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NAS CECIL FIELD
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RECORD OF DECISION FOR OPERABLE UNIT 2 NAS CECIL FIELD FL
9/1/1995
ABB ENVIRONMENTAL SERVICES INC

NASCF Jacksonville
N60200_000011
9/11/1995

RECORD OF DECISION
OPERABLE UNIT 2

NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

UNIT IDENTIFICATION CODE: N60207
CONTRACT NO.: N62467-89-D-0317/090

SEPTEMBER 1995

SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
NORTH CHARLESTON, SOUTH CAROLINA
29419-9010

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RECORD OF DECISION
OPERABLE UNIT 2

NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

Unit Identification Code: N60200

Contract No. N62467-89-D-0317/090

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September 1995

RECORD OF DECISION
OPERABLE UNIT 3

NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

Unit Identification Code: N00260

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September 1996

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-0317/031 are complete and accurate and comply with all requirements of this contract.

DATE: September 27, 1995

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(DFAR 252.227-7036)

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Operable Unit 2
Naval Air Station Cecil Field
Jacksonville, Florida

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GLOSSARY

ARAR	applicable or relevant and appropriate requirement
bls	below land surface
β-HCH	beta-hexachlorocyclohexane
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CNO	Chief of Naval Operations
ECPCs	ecological contaminants of potential concern
FAC	Florida Administrative Code
FS	feasibility study
IAS	Initial Assessment Study
IRA	interim remedial action
IROD	Interim Record of Decision
$\mu g/\ell$	micrograms per liter
mg/kg	milligrams per kilogram
mg/ℓ	milligrams per liter
NAS	Naval Air Station
NCP	National Oil and Hazardous Substances Contingency Plan
O&M	operations and maintenance
OU	Operable Unit
OX	oxidant or oxidation
PAH	polynuclear aromatic hydrocarbon
PCB	polychlorinated biphenyl
RA	risk assessment
RAOs	remedial action objectives
RI	remedial investigation
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act
SVOC	semivolatile organic compound
TCE	trichloroethene
TRPH	total recoverable petroleum hydrocarbons
USEPA	U.S. Environmental Protection Agency
UV	ultraviolet
UV/OX	ultraviolet light and oxidation
VOC	volatile organic compound
yd^3	cubic yard

Glossary

ARAR	applicable or relevant and appropriate requirements
BLM	Bureau Land Management
BTEX	benzene toluene ethylbenzene xylene
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CNO	Chief of Naval Operations
COPCs	ecological contaminants of potential concern
FAC	Florida Administrative Code
FS	Feasibility study
IAC	Initial Assessment Study
IRA	Interim remedial action
IROD	Interim Record of Decision
µg/L	micrograms per liter
µg/kg	milligrams per kilogram
mg/L	milligrams per liter
NAS	Naval Air Station
NCP	National Oil and Hazardous Substances Contingency Plan
O&M	operations and maintenance
OU	Operable Unit
OX	oxidant or oxidation
PAH	polynuclear aromatic hydrocarbons
PCB	polychlorinated biphenyl
RA	risk assessment
RAOs	remedial action objectives
RI	remedial investigation
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act
SVOC	semivolatile organic compound
TCE	trichloroethene
TRPH	total recoverable petroleum hydrocarbons
USEPA	U.S. Environmental Protection Agency
UV	ultraviolet
UV/OX	ultraviolet light and oxidation
VOC	volatile organic compound
yd³	cubic yard

1.0 DECLARATION FOR THE RECORD OF DECISION

1.1 SITE NAME AND LOCATION. Operable Unit (OU) 2 is located in an undeveloped area of the western part of the main base of Naval Air Station (NAS) Cecil Field, Jacksonville, Florida. OU 2 consists of two sites, Site 5, Oil Disposal Area Northwest, and Site 17, Sludge Disposal Pit Southwest. Site 5 is located approximately 1,000 feet west of Lake Fretwell and immediately east of Perimeter Road. Site 17 is located approximately 3,700 feet south of Site 5, approximately 1,600 feet west of Rowell Creek, and immediately east of Perimeter Road. These sites are grouped as an OU because of their close proximity to each other and the flightline and because of the similarity of wastes and disposal practices.

1.2 STATEMENT OF BASIS AND PURPOSE. This decision document presents the selected remedial actions for OU 2, which were chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP, 40 Code of Federal Regulations [CFR] 300). This decision is based on the Administrative Record for OU 2.

The U.S. Environmental Protection Agency (USEPA) and the State of Florida concur with the selected remedies.

1.3 ASSESSMENT OF THE SITE. Actual or threatened releases of hazardous substances from these sites, if not addressed by implementing the response actions selected in this Record of Decision (ROD), may present an imminent and substantial endangerment to public health, welfare, or the environment.

1.4 DESCRIPTION OF THE SELECTED REMEDY. Selected remedies address source control and risk reduction. Remedial activities will address the following media: soil, sediment, and groundwater.

1.4.1 Source Control The selected remedy for source control at OU 2 was addressed in two September 1994 interim RODs (IRODs). Both interim actions are currently ongoing and are the final actions for soil at each site. At Site 5 approximately 16,300 cubic yards (yd^3) of contaminated soil will be excavated and biologically treated in an engineered biocell under controlled conditions (see IROD, Oil Disposal Area Northwest, Site 5, OU 2, NAS Cecil Field, Jacksonville, Florida, September 1994). At Site 17, approximately 9,900 yd^3 of contaminated soil has been excavated and is being thermally treated onsite (not necessarily at Site 17, but within the limits of the facility) in a low temperature thermal desorption unit (see IROD, Oil and Sludge Disposal Area Southwest, Site 17, OU 2, NAS Cecil Field, Jacksonville, Florida, September 1994).

The interim remedial action (IRA) at Site 5 was initiated in March 1995, will cost approximately $3,000,000, and will be completed in the fall of 1997. The interim remedial action at Site 17 was initiated in February 1995, will cost approximately $1,900,000, and will be completed in fall of 1995.

1.4.2 Risk Reduction Risk-reduction alternatives selected for Sites 5 and 17 include sediment excavation and treatment at Site 5 and groundwater treatment at both sites. The selected alternatives for each site include:

Site 5, Sediment treatment, Excavation and Biological Treatment:

- excavate approximately 300 yd^3 of sediment from the drainage ditch south of Site 5,
- excavate the sediment to a depth of approximately 2 feet,
- sample and analyze the excavation area to identify the extent of excavation needed,
- treat the sediment at the existing biological treatment facility,
- backfill the ditch to grade with clean soil, and
- institute temporary land-use restrictions.

