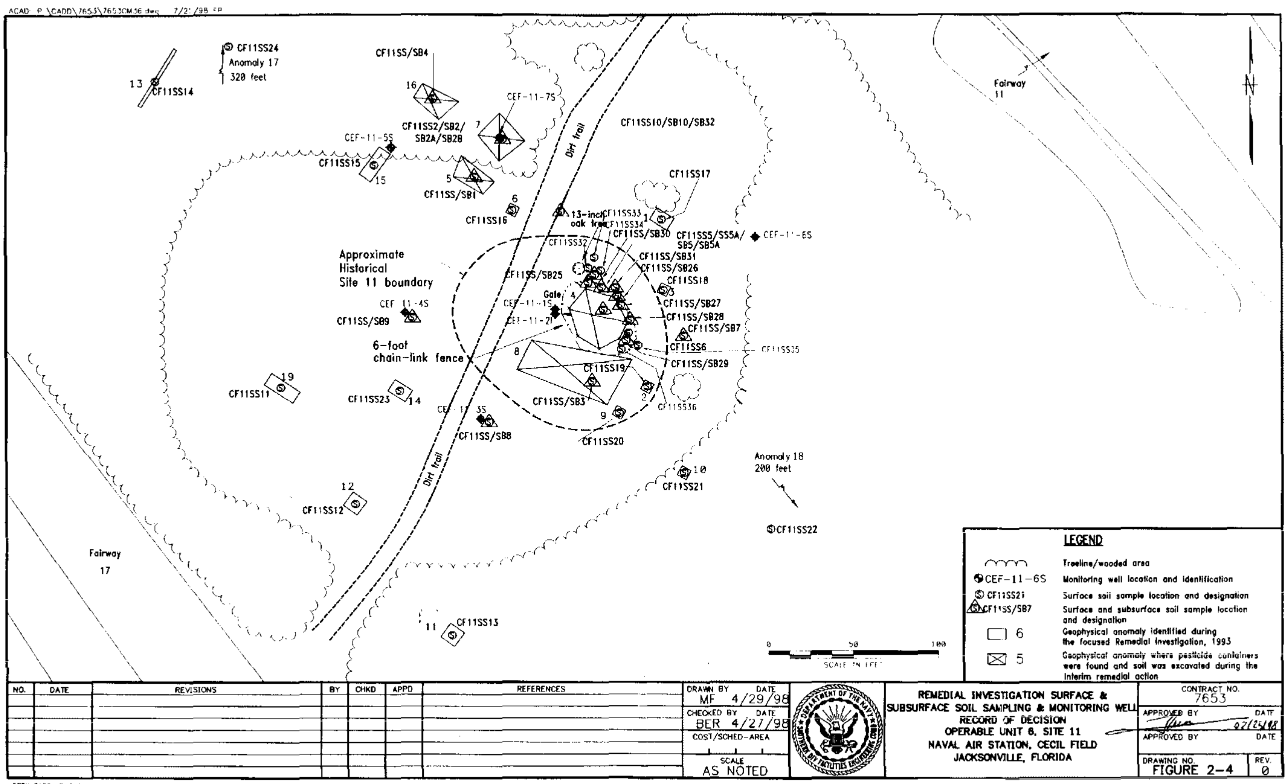
An IRA was conducted at Site 11 from 1995 to 1996. This included the excavation of 417 cubic yards (yd^3) of soil from five geophysical anomalies and removal of the containers found in these anomalies. Soil was generally removed from the ground surface to one foot below the water table (approximately 6 to 7 feet below ground surface [bgs]) unless undisturbed and uncontaminated soil was encountered first. A total of 55 containers was removed from 5 excavations (Anomalies 4, 5, 7, 8, and 16), overpacked and disposed offsite. The excavated soil was stockpiled, sampled, and tested for RCRA-hazardous characteristics to select the appropriate disposal method. Based on test results, 309 yd^3 of excavated soil was disposed of as RCRA-hazardous. The remaining soil was deemed non-hazardous and returned to the site. Following excavation, a high-density polyethylene (HDPE) liner was placed in the largest excavation area (Anomaly 4) and a chain link fence was installed around its perimeter.

Following the IRA, additional field investigations were conducted at Site 11 in support of a Remedial Investigation (RI) and baseline risk assessment (BRA) (ABB-ES, 1997) in 1996 and 1997. These field investigations included a contaminant source investigation and a groundwater investigation. Figure 2-4 shows RI sampling locations.

As part of the contaminant source investigation, 10 surface and 9 subsurface soil samples were collected in 1996 and analyzed for Target Compound List (TCL) organics, pesticides, and Target Analyte List (TAL) inorganics. An additional 21 surface soil samples were also collected in 1996 and analyzed for DBCP. Supplemental sampling was conducted in 1997. Seven surface soil samples were collected and analyzed for DBCP. Four subsurface soil samples were collected with one analyzed for DBCP, two for arsenic, and one for phenol.

As part of the groundwater investigation, three piezometers, one deep (30 feet), and five shallow (14 feet) monitoring wells were installed in 1996, and one additional shallow monitoring well was installed in 1997. Water level was measured in the piezometers and monitoring wells and slug tests were performed on selected wells. One round of groundwater samples was collected from the monitoring wells. The samples collected from the wells installed in 1996 were analyzed for TCL organics, pesticides, and TAL inorganics. The sample collected from the additional well installed in 1997 was analyzed only for arsenic.

A Feasibility Study (FS) was conducted to evaluate remedial alternatives for Site 11 (ABB-ES, 1998). A Proposed Plan was prepared to present preferred remedies for this site (B&R Environmental, 1998).


CF11SS24
Anomaly 17
320 feet
CF11SS14
CF11SS/SB4
CEF-11-7S
CF11SS2/SB2/
SB2A/SB28
CEF-11-5S
CF11SS15
CF11SS/SB1
CF11SS16
Dirt trail
CF11SS10/SB10/SB32
CF11SS17
Fairway
11
13-inch
oak tree
CF11SS33
CF11SS34
CF11SS/SB30
CF11SS5/SS5A/
SB5/SB5A
CEF-11-ES
CF11SS32
CF11SS/SB31
CF11SS/SB26
CF11SS18
Approximate
Historical
Site 11 boundary
CF11SS/SB25
Gate
CEF-11-1S
CEF-11-2D
CEF 11-4S
CF11SS/SB9
CF11SS/SB27
CF11SS/SB28
CF11SS/SB7
CF11SS6
CF11SS35
CF11SS/SB29
6-foot
chain-link fence
CF11SS19
CF11SS11
CF11SS23
CF11SS/SB3
CF11SS36
CEF-11-3S
CF11SS/SB8
CF11SS20
Anomaly 18
200 feet
CF11SS21
CF11SS12
CF11SS22
Fairway
17
CF11SS13
LEGEND
Treeline/wooded area
CEF-11-6S Monitoring well location and identification
CF11SS21 Surface soil sample location and designation
CF11SS/SB7 Surface and subsurface soil sample location and designation
6 Geophysical anomaly identified during the focused Remedial Investigation, 1993
5 Geophysical anomaly where pesticide containers were found and soil was excavated during the interim remedial action
0 50 100
SCALE IN FEET
NO. DATE REVISIONS BY CHKD APPD REFERENCES
DRAWN BY MF DATE 4/29/98
CHECKED BY BER DATE 4/27/98
COST/SCHED-AREA
SCALE AS NOTED
REMEDIAL INVESTIGATION SURFACE &
SUBSURFACE SOIL SAMPLING & MONITORING WELL
RECORD OF DECISION
OPERABLE UNIT 8, SITE 11
NAVAL AIR STATION, CECIL FIELD
JACKSONVILLE, FLORIDA
CONTRACT NO. 7653
APPROVED BY DATE 07/25/98
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2.3 HIGHLIGHTS OF COMMUNITY PARTICIPATION

The results of the RI and the BRA, the remedial alternatives identified in the FS, and the preferred alternative described in the Proposed Plan have been presented to the NAS Cecil Field Restoration Advisory Board (RAB), which is composed of community members as well as representatives from the Navy and State and Federal regulatory agencies.

The RI and BRA results, the remedial alternatives identified in the FS, and the preferred alternative were presented at the RAB meeting held on March 17, 1998. A 30-day public comment period was held from April 2 through May 1, 1998. No comments were received.