Site 5, Groundwater treatment, Air Sparging or *In Situ* Air Stripping and Biological Treatment:

- conduct a performance test of two alternatives, air sparging and *in situ* air stripping and biological treatment;
- install the alternative that performs more effectively after the interim remedial action is completed;
- after the alternative is selected, install remediation wells and associated treatment units and hardware to treat organic contaminants in the groundwater;
- if required, discharge treated water into an infiltration basin;
- monitor treatment to measure effectiveness; and
- institute controls and restrict all usage of groundwater from the surficial aquifer.

Site 17, Groundwater treatment, Natural Attenuation:

- after completion of the interim remedial action, install temporary monitoring wells and sample the shallow groundwater for the contaminants of concern and intrinsic bioremediation parameters to reassess groundwater conditions and the contaminant plume;
- based on analytical groundwater results, establish a monitoring and modeling program to assess the effectiveness of naturally occurring biodegradation, including monitoring wells in the contaminant plume and downgradient of the contaminant plume;

- institute controls and restrict all usage of the groundwater from the surficial aquifer during the life of remedial action;

- evaluate, on a scheduled basis, the effectiveness of natural attenuation; and

- if needed, remediate within the contaminant plume those areas where contaminant concentrations are significantly higher than average concentrations using air sparging or *in situ* air stripping and biological treatment.

(For this ROD, natural attenuation means intrinsic bioremediation. Groundwater on the surficial aquifer at Site 17 will be aggressively monitored for the degradation of contaminants by microorganisms.) The Site 5 sediment alternative is estimated to cost $236,000 and take 4 months to implement. The Site 5 groundwater alternative is estimated to cost $1,650,000 and take 4 years to complete. The Site 17 groundwater alternative is estimated to cost $232,000 and take 15 years to complete. The estimated 15-year period for Site 17 is based on observed trichloroethene (TCE) concentrations and literature-based TCE degradation rates. Details of degradation time are presented in Appendix H of the OU 2 Feasibility Study (FS).

1.5 STATUTORY DETERMINATIONS. The selected remedies are protective of human health and the environment and are cost-effective. The selected remedies for Site 5 comply with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial actions. The nature of the selected remedy for Site 17 is such that contaminant concentrations in groundwater may remain above regulatory standards during the remedial action. As a result, applicable or relevant and appropriate requirements will not be met as a near-term goal. Therefore, compliance with groundwater standards will be a long-term cleanup goal. These remedies utilize permanent solutions and alternative treatment technologies to the maximum extent practicable and satisfy the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element. Because this remedy will result in hazardous substances remaining onsite above health-based levels, a review will be conducted within 5 years after the commencement of remedial actions to ensure that the remedies continue to provide adequate protection of human health and the environment.

1.6 SIGNATURE AND SUPPORT AGENCY ACCEPTANCE OF THE REMEDY.

SMWilson

Stephen M. Wilson, P.E.
Base Realignment and Closure
Environmental Coordinator

9/27/95
Date

Institute contaminant barrier all sides of the groundwater from the artificial aquifer during the life of remedial action;

- evaluate, on a scheduled basis, the effectiveness of natural pressure flow;

- If needed, remediate which the contaminant plume cross under contaminant concentrations are significantly higher than acceptable concentrations using the remedial alternatives and historical cost assessment.

(for this FS) natural attenuation being inadequate historically. Groundwater in the surficial aquifer at Site 17 will be aggressively monitored for the degradation of contaminants by biodegradation. The Site 5 contaminant plume is estimated to cost $[illegible] and take [illegible] years to complete. The Site 17 groundwater alternative is estimated to cost $12,000 and take 15 years to complete. The additional 15-year period for Site 17 is based on observed contaminant (TCE) concentrations and lithologic-based hydraulic conductivity rates. Details of derivation are presented in Appendix B of the OU 2 Feasibility Study (FS).

1.3 [illegible] The selected remedies are protective of human health and the environment and are cost-effective. The selected remedies for Site 5 comply with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial actions. The remedy of the selected remedy for Site 17 is also that contaminant concentrations in groundwater may require more regulatory standards during the remedial action. As a result, applicable or relevant and appropriate requirements will not be met in a reasonable period. Therefore, compliance with groundwater standards will be a long-term cleanup goal. These remedies utilize permanent solutions and alternative treatment technologies to the maximum extent practicable and satisfy statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element. Because this remedy will result in hazardous substances remaining at Site 17 above levels that allow unlimited use and unrestricted exposure, a review will be conducted within 5 years after the commencement of remedial action to assure that the remedy continues to provide adequate protection of human health and the environment.

1.4 [illegible] AND [illegible] AGENCY [illegible] OF THE [illegible]

Michael M. Wilson, P.E.
Base Civil Engineer and Director
Environmental Management

Date

cc: [illegible]
[illegible]

2.0 DECISION SUMMARY

2.1 SITE NAME, LOCATION, AND DESCRIPTION. NAS Cecil Field is located 14 miles southwest of Jacksonville, Florida. The majority of Cecil Field is located within Duval County; the southernmost part of the facility in located in northern Clay County (Figure 2-1).

Land surrounding NAS Cecil Field is used primarily for forestry with some light agriculture and ranching. Small communities and scattered dwellings are in the vicinity of NAS Cecil Field; the closest abuts the western edge of the facility. The closest incorporated municipality, Baldwin, is approximately 6.4 miles northwest of the main facility entrance. The nearest base housing to OU 2 is located approximately 3,000 feet northeast of Site 5.