Public notice of the availability of the Proposed Plan was placed in the Metro section of the Florida Times Union on March 29, 1998. This local edition targets the communities closest to NAS Cecil Field. As indicated in these public notices, documents pertinent to Site 11 were made accessible to the public at the Information Repository located at the Charles D. Webb Wesonnett Branch of the Jacksonville Library, 6887 103rd Street, Jacksonville, Florida.

2.4 SCOPE AND ROLE OF OPERABLE UNIT

The environmental concerns at NAS Cecil Field are complex. As a result, work at the 18 sites have been organized into 8 OUs and more than 100 other areas undergoing evaluation in the Base Realignment and Closure (BRAC) and underground storage tank (UST) petroleum programs.

Final RODs have been approved for OUs 1, 2, 4, and 7. RIs and BRAs have been completed for OUs 3, 5, 6, and 8. Investigations at OU 6, Site 11 indicated the presence of soil and groundwater contamination. The purpose of this RA is to remediate the soil contamination and monitor and remediate groundwater contamination that pose unacceptable human health risks. Inhalation, ingestion, or dermal contact with surface and subsurface soil and ingestion of groundwater extracted from the surficial aquifer pose human health risks that exceed the State of Florida threshold excess lifetime cancer risk (ELCR) of 1E-06.

The following Remedial Action Objectives (RAOs) were established for Site 11:

- Reduce human health risk associated with exposure to surface soil containing arsenic concentrations in excess of the site-specific background concentration (referred to as Hi-Cut value) of 2.1 milligrams per kilogram (mg/kg).

- Reduce human health risk associated with exposure to subsurface soil containing arsenic in excess of the FDEP brownfield site cleanup criterion of 29 mg/kg and DBCP in excess of its practical detection limit of 0.2 micrograms per kilogram (μg/kg).

- Reduce human health risk associated with exposure to groundwater containing DBCP and phenol in excess of their respective risk-based cleanup goals of 0.2 and 10 micrograms per liter (μg/L).

The RA documented in this ROD will achieve these RAOs.

2.5 SUMMARY OF SITE CHARACTERISTICS

2.5.1 Geology

Site 11 is underlain by approximately 50 feet of unconsolidated and undifferentiated silty sand. Lenses and stringers of clayey material, typically 3 to 4 feet thick, may be encountered intermittently.

2.5.2 Hydrogeology

At NAS Cecil Field, there are three water-bearing systems: the surficial aquifer, the intermediate aquifer, and the Floridan aquifer system. Each system is separated from the next by an aquitard or less permeable unit. Only the surficial aquifer was investigated at Site 11.

The surficial aquifer system at Site 11 is composed primarily of undifferentiated silty sand with some clayey sand lenses. The surficial aquifer system is unconfined, and the depth to the water table is approximately 5 feet bgs. Groundwater flow in the surficial aquifer is to the southwest toward Rowell Creek, which is approximately 1,000 feet from the site. The estimated groundwater velocity is 26 feet per year.

2.5.3 Contaminant Sources

The primary sources of contamination at Site 11 were the containers of pesticides, fungicides, and herbicides which were disposed at the site and the soil which was contaminated as a result of disposal activities. Disposal activities have ceased, and most of the containers and contaminated soil have been removed as part of an IRA. Therefore, only a minimal source of contamination remains at the site.

2.5.4 Nature and Extent of Contamination

Site investigations were conducted in 1996 and 1997. Samples of surface soil, subsurface soil, and groundwater were collected and analyzed. A summary of analytical results for each medium and their comparison to regulatory standards and to site-specific background concentrations, which are referred to as Hi-Cut values (for inorganic compounds only), is presented below.

Surface Soil

Three volatile organic compounds (VOCs), methylene chloride, acetone, and trichlorethylene (TCE) were detected in several surface soil samples. None of these detections exceeded the FDEP residential Soil Cleanup Goals (SCGs).

Eight semi-volatile organic compounds (SVOCs), benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, fluoranthene, pyrene, and bis(2-ethylhexyl)phthalate were detected in several surface soil samples. None of these detections exceeded the FDEP residential SCGs.

Thirteen pesticides were detected in surface soil samples. The most frequent detections were of delta-BHC (5 of 10 samples), 4,4'-dichlorodiphenyldichloroethene (DDE) (7 of 10 samples), 4,4'-dichlorodiphenyltrichloroethene (DDT) (9 of 10 samples), dieldrin (6 of 10 samples), endrin (5 of 10 samples), and heptachlor epoxide (5 of 10 samples). DBCP was detected in only one of 31 initial samples and none of the 7 supplemental samples. None of these detections exceeded the FDEP residential SCGs. No organophosphorus pesticides, chlorinated herbicides, or polychlorinated biphenyls (PCBs) were detected in surface soil at Site 11.

Eighteen inorganic compounds were detected in surface soil samples. Of these, the most prevalent were aluminum, barium, calcium, chromium, iron, lead, magnesium, manganese, vanadium, and zinc, which were detected in all 10 samples. Calcium, chromium, iron, vanadium, and zinc exceeded Hi Cut values but not regulatory standards. Only arsenic, detected in 3 of 10 samples at concentrations ranging from 0.74 mg/kg to 5.7 mg/kg, exceeded both the FDEP residential SCG of 0.7 mg/kg and the Hi Cut value of 2.1 mg/kg.

Locations of detections of compounds with surface soil concentrations in excess of regulatory standards are illustrated on Figure 2-5. Only arsenic is identified as a human health chemical of concern (COC) in surface soil.

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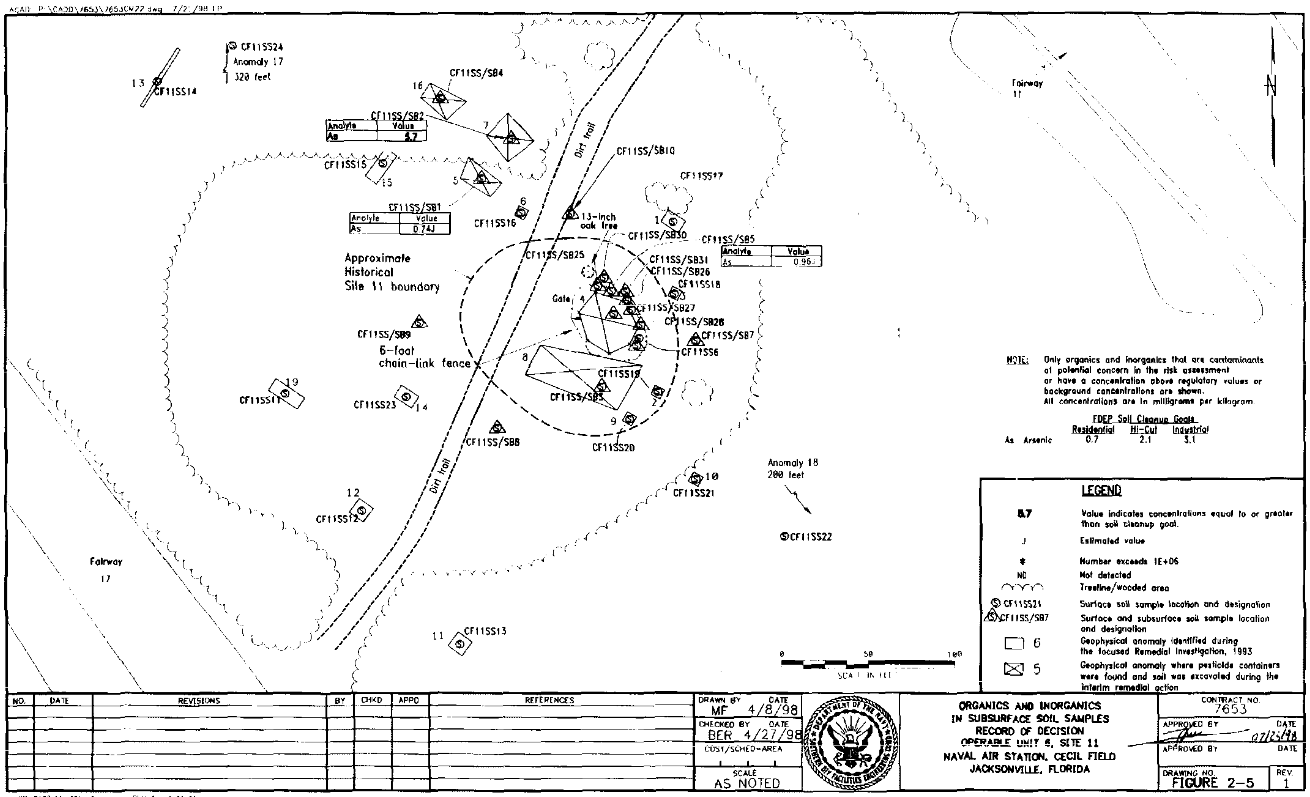
CF11SS24
Anomaly 17
320 feet
CF11SS14
CF11SS/SB4
CF11SS/SB2
Analyte | Value
As | 5.7
CF11SS15
CF11SS/SB1
Analyte | Value
As | 0.74J
CF11SS16
Dirt trail
CF11SS/SB10
CF11SS17
13-inch oak tree
CF11SS/SB30
CF11SS/SB5
Analyte | Value
As | 0.96J
CF11SS/SB25
CF11SS/SB31
CF11SS/SB26
CF11SS18
Gate
CF11SS/SB27
CF11SS/SB28
CF11SS/SB7
CF11SS6
Approximate Historical Site 11 boundary
CF11SS/SB9
6-foot chain-link fence
CF11SS19
CF11SS/SB3
CF11SS11
CF11SS23
CF11SS/SB8
CF11SS20
Anomaly 18
200 feet
CF11SS21
CF11SS22
CF11SS12
Fairway 17
Fairway 11
CF11SS13
N
NOTE: Only organics and inorganics that are contaminants of potential concern in the risk assessment or have a concentration above regulatory values or background concentrations are shown. All concentrations are in milligrams per kilogram.
FDEP Soil Cleanup Goals
Residential | Hi-Cut | Industrial
As Arsenic | 0.7 | 2.1 | 3.1
LEGEND
5.7 Value indicates concentrations equal to or greater than soil cleanup goal.
J Estimated value
* Number exceeds 1E+06
ND Not detected
Treeline/wooded area
CF11SS21 Surface soil sample location and designation
CF11SS/SB7 Surface and subsurface soil sample location and designation
6 Geophysical anomaly identified during the focused Remedial Investigation, 1993
5 Geophysical anomaly where pesticide containers were found and soil was excavated during the interim remedial action
0 50 100
SCALE IN FEET
NO. DATE REVISIONS BY CHKD APPD REFERENCES
DRAWN BY MF DATE 4/8/98
CHECKED BY BER DATE 4/27/98
COST/SCHED-AREA
SCALE AS NOTED
ORGANICS AND INORGANICS IN SUBSURFACE SOIL SAMPLES
RECORD OF DECISION
OPERABLE UNIT 6, SITE 11
NAVAL AIR STATION, CECIL FIELD
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APPROVED BY
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REV. 1

Subsurface Soil

Three VOCs, methylene chloride, acetone, and TCE were detected in several subsurface soil samples. None of these detections exceeded the FDEP industrial SCGs for leaching from soil to groundwater.

Three SVOCs, including benzo(b)fluoranthene, bis(2-ethylhexyl)phthalate, and phenol were detected in one or more subsurface soil samples. Detections of benzo(b)fluoranthene and bis(2-ethylhexyl)phthalate did not exceed regulatory criteria. During the RI, phenol was detected at one location (CF11SB10) at a concentration of 2,000 μg/kg which greatly exceeds the FDEP industrial SCG of 20 μg/kg for leaching from soil to groundwater. However, a subsurface soil sample collected later from the same location during the 1997 supplemental sampling (CF11SB32) showed no positive detection of phenol.

Eleven pesticides, DBCP, aldrin, dieldrin, alpha-chlordane, methoxychlor, alpha-BHC, delta-BHC, endosulfan II, 4,4'-DDT, 4,4'-dichlorodiphenyldichloroethane (DDD), and heptachlor epoxide, were detected in one or more subsurface soil samples. Of these, only DBCP exceeded regulatory criteria. DBCP was detected at concentrations ranging from 2 to 620 μg/kg in the wall and at the bottom of the excavation of Anomaly 4 during the IRA. These concentrations exceed the U.S. EPA Region III RBC of 0.61 μg/kg for leaching from soil to groundwater. However, the lowest DBCP concentration which current analytical methods can measure with confidence is 2 μg/kg and, therefore, this value was retained as a clean-up goal. No PCBs were detected in subsurface soil.

Eighteen inorganic compounds were detected in subsurface soil samples. The most prevalent were aluminum, barium, calcium, chromium, iron, lead, magnesium, manganese, vanadium, and zinc, which were detected in all 9 samples. Calcium, chromium, iron, and vanadium exceeded the Hi-Cut values but not regulatory standards. Only arsenic, detected in 10 of 11 samples at concentrations ranging from 0.79 mg/kg to 449 mg/kg, exceeded both the Hi-Cut value of 2.1 mg/kg and the FDEP guidance value of 29 mg/kg for the remediation of brownfield sites.

Locations of detections of compounds with subsurface soil concentrations in excess of regulatory standards are illustrated on Figure 2-6. DBCP and arsenic are identified as human health COCs in subsurface soil.