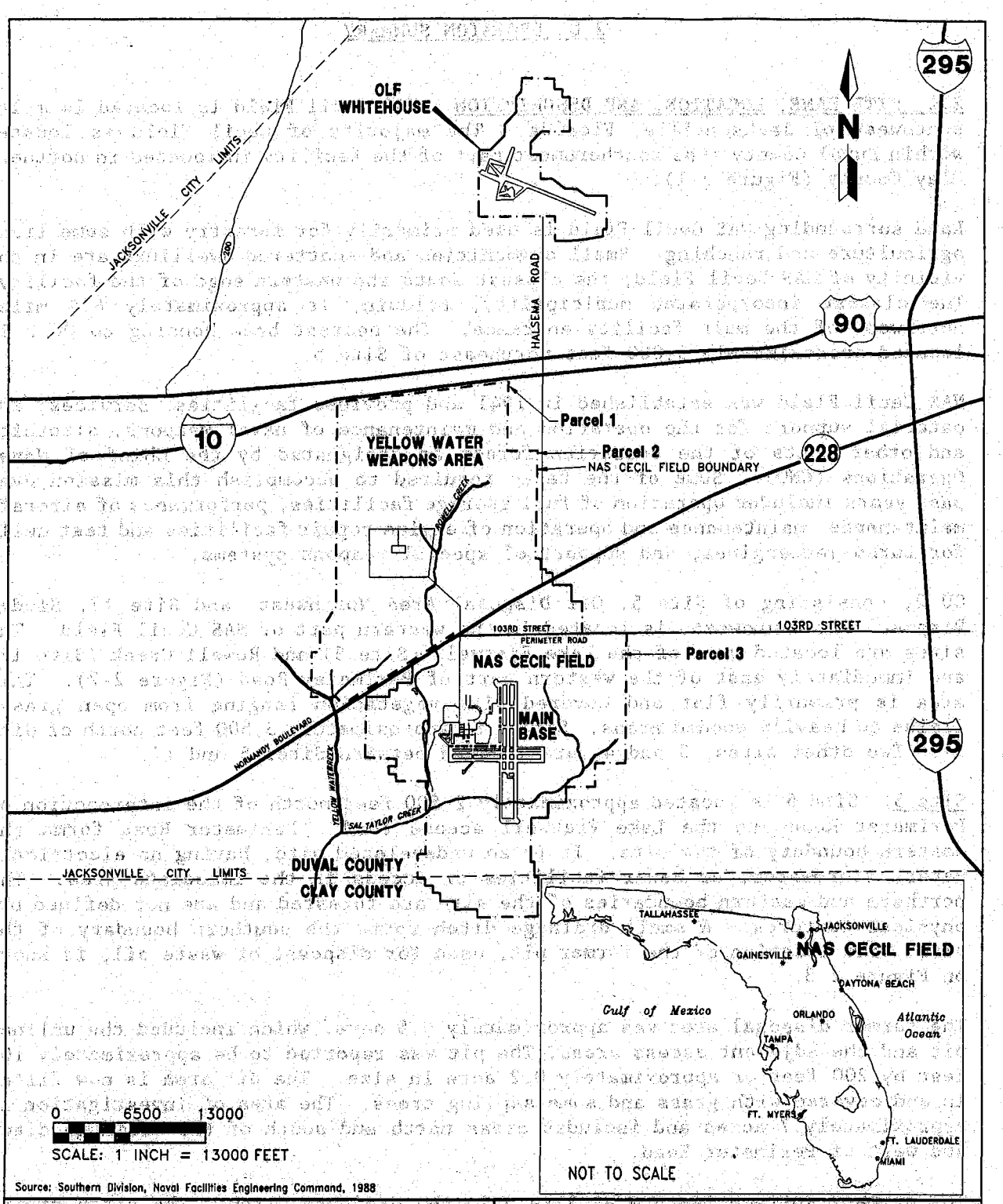
NAS Cecil Field was established in 1941 and provides facilities, services, and material support for the operation and maintenance of naval weapons, aircraft, and other units of the operation forces as designated by the Chief of Naval Operations (CNO). Some of the tasks required to accomplish this mission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

OU 2, consisting of Site 5, Oil Disposal Area Northwest, and Site 17, Sludge Disposal Pit Southwest, is located in the western part of NAS Cecil Field. The sites are located west of the Lake Fretwell (Site 5) and Rowell Creek (Site 17) and immediately east of the western part of Perimeter Road (Figure 2-2). This area is primarily flat and covered with vegetation ranging from open grassy fields to heavily wooded areas. Site 5 is approximately 3,500 feet north of Site 17. Two other sites, 3 and 4, are located between Sites 5 and 17.

Site 5. Site 5 is located approximately 2,500 feet north of the intersection of Perimeter Road and the Lake Fretwell access road. Perimeter Road forms the western boundary of the site. It is an undeveloped site, having no electrical, water, stormwater, or sewer facilities or access in the immediate area. The northern and eastern boundaries of the site are forested and are not defined by physical features. A small drainage ditch forms the southern boundary of the site. The location of the former pit, used for disposal of waste oil, is shown on Figure 2-3.

The former disposal area was approximately 0.5 acre, which included the unlined pit and the adjacent access areas. The pit was reported to be approximately 100 feet by 200 feet or approximately 0.2 acre in size. The pit area is now filled in and covered with grass and some sapling trees. The area of investigation is approximately 7 acres and includes areas north and south of the drainage ditch and west of Perimeter Road.

The primary surface feature at Site 5 is the drainage ditch. The ditch drains a wetland area located approximately 200 feet west of Perimeter Road (Figure 2-3). The wetland occupies a large part of the area between Perimeter Road and Yellow Water Creek and extends northward to Normandy Boulevard. Water in the Site 5 drainage ditch flows eastward (from the west side of Perimeter Road) along the south side of the site, empties into another wetland area (east of Site 5), and eventually into Lake Fretwell.