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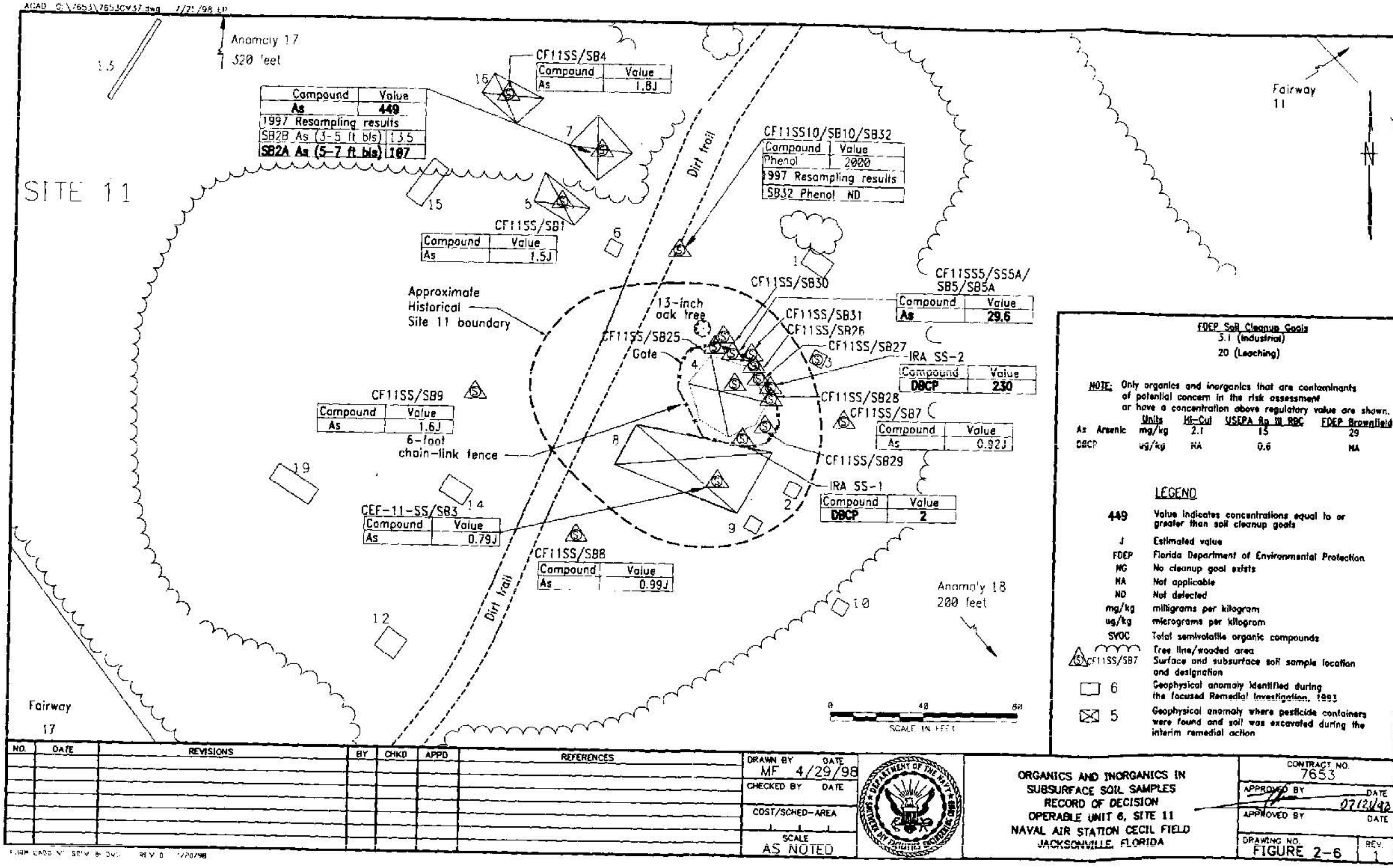
SITE 11
Anomaly 17
520 feet
CF11SS/SB4
Compound | Value
As | 1.8J
Compound | Value
As | 449
1997 Resampling results
SB2B As (3-5 ft bls) | 13.5
SB2A As (5-7 ft bls) | 107
CF11SS10/SB10/SB32
Compound | Value
Phenol | 2000
1997 Resampling results
SB32 Phenol ND
Dirt trail
CF11SS/SB1
Compound | Value
As | 1.5J
Fairway
11
Approximate
Historical
Site 11 boundary
13-inch
oak tree
CF11SS/SB30
CF11SS5/SS5A/
SB5/SB5A
Compound | Value
As | 29.6
CF11SS/SB31
CF11SS/SB26
CF11SS/SB25
Gate
CF11SS/SB27
IRA SS-2
Compound | Value
DBCP | 230
CF11SS/SB9
Compound | Value
As | 1.6J
6-foot
chain-link fence
CF11SS/SB28
CF11SS/SB7
Compound | Value
As | 0.92J
CF11SS/SB29
IRA SS-1
Compound | Value
DBCP | 2
CEF-11-SS/SB3
Compound | Value
As | 0.79J
CF11SS/SB8
Compound | Value
As | 0.99J
Dirt trail
Anomaly 18
200 feet
Fairway
17
SCALE IN FEET
FDEP Soil Cleanup Goals
5.1 (Industrial)
20 (Leaching)
NOTE: Only organics and inorganics that are contaminants of potential concern in the risk assessment or have a concentration above regulatory value are shown.
Units | Hi-Cut | USEPA Rg III RBC | FDEP Brownfield
As Arsenic | mg/kg | 2.1 | 15 | 29
DBCP | ug/kg | NA | 0.6 | NA
LEGEND
449 Value indicates concentrations equal to or greater than soil cleanup goals
J Estimated value
FDEP Florida Department of Environmental Protection
NG No cleanup goal exists
NA Not applicable
ND Not detected
mg/kg milligrams per kilogram
ug/kg micrograms per kilogram
SVOC Total semivolatile organic compounds
Tree line/wooded area
CF11SS/SB7 Surface and subsurface soil sample location and designation
6 Geophysical anomaly identified during the focused Remedial Investigation, 1993
5 Geophysical anomaly where pesticide containers were found and soil was excavated during the interim remedial action
NO. | DATE | REVISIONS | BY | CHKD | APPD | REFERENCES
DRAWN BY MF DATE 4/29/98
CHECKED BY DATE
COST/SCHED-AREA
SCALE AS NOTED
ORGANICS AND INORGANICS IN SUBSURFACE SOIL SAMPLES
RECORD OF DECISION
OPERABLE UNIT 6, SITE 11
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA
CONTRACT NO. 7653
APPROVED BY DATE 07/21/98
APPROVED BY DATE
DRAWING NO. FIGURE 2-6
REV. 1

Groundwater

Only one VOC, acetone, was detected in the groundwater samples at a concentration of 3 μg/L, which does not exceed the FDEP drinking water standard of 700 μg/L.

Two SVOCs, bis(2-ethylhexyl)phthalate and phenol, were detected in groundwater samples. Neither of the two detections of bis(2-ethylhexyl)phthalate (both at 2 μg/L) exceed the FDEP drinking water standard of 6 μg/L. Phenol was detected in one sample at a concentration of 49 μg/L, which exceeds the FDEP drinking water standard of 10 μg/L.

Three pesticides, DBCP, heptachlor epoxide, and 4,4'-DDT, were detected in groundwater. DBCP was detected in a single sample at a concentration of 8.9 μg/L, which exceeds the FDEP drinking water standard of 0.2 μg/L. Heptachlor epoxide was detected in a single sample at a concentration of 0.0016 μg/L, which slightly exceeds the U.S. EPA Region III Risk-Based Concentration (RBC) of 0.0012 μg/L but does not exceed the FDEP drinking water standard of 0.2 μg/L. Neither of the two detections of 4,4'-DDT (0.019 μg/L and 0.0024 μg/L) exceed the FDEP drinking water standard of 0.1 μg/L

Eighteen inorganic compounds were detected in groundwater. The most prevalent were aluminum, barium, calcium, iron, lead, magnesium, manganese, potassium, sodium, thallium, and zinc, which were detected in all 6 samples. Only barium and sodium slightly exceeded Hi-Cut values but not the FDEP drinking water standards.

Locations of detections of compounds with groundwater concentrations in excess of regulatory standards are illustrated on Figure 2-7. Phenol and DBCP are identified as human health COCs in groundwater.

2.6 SUMMARY OF SITE RISKS

This section summarizes the results of the BRA included in the RI report (ABB-ES, 1997), which provides the basis for taking action and indicates the exposure pathways to be addressed by the RA. This BRA indicates that unacceptable human health risks could exist if no action is taken at the site. No unacceptable ecological risks were identified at Site 11.

Human health risks are estimated for both cancer and non-cancer risks in accordance with the NCP. The NCP establishes an acceptable ELCR target range of 1 in 1,000,000 (1E-06) to 1 in 10,000 (1E-04) (U.S. EPA, 1990). The NCP also establishes an acceptable non-cancer Hazard Index (HI) threshold value of

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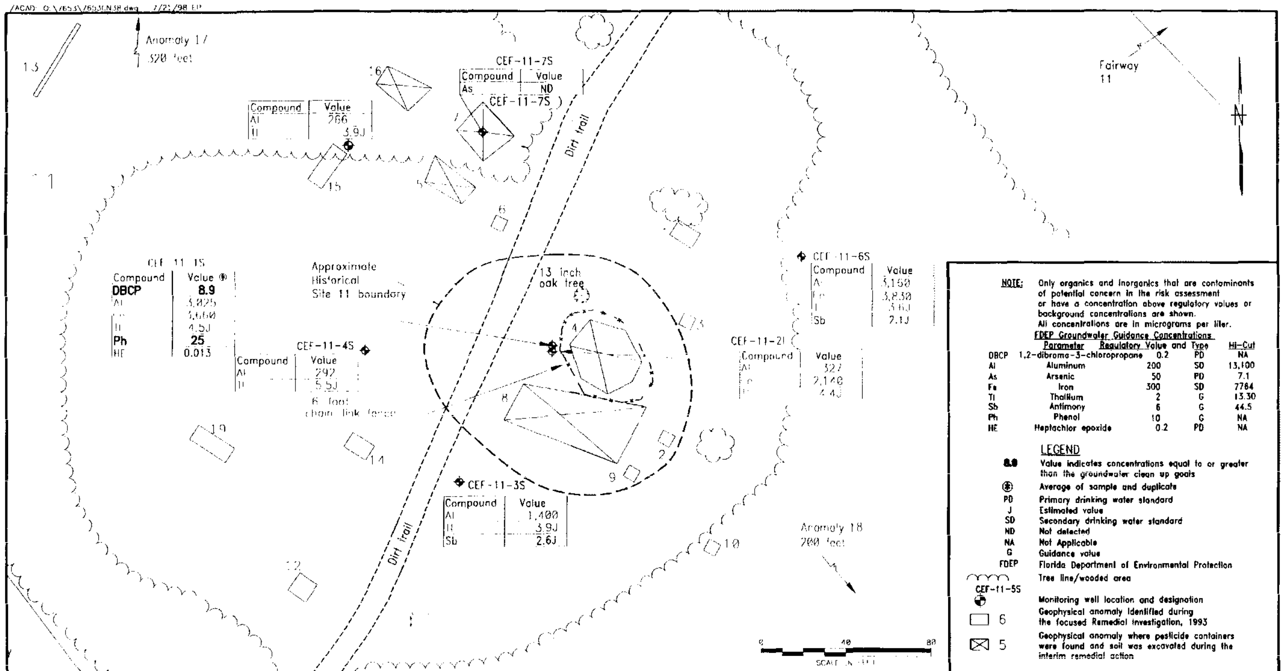

NOTE: Only organics and inorganics that are contaminants of potential concern in the risk assessment or have a concentration above regulatory values or background concentrations are shown.
All concentrations are in micrograms per liter.

FDEP Groundwater Guidance Concentrations

	Parameter	Regulatory Value	and Type	Hi-Cut
DBCP	1,2-dibromo-3-chloropropane	0.2	PD	NA
Al	Aluminum	200	SD	13,100
As	Arsenic	50	PD	7.1
Fe	Iron	300	SD	7784
Tl	Thallium	2	G	13.30
Sb	Antimony	6	G	44.5
Ph	Phenol	10	G	NA
HE	Heptachlor epoxide	0.2	PD	NA

LEGEND

- **8.9** Value indicates concentrations equal to or greater than the groundwater clean up goals
- (*) Average of sample and duplicate
- PD Primary drinking water standard
- J Estimated value
- SD Secondary drinking water standard
- ND Not detected
- NA Not Applicable
- G Guidance value
- FDEP Florida Department of Environmental Protection
- Tree line/wooded area
- CEF-11-5S Monitoring well location and designation
- 6 Geophysical anomaly identified during the focused Remedial investigation, 1993
- 5 Geophysical anomaly where pesticide containers were found and soil was excavated during the interim remedial action

SCALE IN FEET

NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

DRAWN BY MF DATE 4/29/98
CHECKED BY DATE
COST/SCHED-AREA
SCALE AS NOTED

ORGANIC AND INORGANIC DETECTIONS IN GROUNDWATER
RECORD OF DECISION
OPERABLE UNIT 6, SITE 11
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

CONTRACT NO. 7653
APPROVED BY DATE 07/23/98
APPROVED BY DATE
DRAWING NO. FIGURE 2-7 REV. 1

1.0 or less. The State of Florida establishes acceptable ELCR and non-cancer HI threshold values of 1E-06 or less and 1.0 or less, respectively.

Human health risks are summarized on Table 2-1.

Under the current land use scenario, exposure of all potential human receptors (site maintenance worker and adult and adolescent trespassers) to surface soil results in acceptable human health risks. ELCRs range from 7E-08 for the site maintenance worker to 3E-07for the combined adult and adolescent trespassers. HIs range from 0.001 for the site maintenance worker to 0.005 for the adolescent trespasser. Under the current land use scenario, there is no exposure to subsurface soil and groundwater.

Under the potential future land use scenario, exposure to surface soil of all potential receptors except the future resident (site maintenance, occupational, and excavation workers; adult and adolescent trespassers) would result in acceptable human health risks. ELCRs would range form 3E-08 for the excavation worker to 3E-07 for the combined adult and adolescent trespassers. HIs would range from 0.001 for the site maintenance worker to 0.005 for the adolescent trespasser. Exposure of the future resident to surface soil would also result in acceptable non-cancer risk, with HIs ranging from 0.02 for the adult resident to 0.2 for the child resident. However, exposure of the future resident to surface soil would result in slightly higher than acceptable cancer risks, with a combined adult and child ELCR of 4E-06 which is within the U.S. EPA target range but above the FDEP threshold.

Under the future land use scenario, only the construction worker would be exposed to subsurface soil. Non cancer risks resulting from this exposure would be acceptable with an HI of 0.8. However cancer risks resulting from this exposure would result in a slightly higher than acceptable cancer risk, with an ELCR of 5E-06 which is within the U.S. EPA target range but above the FDEP threshold.

Under the future land use scenario, adult and child resident could be exposed to groundwater from the surficial aquifer. Cancer and non-cancer risks resulting from this exposure would not be acceptable, with a combined adult and child ELCR of 5E-05 and HIs ranging from 2.0 for the adult to 4.0 for the child.

2.7 DESCRIPTION OF ALTERNATIVES

This section provides a narrative of each alternative evaluated. Alternatives were developed for soil (combined surface and subsurface) and groundwater. The FS for Site 11 (ABB-ES, 1998) provides additional information on the remedial alternatives.

TABLE 2-1

SUMMARY OF HUMAN HEALTH RISKS
OPERABLE UNIT 6, SITE 11
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

Medium	Risks Above U.S. EPA Risk Range[1]?		Risks Above FDEP Risk Threshold[2]?		Contaminant Concentrations Above Cleanup Goals?
	Current Land Use[3]	Future Land Use[4]	Current Land Use[3]	Future Land Use[4]	
Surface Soil	No	No	No	Yes[5]	Yes[6]
Subsurface Soil	NA	No	NA	Yes[7]	Yes[8]
Groundwater	NA	Yes[9]	NA	Yes[9]	Yes[10]

NOTES:

NA Not Applicable

(1) U.S. EPA has established an acceptable ELCR range of 1E-06 to 1E-04 (U.S. EPA, 1990b) and a maximum non-carcinogen HI of 1.0.

(2) FDEP has established an acceptable ELCR threshold of 1E-06 and a maximum non-carcinogen HI of 1.0.

(3) Current land use is non-residential. Exposure scenarios include exposure of site maintenance workers, occupational workers, and trespassers (adult and adolescent) to surface soil. There is no exposure to subsurface soil or groundwater under current land use.

(4) Potential future land use includes residential development. Exposure scenarios include exposure of site maintenance workers, occupational workers, excavation workers, trespassers (adult and adolescent), and resident (adult and child) to surface. Exposure scenarios also include exposure of excavation workers to subsurface soil and exposure of residents (adult and child) to groundwater.

(5) Under potential future land use, expösure of the resident to surface soil would result in an ELCR of 4E-06..

(6) The maximum concentration of arsenic (5.7 mg/kg) exceeds the FDEP residential SCG of 0.7 mg/kg and the Hi-Cut value of 2.1 mg/kg.

(7) Under potential future land use, exposure of the excavation worker to subsurface soil would result in an ELCR of 6E-06.

(8) The maximum concentration of DBCP (620 µg/kg) exceeds the U.S. EPA Region II RBC of 0.61 µg/kg and the maximum concentration of arsenic (449 mg/kg) exceeds the FDEP guidance value of 29 mg/kg for the remediation of brownfield sites.

(9) Under potential future land use, exposure of the resident to groundwater would result in an ELCR of 5E-05 and a non-carcinogenic HI ranging from 2.0 (adult) to 4.0 (child)

(10) The maximum concentrations of DBCP (8.9 µg/L) and phenol (49 µg/L) exceed their respective FDEP drinking water standards of 0.2 µg/L and 10 µg/L.

2.7.1 **<u>Soil Alternatives</u>**

Three alternatives were developed and analyzed for soil at Site 11. These include Alternative S-1: No Action; Alternative S-2: Limited Action; and Alternative S-3: Excavation and Disposal.

Alternative S-1: No Action

Evaluation of the No Action alternative is required by law to provide a baseline against which other alternatives can be compared. Under this alternative, soil would remain in place and contaminant concentrations would only be reduced through long-term natural attenuation. No controls would be implemented to reduce risks to human receptors. This alternative would not be protective of human health as risks from direct exposure to contaminated soil would continue to exist as well as the risks which could result from migration of contaminants from the soil. This alternative would not achieve the RAOs and, although there are no ARARs for soil at this site, contaminant concentrations would continue to exceed cleanup goals. There would be no reduction of contaminant mobility and reduction in toxicity and volume would only occur through long-term natural attenuation and would not be monitored. Because no remedial action would take place, this alternative would not result in any short-term risks and would be very easy to implement. There would be no cost associated with this alternative.

Alternative S-2: Limited Action

Under this alternative, limited action would be taken to reduce risk to human receptors. Site access would be restricted by fencing, site conditions would be monitored to determine the degree of contaminant removal achieved through long-term natural attenuation, administrative measures, such as deed restrictions, would be implemented to restrict future land use, and 5-year reviews would be performed to determine whether continued implementation of this alternative is appropriate.