Source: Southern Division, Naval Facilities Engineering Command, 1988

FIGURE 2-1
GENERAL LOCATION MAP

RECORD OF DECISION
OPERABLE UNIT 2

NAS CECIL FIELD
JACKSONVILLE, FLORIDA

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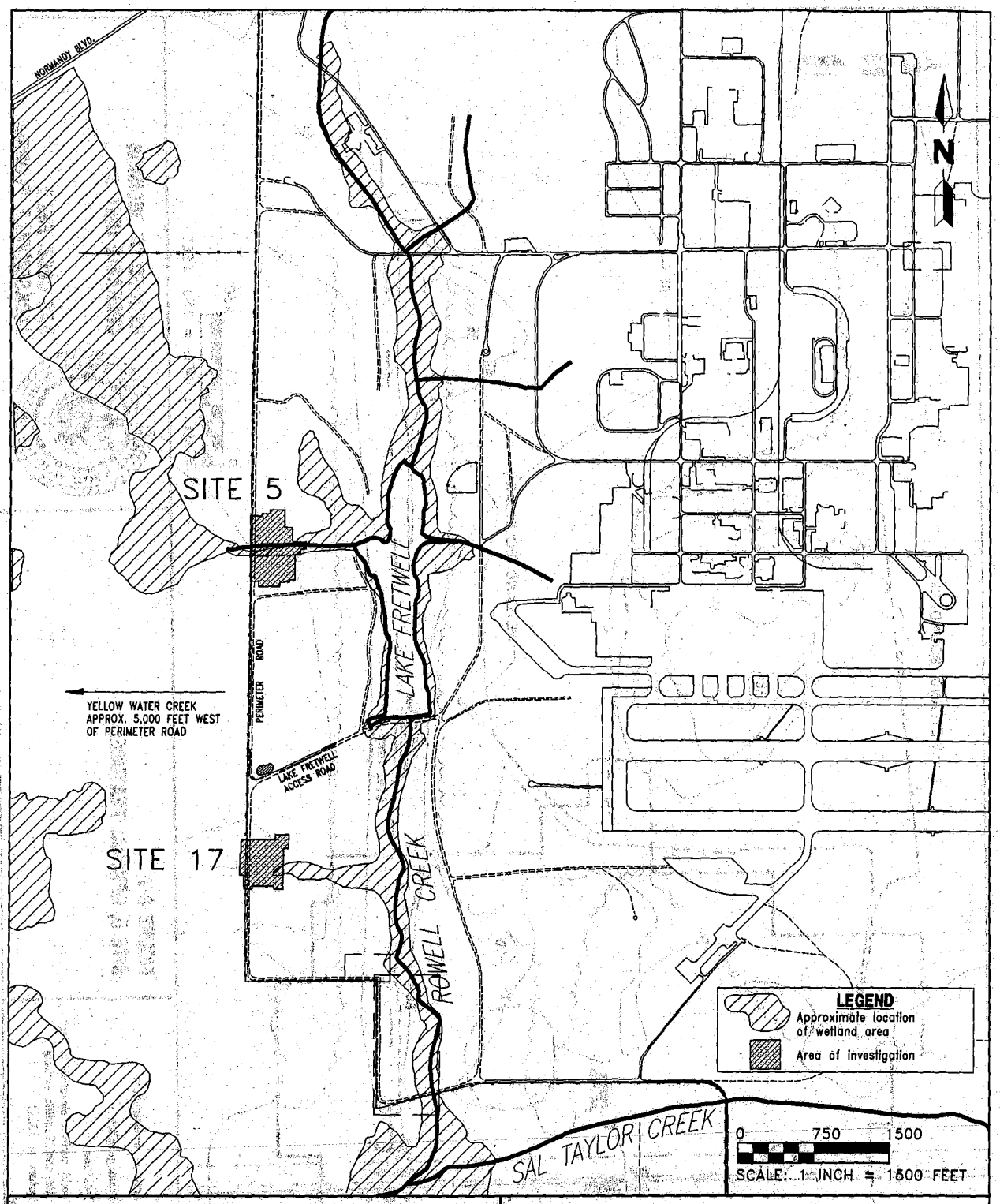

FIGURE 2-2
SITE LOCATIONS AND APPROXIMATE LOCATIONS OF WETLANDS SOUTHWEST NAS CECIL FIELD AREA

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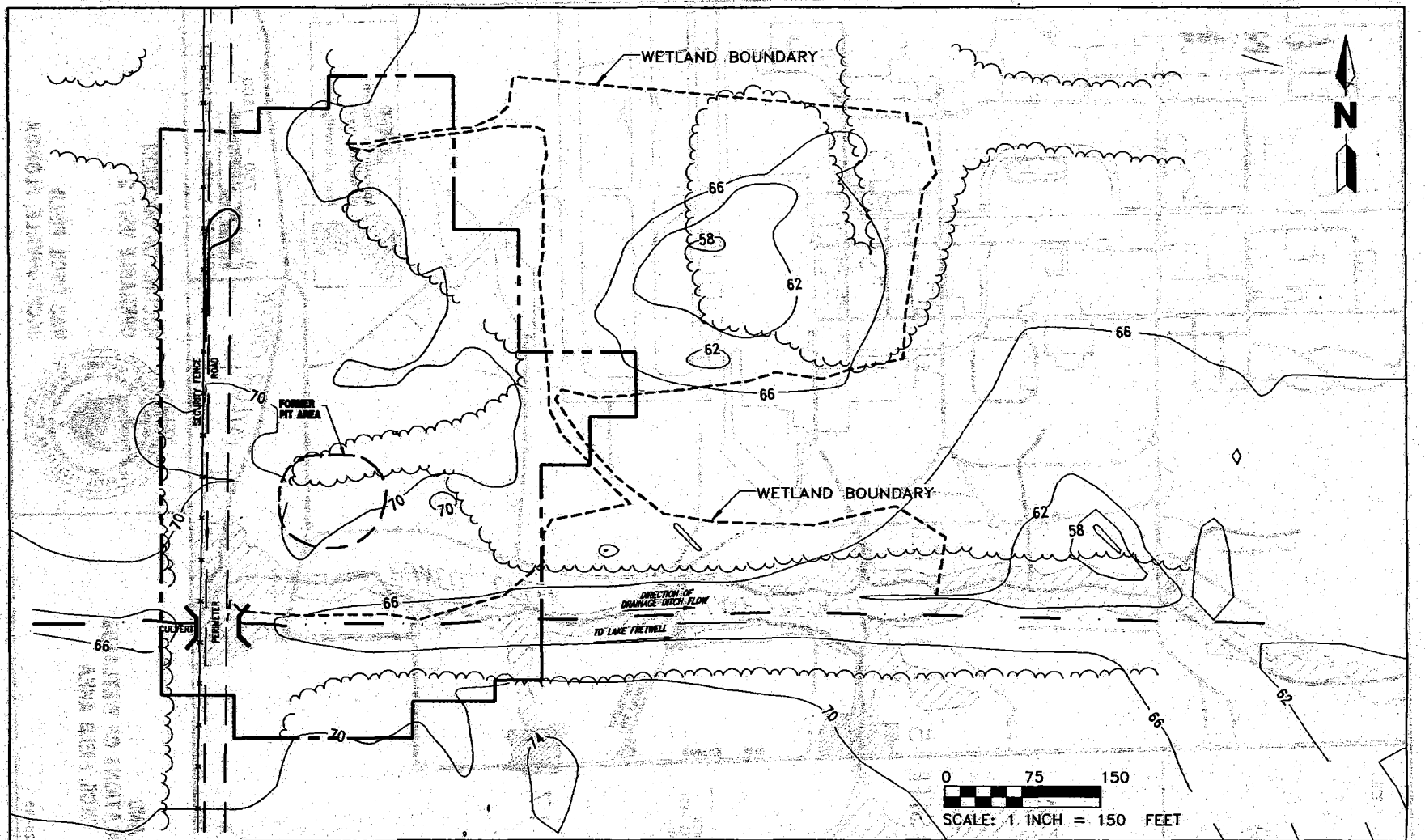
RECORD OF DECISION
OPERABLE UNIT 2

NAS CECIL FIELD
JACKSONVILLE, FLORIDA



LEGEND

- Area of investigation
- Drainage ditch
- Tree line
- 70 Land surface elevation in feet (National Geoditic Vertical Datum of 1929)

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FIGURE 2-3
SITE 5, GENERAL FEATURES

RECORD OF DECISION
OPERABLE UNIT 2

NAS CECIL FIELD
JACKSONVILLE, FLORIDA

Site 5 is relatively flat with no prominent hills or depressions. The ground surface slopes primarily to the south toward the drainage ditch. The eastern side of the site slopes toward the eastern wetland. The area immediately west of Perimeter Road slopes toward the drainage ditch to the south.

At Site 5, groundwater flow is from the northwest to the southeast. Vertical hydraulic gradients are downward in the northwestern part of Site 5, becoming upward in the vicinity of the drainage ditch. Groundwater from Site 5, therefore, discharges to the drainage ditch, which is topographically and hydraulically downgradient of the disposal pit.

Site 17. Site 17 is located approximately 1,000 feet south of the intersection of Perimeter Road and the Lake Fretwell Access Road (Figure 2-2). This site is also undeveloped. Perimeter Road forms the western boundary of the site. The northern, eastern, and southern boundaries of the site are forested and are not defined by physical features. The location of the former pit, used for disposal of waste oil, is shown on Figure 2-4. Aerial photographs show the disposal pit to be nearly square, being approximately 130 feet long on its northern, eastern, and southern sides and approximately 100 feet long on its western side. The initial assessment survey (IAS) states that the pit was 3 to 4 feet deep. The area evaluated during the investigation included approximately 3.8 acres centered on the former pit location.

The area of Site 17 is relatively flat with no prominent hills or depressions. Site 17 is covered by grass and trees. A wetland is located east of the site (approximately 420 feet east of Perimeter Road).

Runoff of surface water from Site 17 is primarily to the east and south following the topography. Runoff is directed to a low area, the wetland east of the site. Discharge from this low area enters Rowell Creek.

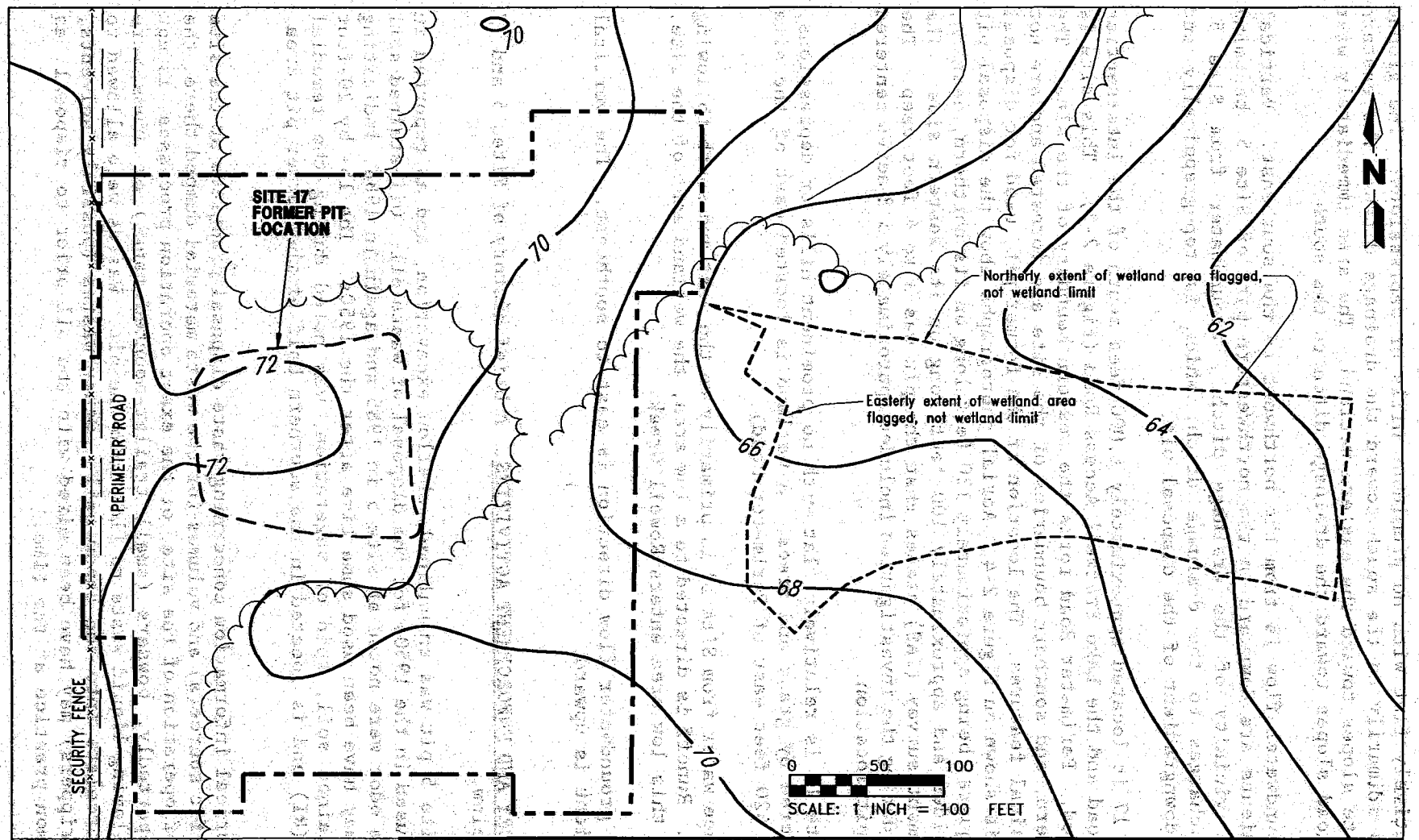
At Site 17 the groundwater flow direction is east to southeast. The vertical hydraulic gradient is upward.

2.2 SITE HISTORY AND ENFORCEMENT ACTIVITIES

A brief history of Sites 5 and 17 is presented below.

Site 5. The Site 5 pit was an unlined, shallow excavation, and as reported in the IAS, 1985, used in the 1950s for the disposal of waste oil. Oil-stained soil and a petroleum odor were noted at Site 5 in 1985 and again in 1988, indicating that the site may have been used some time after the 1950s. The 15- by 20-foot area of oil-stained soil, void of vegetation, was noted during the remedial investigation (RI) and is located in the southern half of the former pit area.