This alternative would be partially protective of human health because it would reduce the risk from direct exposure to contaminated soil. However, this alternative would not reduce the risk which could result from migration of contaminants from the soil. This alternative would achieve the RAOs and, although contaminant concentrations would continue to exceed cleanup goals in the short-term, monitoring of site conditions would allow determination of long-term compliance through natural attenuation. There would be no reduction of contaminant mobility, but monitoring of site conditions would determine the reduction of contaminant toxicity achieved through long-term natural attenuation. There would be minimal short-term risk associated with the performance of site monitoring activities, which would be addressed through compliance with appropriate health and safety procedures. All of the activities for this alternative would be easy to perform, but their continued implementation, especially after the site is no longer under military control, would require careful oversight. The present-worth cost of this alternative would be approximately $327,000.

Alternative S-3: Excavation and Disposal

Under this alternative, approximately 267 yd^3 of soil with contaminant concentrations in excess of cleanup goals would be excavated and disposed at a permitted off-site landfill. Depending on the results of RCRA hazardous characteristic testing conducted on the excavated soil, the off-site facility would be either RCRA Subtitle C (hazardous) or Subtitle D (non-hazardous) permitted. Excavated areas would be backfilled with clean soil, graded, and revegetated.

This alternative would be protective of human health by eliminating the risks from direct exposure to contaminated soil as well as the risks which could result from migration of contaminants from the soil. This alternative would achieve the RAOs and comply with the cleanup goals and all action-specific ARARs. Contaminant toxicity and volume would not be reduced but, to the extent that the offsite landfill is properly maintained, contaminant mobility would be permanently and irreversibly reduced. There would be some short-term risks to construction workers during the excavation of contaminated soil, to the surrounding community during the off-site transportation of contaminated soil, and to the disposal facility workers during the disposal of the contaminated soil. All of these risks would be addressed by the implementation of proper engineering controls and compliance with appropriate health and safety procedures. This alternative would require approximately one month to complete. This alternative would be relatively easy to implement and the necessary excavation and transportation contractors and disposal facilities are readily available. The present-worth cost of this alternative would range from approximately $153,000 to approximately $318,000, depending on the amount of excavated soil that needs to be disposed as RCRA-hazardous.

2.7.2 Groundwater Alternatives

Six alternatives were developed and analyzed for Site 11 groundwater contamination. These include Alternative GW-1: No Action; Alternative GW-2: Limited Action; Alternative GW-3: Groundwater Extraction and Treatment; Alternative GW-4: Insitu Enhanced Biological Treatment; Alternative GW-5: Insitu Air Sparging; and Alternative GW-6: Recirculation Well.

Alternative GW-1: No Action

Evaluation of the No Action alternative is required by law to provide a baseline against which other alternatives can be compared. Under this alternative, no remedial activities would occur to address groundwater contamination, and contaminant concentrations would only be reduced through long-term natural attenuation. No controls would be implemented to reduce risks to human receptors.

This alternative would not be protective of human health because risks from direct exposure to contaminated groundwater would continue to exist. This alternative would not achieve the RAOs or comply with ARARs. There would be no reduction of contaminant mobility, and reduction in toxicity and volume would only occur through long-term natural attenuation and would not be monitored. Because no remedial action would take place, this alternative would not result in any short-term risks and would be very easy to implement. There would be no cost associated with this alternative.

Alternative GW-2: Limited Action

Under this alternative, limited action would be taken to reduce risk to human receptors. Groundwater would be monitored to determine the degree of contaminant removal achieved through long-term natural attenuation, administrative measures, such as deed restrictions, would be implemented to restrict land use and prevent use of the surficial aquifer groundwater. Site reviews would be conducted every 5 years to determine whether continued implementation of this alternative is appropriate.

This alternative would be protective of human health because it would reduce the risk from direct exposure to contaminated groundwater. This alternative would achieve the RAOs, and groundwater monitoring would allow determination of long-term compliance with ARARs through natural attenuation of residual contaminants. There would be no reduction of contaminant mobility, but groundwater monitoring would determine the reduction of contaminant toxicity achieved through long-term natural attenuation. There would be minimal short-term risk associated with the performance of groundwater monitoring activities, which would be addressed through compliance with appropriate health and safety procedures. Based on the results of natural attenuation modeling and assuming removal of contaminated soil from the site as per Alternative S-3, it is estimated that the DBCP cleanup goal would be met within approximately 10 years. All of the activities for this alternative would be easy to perform, but their continued implementation, especially after the site is no longer under military control, would require careful oversight. The present-worth cost of this alternative would be approximately $252,000.

Alternative GW-3: Groundwater Extraction and Treatment

Under this alternative, contaminated groundwater would be extracted from the surficial aquifer, treated to remove contaminants, and discharged. Groundwater would be extracted from two wells at a combined rate of 4 gallons per minute (gpm). The extracted groundwater would be filtered to remove suspended solids particles, air-stripped to remove DBPC, the main contributor to cancer risk, and percolated through granular activated carbon (GAC) to remove phenol, the other organic COC. The need for treatment of the air stripping emissions would be determined at the pre-design stage. The treated water would be discharged to an infiltration basin. This alternative would also include groundwater monitoring to evaluate the effectiveness of the remediation process, implementation of administrative measures to prevent groundwater use until compliance with cleanup goals has been achieved.

This alternative would be protective of human health because it would remove COCs from the groundwater and prevent its use until action levels have been met. This alternative would achieve the RAOs and comply with ARARs. There would be a significant, and permanent and irreversible, reduction of contaminant mobility, toxicity, and volume, and groundwater monitoring would determine the rate and effectiveness of this reduction. There would be some short-term risks associated with the construction and operation of the groundwater extraction and treatment system and with the performance of groundwater monitoring activities. These risks would be addressed through implementation of proper engineering controls and compliance with appropriate health and safety procedures. This alternative would achieve compliance with cleanup goals within approximately 2.5 years. This alternative would be relatively easy to implement, and the necessary equipment, materials, and construction contractors are readily available. The present-worth cost of this alternative would be approximately $582,000.

Alternative GW-4: Insitu Enhanced Biological Treatment

Under this alternative, the activity of naturally-occurring microorganisms which degrade groundwater organic contaminants (particularly DBCP) would be enhanced by injecting nutrients (nitrogen and phosphorus compounds) in the surficial aquifer through a network of six wells. Bench-scale treatability studies would be performed to determine optimum nutrient composition. This alternative would also include groundwater monitoring to evaluate the rate of biodegradation, implementation of administrative measures to prevent groundwater use until compliance with cleanup goals has been achieved, and performance of 5-year reviews to determine whether continued implementation of this alternative is appropriate.

This alternative would be protective of human health because it would biodegrade DBCP, which is the major cancer risk contributor for groundwater, and phenol. This alternative would also prevent groundwater use until action levels have been met and would achieve the RAOs and comply with ARARs. There would be a significant, and permanent and irreversible, reduction of contaminant mobility, toxicity, and volume through biodegradation. Groundwater monitoring would determine the rate and effectiveness of this reduction. There would be minimal short-term risk associated with the installation and operation of the nutrient injection system and with the performance of groundwater monitoring activities. These risks would be addressed through implementation of proper engineering controls and compliance with appropriate health and safety procedures. This alternative would achieve compliance with cleanup goals within approximately 10 years. This alternative would be relatively easy to implement, and the necessary equipment, materials, and construction contractors are readily available. The present-worth cost of this alternative would be approximately $798,000.

Alternative GW-5: Insitu Air Sparging

Under this alternative, a blower would inject a total of approximately 26 cubic feet per minute (cfm) of air into the surficial aquifer through two wells, and a vacuum pump would extract vapors from two trenches installed in the unsaturated zone. These trenches would be covered with a low-permeability barrier to minimize short-circuiting of the air flow. This would induce a current of air bubbles through the groundwater which would volatilize organic contaminants, particularly DBCP. The extracted vapors would be treated above ground through GAC adsorption for removal of the volatilized organic contaminants. This alternative would also include groundwater monitoring to evaluate the rate of biodegradation, implementation of administrative measures to prevent groundwater use until compliance with cleanup goals has been achieved.

This alternative would be protective of human health because it would remove DBCP from the groundwater and prevent groundwater use until action levels have been met. This alternative would achieve the RAOs and comply with ARARs. There would be a significant and permanent and irreversible reduction of contaminant mobility, toxicity, and volume through volatilization, GAC adsorption, and spent GAC regeneration or incineration. Groundwater monitoring would determine the rate and effectiveness of this reduction. There would be some short-term risks associated with the installation and operation of the air injection and vapor extraction and treatment system and with the performance of groundwater monitoring activities. These risks would be addressed through implementation of proper engineering controls and compliance with appropriate health and safety procedures. This alternative would achieve compliance with cleanup goals within approximately 2.5 years. This alternative would be relatively easy to implement, and the necessary equipment, materials, and construction contractors are readily available. The present-worth cost of this alternative would be approximately $651,000.