Extensive historical information concerning waste disposal practices at the site including specific source(s) and volumes for the waste material dumped there, the actual period of operation of the site, or the exact operation processes, is not available. Reportedly, bowsers (small trailer-mounted tanks) or drums were tipped over, allowing liquid waste to flow into the pit. Wastes were allowed to evaporate or percolate into the sandy soil. Other wastes (possibly solvents, paints, and strippers) may have been mixed with the oil prior to disposal, as this was a common practice at the time.



LEGEND

Area of Investigation

Tree line

70 Land surface elevation in feet (National Geodetic Vertical Datum of 1929)

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FIGURE 2-4
SITE 17, GENERAL FEATURES

RECORD OF DECISION
OPERABLE UNIT 2

NAS CECIL FIELD
JACKSONVILLE, FLORIDA

A review of available historical aerial photographs indicates that a pit, containing liquid, was present in November 1969. The outline of this disturbed area remains fairly constant in 1970, 1972, and 1973 photographs, but the circular pit with liquid is no longer visible. In 1972 to 1973 the site had begun to revegetate.

Site 17. The Site 17 disposal pit was reported to be approximately 0.4 acre in size. Like the Site 5 disposal pit, the Site 17 pit was unlined. The liquids, reportedly waste fuels and oils possibly mixed with solvents, paints, and/or paint thinners, were transported to the site via bowsers or 55-gallon drums and emptied into the pit. The liquids were then allowed to evaporate or soak into the ground. Both stained soil and a petroleum odor were noted during the RI investigation.

Site 17 was used for a 2- or 3-year period in the late 1960s or early 1970s for the disposal of waste liquids. A review of available historical aerial photographs indicates that no visible disturbance is evident at the site in photographs predating 1970. The 1970 photograph shows the basic outline (as evidenced by disturbed areas) of the site. Photographs from 1972 and 1973 show the presence of a pit that is partially filled with liquid and has disturbed access areas around all sides. Aerial photographs from 1975 and later show that Site 17 had become progressively more vegetated.

Sources for the liquid wastes dumped at the site are the fuel farm, aircraft intermediate maintenance department, the squadrons, and public works department. Estimates regarding the quantities of material potentially disposed of at the site are not available. During the site's period of operation, it is estimated that hundreds of gallons of these types of wastes could have been disposed of at the site. Following closure of the site, the pit was filled in and covered with soil.

Investigation of the disposal areas at Sites 5 and 17 began in the 1980s. Each investigation's findings, conclusions, and recommendations are given in chronological order in Table 2-1, Findings and Conclusions from Previous Investigations.

Analytical data evaluation indicated that free product at Site 5 and petroleum- and solvent-contaminated soil in and around each disposal pit were the sources of contamination to the groundwater and could either directly or indirectly pose risk to human health and the environment. An initial remedial action (IRA) was developed and implemented for each site. The interim RODs for OU 2 were approved in September 1994.

The IRAs of OU 2 are intended to abate the source of contamination. The IRAs include soil removal and treatment. The maximum areal extent of soil to be removed at each site is shown on Figures 2-5 and 2-6. It is anticipated that the maximum depth of excavation will be about 8 feet below land surface (bls). It should be noted that groundwater may be encountered at 1 to 8 feet bls, depending on seasonal conditions. The IRA is ongoing at each site and includes:

Site 5:

- excavation and separation of petroleum- and solvent-contaminated soil and free-product-saturated soil,

Table 2-1
Findings and Conclusions from Previous Investigations

Record of Decision
Operable Unit 2
Naval Air Station Cecil Field
Jacksonville, Florida

Previous Study	Tasks Completed	Findings	Recommendations
Hydrogeologic Assessment and Groundwater Monitoring Plan (Geraghty & Miller, 1983)	Sites 5 and 17 were not included in the study, which addressed Sites 1, 2, 3, and 4.	No sampling completed.	1. Place a surficial well upgradient of sites to establish background water quality (well was inadvertently located at Site 17). 2. Do quarterly sampling for one year.
As-Built Groundwater Monitoring Network (Geraghty & Miller, 1984)	1. Installed groundwater monitoring wells, including a Site 17 well. 2. Performed first quarterly sampling. 3. Compared results to primary and secondary drinking water standards.	1. No organic constituents were detected in samples from wells at Site 17. 2. Metals sampled were below primary and secondary standards.	Continue quarterly sampling of upgradient well (at Site 17).
Year-End Groundwater Monitoring Report (Geraghty & Miller, 1985)	Summarized quarterly well sampling.	1. No organic constituents were detected in samples from wells at Site 17 during four quarters of sampling. 2. Metals in Site 17 well samples were below primary and secondary standards.	No specific recommendations made for the study's upgradient location (Site 17).
Initial Assessment Study (IAS) (Envirodyne Engineers, 1985)	1. Performed records search. 2. Performed onsite survey. 3. Estimated waste quantities. 4. Performed site ranking. 5. Made recommendations for future study.	1. Summarized available historical information for Sites 5 and 17. 2. Identified waste oil and possibly solvents, paints, and paint thinners as waste types. 3 Waste quantity estimates for Sites 5 and 17 could not be made.	1. Investigation recommended at Sites 5 and 17. 2. Site 5: Install two surficial monitoring wells, collect two soil samples, and collect one surface water and one sediment sample in creek at site. 3. Site 17: Install one monitoring well and resample existing well (from Geraghty & Miller study). Soil sampling not recommended.
RCRA Facility Investigation (RFI) (Harding Lawson Associates, 1988)	Sites 5 and 17 1. Performed site reconnaissance. 2. Performed geophysical survey, magnetometer and very low frequency. 3. Installed monitoring wells (2 wells at Site 5 and 2 wells at Site 17). 4. Collected groundwater samples. 5. Collected surface water and sediment samples and two composite soil samples (Site 5 only).	Site 5 1. Soil: ethylbenzene and methylene chloride, maximum 22 μg/kg; PCBs, maximum of 580 μg/kg. 2. Sediment: methylene chloride (43 μg/kg). 3. Groundwater: bis(2-ethylhexyl)phthalate, naphthalene, and 2-methyl naphthalene, maximum 13 μg/ℓ; lead 49 μg/ℓ Site 17 Groundwater: no "hazardous constituents detected."	1. Site 5: Further investigation to define extent of hazardous constituents detected. 2. Site 17: No further action recommended.

See notes at end of table.