Alternative GW-6: Recirculation Well

Under this alternative, organic contaminants, particularly DBCP, would be air stripped insitu, within a specially-designed well which recirculates groundwater entirely beneath the ground. A single recirculation well would be used equipped with submersible pumps to induce an internal groundwater flow of 2 gpm and with a regenerative vacuum pump to induce an internal negative air flow of 13 cfm. The extracted vapors would be treated above ground through GAC adsorption for removal of the volatilized organic contaminants. This alternative would also include groundwater monitoring to evaluate the rate of biodegradation, implementation of administrative measures to prevent groundwater use until compliance with cleanup goals has been achieved, and performance of 5-year reviews to determine whether continued implementation of this alternative is appropriate.

This alternative would be protective of human health because it would remove DBCP from the groundwater and prevent groundwater use until action levels have been met. This alternative would achieve the RAOs and comply with ARARs. There would be a significant and permanent and irreversible reduction of contaminant mobility, toxicity, and volume through volatilization, GAC adsorption, and spent GAC regeneration or incineration. Groundwater monitoring would determine the rate and effectiveness of this reduction. There would be some short-term risks associated with the installation and operation of recirculation well and associated vapor treatment system and with the performance of groundwater monitoring activities. These risks would be addressed through implementation of proper engineering controls and compliance with appropriate health and safety procedures. This alternative would achieve compliance within approximately 14 years. In situ air stripping is a relatively innovative technology, and only a few full-scale recirculation well systems have been installed at hazardous waste sites, and the number of vendors providing this equipment is limited. Fouling, due to iron oxidation and precipitation within the well, may occur and interfere with the efficient operation of the system. The present-worth cost of this alternative would be approximately $714,000.

2.8 SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

This section evaluates and compares the alternatives with respect to the nine criteria outlined in Section 300.430(s) of the NCP (U.S. EPA, 1990). These criteria are categorized as threshold, primarily balancing, and modifying. Table 2-2 lists and explains these evaluation criteria.

A detailed comparative analysis of the alternatives using the nine criteria was performed as part of the FS (ABB-ES, 1998). This analysis was used to identify preferred remedies for Site 11 in the Proposed Plan (B&R Environmental, 1998). Table 2-3 presents a summary of the comparative analysis of alternatives.

TABLE 2-2

EXPLANATION OF ALTERNATIVE EVALUATION CRITERIA
RECORD OF DECISION-SITE 11, OPERABLE UNIT 6
NAS CECIL FIELD, JACKSONVILLE, FLORIDA

Criteria	Description
Threshold	**Overall Protection of Human Health and the Environment.** This criterion evaluates the degree to which each alternative eliminates, reduces, or controls threats to human health and the environment through treatment, engineering methods, or institutional controls (e.g., access restrictions). **Compliance with State and Federal Regulations.** The alternatives are evaluated for compliance with environmental protection regulations determined to be applicable or relevant and appropriate to the site conditions.
Primary Balancing	**Long-Term Effectiveness and Permanence.** The alternatives are evaluated based on their ability to maintain reliable protection of human health and the environment after implementation. **Reduction of Contaminant Toxicity, Mobility, and Volume Through Treatment.** Each alternative is evaluated based on how it reduces the harmful nature of the contaminants, their ability to move through the environment, and the amount of contamination using treatment. **Short-Term Effectiveness.** The risks that implementation of a particular remedy may pose to workers and nearby residents (e.g., whether or not contaminated dust will be produces during excavation), as well as the reduction in risks that results by controlling the contaminants, are assessed. The length of time needed to implement each alternative is also considered. **Implementability.** Both the technical feasibility and administrative ease (e.g., the amount of coordination with other government agencies needed) of a remedy, including availability of necessary goods, and services, are assessed. **Cost.** The benefits of implementing a particular alternative are weighted against the cost of implementation.
Modifying	**U.S. Environmental Protection Agency (U.S. EPA) and Florida Department of Environmental Protection (FDEP) Acceptance.** The final Feasibility Study and the Proposed Plan, which are placed in the Information Repository, represent a consensus by the Navy, USEPA, and FDEP. **Community Acceptance.** The Navy assesses community acceptance of the preferred alternative by giving the public and opportunity to comment on the remedy selection process and the preferred alternative and then responds to those comments.

TABLE 2-3

SUMMARY OF COMPARATIVE EVALUATION OF ALTERNATIVES
RECORD OF DECISION, OPERABLE UNIT 6, SITE 11
NAS CECIL FIELD, JACKSONVILLE, FLORIDA
PAGE 1 OF 2

	Threshold Criteria		Primary Balancing Criteria				
Alternatives	**Overall Protection of Human Health & the Environment**	**Compliance with ARARs & TBCs**	**Long-Term Effectiveness & Permanence**	**Reduction in Contaminant Toxicity, Mobility, & Volume**	**Short-Term Effectiveness**	**Implementability**	**Cost (Present Worth)**
Soil S-1: No Action	Would not protect human health.	No ARARs. Chemical-specific TBCs would not be met.	Would not be long-term effective.	Would not reduce contaminant mobility. Natural reduction in toxicity and volume would not be monitored.	Would create no short-term risks.	No action to implement	$0
Soil S-2: Limited Action	Would protect human health by preventing exposure to contaminated soil.	No ARARs. Eventual compliance with chemical-specific TBCs would be determined by monitoring.	Would be long-term effective.	Would not reduce contaminant mobility. Natural reduction in toxicity and volume would be monitored.	Would create minimal and manageable short-term risks. Would require 30+ years to complete	Would be easy to implement. Would require careful oversight after facility comes under civilian control.	$327,000
Soil S-3: Excavation & Disposal	Would protect human health through removal of contaminated soil.	Action-specific ARARs and chemical-specific TBCs would be met.	Would be long-term effective.	Would reduce contaminant mobility. Would not reduce toxicity and volume.	Would create significant but manageable short-term risks. Would require 1 month to complete.	Would be easy to implement.	$153,000 (non-hazardous) to $318,000 (hazardous)
Groundwater GW-1: No Action	Would not protect human health.	Would not meet chemical-specific ARARs.	Would not be long-term effective.	Would not reduce contaminant mobility. Natural reduction in volume and toxicity would not be monitored.	Would create no short-term risks.	No action to implement	$0
Groundwater GW-2: Limited Action	Would protect human health by preventing exposure to contaminated groundwater.	Eventual compliance with chemical-specific ARARs would be determined by monitoring.	Would be long-term effective.	Would not reduce contaminant mobility. Natural reduction in toxicity and volume would be monitored.	Would create minimal and manageable short-term risks. Would require 10 years to complete.	Would be easy to implement. Would require careful oversight once facility comes under civilian control.	$252,000

TABLE 2-3

SUMMARY OF COMPARATIVE EVALUATION OF ALTERNATIVES
RECORD OF DECISION, OPERABLE UNIT 6, SITE 11
NAS CECIL FIELD, JACKSONVILLE, FLORIDA
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Alternatives	Threshold Criteria		Primary Balancing Criteria				
	Overall Protection of Human Health & the Environment	**Compliance with ARARs & TBCs**	**Long-Term Effectiveness & Permanence**	**Reduction in Contaminant Toxicity, Mobility, & Volume**	**Short-Term Effectiveness**	**Implementability**	**Cost (Present Worth)**
Groundwater GW-3: Extraction & Treatment	Would protect human health by removal and treatment of contaminated groundwater.	Would meet ARARs.	Would be long-term effective.	Would reduce contaminant mobility, toxicity and volume.	Would create significant but manageable short-term risks. Would require 2.5 years to complete	Would be relatively easy to implement.	$582,000
Groundwater GW-4: In-Situ Enhanced Biological Treatment	Would protect human health by removal and treatment of contaminated groundwater.	Would meet ARARs.	Would be long-term effective.	Would reduce contaminant mobility, toxicity and volume.	Would create minimal and manageable short-term risks. Would require 10 years to complete	Would be relatively easy to implement. Would require treatability testing to verify effectiveness.	$798,000
Groundwater GW-5: In-Situ Air Sparging	Would protect human health by removal and treatment of contaminated groundwater.	Would meet ARARs.	Would be long-term effective.	Would reduce contaminant mobility, toxicity and volume.	Would create minimal and manageable short-term risks. Would require 2.5 years to complete	Would be relatively easy to implement.	$651,000
Groundwater GW-6: Recirculation Well	Would protect human health by removal and treatment of contaminated groundwater.	Would meet ARARs.	Would be long-term effective.	Would reduce contaminant mobility, toxicity and volume.	Would some manageable short-term risks. Would require 14 years to complete	Would be relatively easy to implement. However, due to innovative nature, vendor availability would be limited.	$714,000

NOTE:

Shading identifies the selected remedies.