Table 2-1 (Continued)
Findings and Conclusions from Previous Investigations

Record of Decision
Operable Unit 2
Naval Air Station Cecil Field
Jacksonville, Florida

Previous Study	Tasks Completed	Findings	Recommendations
RI/FS Workplan for OUs 1, 2, and 7 (ABB-ES, 1991)	1. Summarized existing data. 2. Defined RI/FS objectives. 3. Developed sampling approach to achieve RI/FS objectives.	Findings are summarized in Chapter 4.0 of Remedial Investigation Report.	1. Well installation and sampling at Sites 5 and 17. 2. Soil sampling at Sites 5 and 17. 3. Surface water and sediment sampling at Site 5.
Technical Memorandum for Supplemental Sampling (ABB-ES, 1992a)	1. Completed 1991 field program. 2. Summarized contamination detected in soil, sediment, surface water, and groundwater. 3. Identified additional information required to characterize site contamination.	1. Findings are discussed in Chapter 4.0, Nature and Extent of Contamination, Remedial Investigation Report. 2. Hazardous constituents detected in soil and groundwater at both sites. 3. Horizontal and vertical extent of contaminants not fully characterized at either site. 4. Data gathered not sufficient to complete a Baseline Risk Assessment. 5. Free product detected in area of former pit.	1. Complete screening program to characterize extent of detected contaminants in soil and groundwater. 2. Complete confirmatory sampling, based on results of screening program. 3. Finalize number and location of confirmatory samples (per media) with agency approval.

Notes: RCRA = Resource Conservation and Recovery Act.
μg/kg = microgram per kilogram.
PCBs = polychlorinated biphenyls.
μg/ℓ = micrograms per liter.
RI/FS = Remedial Investigation and Feasibility Study.
OU = operable unit.
ABB-ES = ABB Environmental Services, Inc.

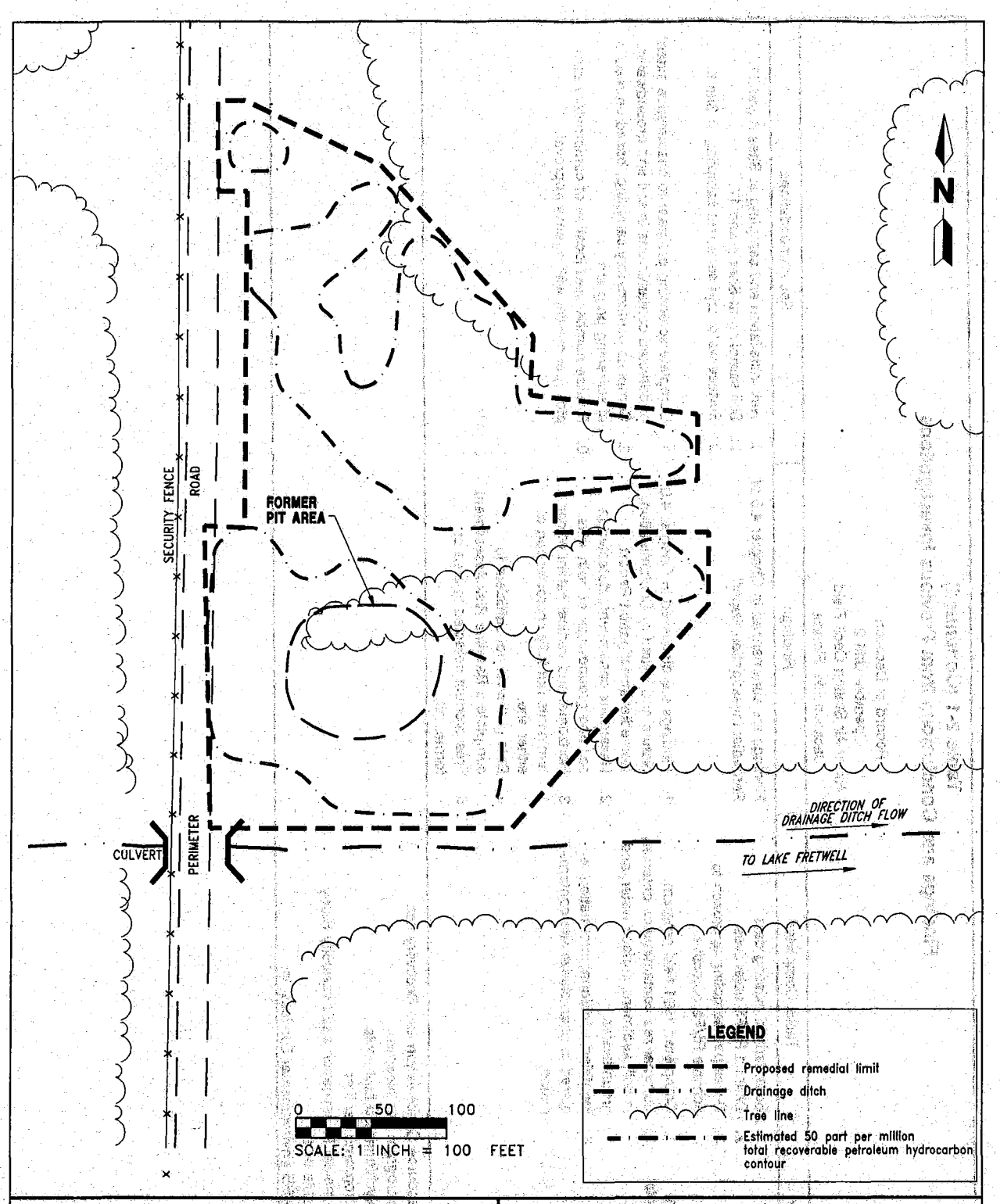

FIGURE 2-5
SITE 5, MAXIMUM AREAL EXTENT OF SOIL REMOVAL, INTERIM REMEDIAL ACTION

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RECORD OF DECISION
OPERABLE UNIT 2