2.9 SELECTED REMEDIES

Based upon consideration of the requirements of CERCLA and the NCP, the detailed analysis of alternatives, and regulatory and public comments, two remedies were selected to address soil and groundwater contamination at Site 11. For soil, Alternative S-3: Excavation and Disposal was selected. For groundwater, Alternative GW-2: Limited Action was selected.

2.9.1 Soil

The selected remedy for the Site 11 soil, Excavation and Disposal (S-3), requires removal of soil with concentrations of COPCs in excess of cleanup goals. Excavated soil will be tested for RCRA hazardous characteristics and, depending on the results of this testing, disposed offsite either at a permitted RCRA Subtitle C (hazardous) or Subtitle D (non-hazardous) landfill. The excavated areas will be backfilled with clean soil, graded and revegetated. This remedy will take approximately one month to complete and its estimated present-worth cost ranges from approximately $153,000 to approximately $318,000, depending on the amount of excavated soil that needs to be disposed of as RCRA-hazardous.

This remedy was selected because it will rapidly eliminate human health risk from exposure to contaminated soil by removing it from the site. In addition, this remedy will be more effective and permanent than the other soil alternatives evaluated. Finally, because it does not require long-term operation and maintenance, the selected remedy will be easier to implement and less costly than the other soil alternatives evaluated (except No Action).

2.9.2 Groundwater

The selected remedy for Site 11 groundwater, Limited Action (GW-2), will require long-term monitoring of groundwater and implementation of institutional controls.

Long-term groundwater monitoring will consist of regular sampling of four newly installed wells and one existing well strategically located to allow detection of potential migration of contaminants.

Institutional controls will consist of administrative measures to prevent exposure of human receptors to the groundwater in the surficial aquifer. Use of the groundwater will be controlled through deed restrictions and/or land use plans. A formal request will be made to the agency administrating the well installation permit program in Duval County to not issue permits for installation of drinking water wells which would pump water from the surficial aquifer.

This remedy will require 10 years and reviews will be performed every 5 years to determine the continued appropriateness of the remedy and to verify the continued implementation of institutional controls. If the results from one of these 5-year reviews show this remedy not to be adequate, one of the more aggressive remedial alternatives (GW-3: Extraction and Treatment or GW-5: In-situ Air Sparging) will be selected as a contingency remedy. The estimated present-worth cost of this remedy is approximately $252,000.

This remedy was selected because no human receptors are currently subjected to unacceptable health risk from exposure to contaminated groundwater. The areal extent of the contaminant plume is limited (approximately 100 feet by 60 feet) and the thickness of the surficial aquifer is less than 20 feet, which does not create an imminent threat to the environment. This remedy will effectively prevent a future scenario under which unacceptable human health risks could occur, i.e., long-term ingestion of contaminated groundwater by residents. In addition, this remedy will monitor the rate at which contaminants are being removed through natural attenuation and determine when action levels are met.

2.10 STATUTORY DETERMINATIONS

The remedies selected for Site 11 are consistent with CERCLA and the NCP. The selected remedies provide protection of human health and the environment, comply with ARARs, and are cost-effective. Table 2-4 lists the Federal and State ARARs with which the selected remedies must comply. The selected remedies utilize permanent solutions and alternative treatment technologies to the maximum extent practicable and they satisfy the statutory preference for remedies that reduce contaminant toxicity, mobility, or volume as a principal element. The selected remedies also provide flexibility to implement additional remedial measures, if necessary, to attain RAOs or address unforeseen issues.

2.11 DOCUMENTATION OF SIGNIFICANT CHANGES

The Proposed Plan for Site 11 (B&R Environmental, 1998) was released for public comments in March 1998. No public comment were received. The Proposed Plan contains the remedial alternatives which were selected for soil and groundwater remediation: Alternative S-3: Excavation and Disposal of contaminated soil and Alternative GW-2: Limited Action for groundwater remediation. No significant changes to the remedies, as identified in the Proposed Plan, were necessary.

TABLE 2-4

SYNOPSIS OF FEDERAL AND STATE REGULATORY REQUIREMENTS
RECORD OF DECISION, SITE 11, OPERABLE UNIT 6
NAS CECIL FIELD,JACKSONVILLE, FLORIDA
PAGE 1 OF 2

Name and Regulatory Citation	Description	Consideration in the Remedial Action Process	Type
Resource Conservation and Recovery Act (RCRA Regulations, Identification and Listing of Hazardous Wastes (40 CFR Part 261)	Defines the listed and characteristic hazardous wastes subject to RCRA. Appendix II contains the Toxicity Characteristic Leaching Procedure	These regulations would apply when determining whether or not waste onsite is hazardous, either by being listed or exhibiting a hazardous characteristic, as described in the regulations.	Chemical-Specific Action Specific
Endangered Species Act Regulations (50 CFR Parts 81, 225, 402)	Requires Federal agencies to take action to avoid jeapardizing the continued existence of federally listed endangered or threatened species.	If a site investigation or remedial activity potentially could affect endangered species or their habitat, these regulations would apply.	Location-Specific
RCRA Regulations, Land Disposal Restrictions (40 CFR Part 268)	Prohibits the land disposal of untreated hazardous wastes and provides standards for treament of hazardous waste prior to land disposal.	Remedial actions that involve excavating hazardous soil, treating, and redepositing it requires compliance with land disposal restriction (LDRs)	Action-Specific
Florida Hazardous Waste Rules (FAC, 62-730)	Adopts by reference sections of the Federal hazardous waste regulations and establishes minor additions to these regulations concerning the generation, storage, treatment, transportation and disposal of hazardous wastes.	These regulations would apply if waste is deemed hazardous and needs to be stored, transported, or disposed of.	Action-Specific
Safe Drinking Water Act (SDWA) Regualtions, Maximum Contaminant Levels (40CFR Part 131)	Establishes enforceable standards for potable water for specific contaminants that have been determined to adversely effect human health.	MCLs can be used as protective levels for groundwater or surface waters that are current or potential drinking water sources.	Chemical-Specific

TABLE 2-4

SYNOPSIS OF FEDERAL AND STATE REGUALTORY REQUIREMENTS
RECORD OF DESIGN, SITE11, OPERABLE UNIT 6
NAS CECIL FIELD, JACKSONVILLE, FLORDIA

Name and Regulatory	Description	Consideration in the Remedial Action Process	Type
Florida Groundwater Classes, Standards and Exemptions(FAC, 62-520)	Designates the groundwaters of the state into five classes and establishes minimum "free from" criteria. Rule also specifies that classes I & II must meet the primary and secondary drinking water standards listed in Chapter 62-550	These regulations may be used to determine cleanup levels for groundwater that are potential sources of drinking water.	Chemical-Specific
Florida Soil Cleanup Standards, September 1995	Provides guidance for soil cleanup levels that can be developed on a site-by-site basis using the calculations found in Appendix B of the guidance.	These guidelines aid in determining leachability based cleanup goals for soils.	Chemical-Specific Guidance
Florida Drinking Water Standards (FAC, 62-550)	Adopts Federal primary and secondary drinking water standards	These regulation apply to remedial activities that involve discharges to potential sources of drinking water.	Chemical-Specific
Florida Groundwater Guidance, Bureau of Groundwater Protection, June 1994	Provides maximum concentration levels of contaminants for groundwater in the State of Florida. Groundwater with concentrations less than the listed values are considered "free from" contamination.	The values in the guidance should be considered when determining cleanup levels for groundwater. FDEP considers them ARARs for cleanup.	Chemical-Specific Guidance

Notes:
OU = Operable Unit.
CFR = Code of Federal Regulations.
LDR = land disposal restriction.
FAC = Florida Administrative Code.
MCL = maximum contaminant level.

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