NAS CECIL FIELD
JACKSONVILLE, FLORIDA

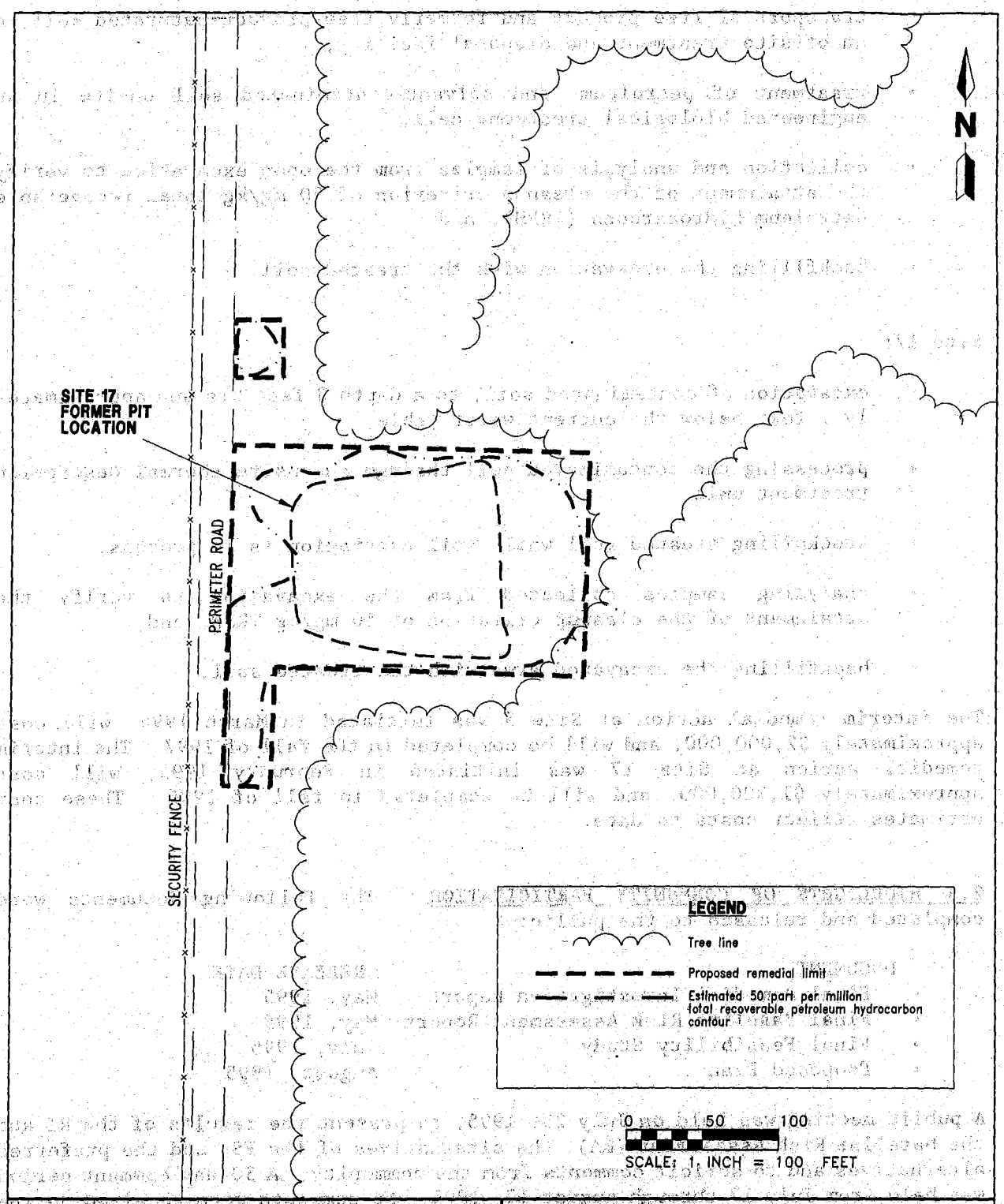

FIGURE 2-6
SITE 17, MAXIMUM AREAL EXTENT OF SOIL REMOVAL, INTERIM REMEDIAL ACTION

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RECORD OF DECISION
OPERABLE UNIT 2

NAS CECIL FIELD
JACKSONVILLE, FLORIDA

- transport of free product and formerly free-product-saturated soil to an offsite treatment and disposal facility,

- treatment of petroleum- and solvent-contaminated soil onsite in an engineered biological treatment cell,

- collection and analysis of samples from the open excavation to verify the attainment of the cleanup criterion of 50 mg/kg total recoverable petroleum hydrocarbons (TRPH), and

- backfilling the excavation with the treated soil.

Site 17:

- excavation of contaminated soil, to a depth 8 feet bls and approximately 7 feet below the current water table,

- processing the contaminated soil through an onsite thermal desorption treatment unit,

- stockpiling treated soil while soil excavation is in process,

- analyzing samples collected from the excavation to verify the attainment of the cleanup criterion of 50 mg/kg TRPH, and

- backfilling the excavated area with the treated soil.

The interim remedial action at Site 5 was initiated in March 1995, will cost approximately $2,000,000, and will be completed in the fall of 1997. The interim remedial action at Site 17 was initiated in February 1995, will cost approximately $1,900,000, and will be completed in fall of 1995. These cost estimates reflect costs to date.

2.3 HIGHLIGHTS OF COMMUNITY PARTICIPATION. The following documents were completed and released to the public:

DOCUMENT	RELEASE DATE
• Final Remedial Investigation Report	May, 1995
• Final Baseline Risk Assessment Report	May, 1995
• Final Feasibility Study	July, 1995
• Proposed Plan	August, 1995

A public meeting was held on July 25, 1995, to present the results of the RI and the baseline Risk Assessment (RA), the alternatives of the FS, and the preferred alternatives and to solicit comments from the community. A 30-day comment period was held from July 17 through August 17, 1995. No comments were received during the public comment period.

Public notices of the availability of the Proposed Plan were placed in the *Metro* section of the *Florida Times Union* on July 16 and 23, 1995. A notice was also placed in the local editions of the *Florida Times Union* (i.e., the Clay, Southside, and Westside editions) on July 19, 1995. These local editions target

the communities closest to NAS Cecil Field. The Proposed Plan and other documents are available to the public at the Information Repository, Charles D. Webb Wesconnett Branch of the Jacksonville Library, 6887 103rd Street, Jacksonville, Florida.

2.4 SCOPE AND ROLE OF OPERABLE UNIT. Investigations at Site 5 indicated the presence of free product, soil, sediment, and groundwater contamination from past disposal practices. The Site 5 interim remedial action is addressing soil and free product. The purpose of this remedial action is to remediate sediment and groundwater that pose a risk to human health and the environment.

Investigations at Site 17 indicated the presence of soil and groundwater contamination from past disposal practices. The Site 17 interim remedial action is addressing soil. The purpose of this remedial action is to remediate groundwater that poses a risk to human health and the environment.

The following remedial action objectives (RAOs) were established for OU 2.

RAO 1: Protect human health from potable water use of groundwater at Sites 5 and 17 that contains concentrations of volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides, and inorganics above drinking water-based applicable or relevant and appropriate requirements (ARARs) or risk assessment RAOs.

RAO 2: Protect ecological receptors from exposure to sediment that contains concentrations of PCBs above guidance concentrations and TRPH that are demonstrated to pose a toxic effect at Site 5.

Remedial actions proposed by this ROD will address the principal threats posed by conditions at the sites.

2.5 SITE CHARACTERISTICS. Contaminant sources, detections, fate and transport, contaminated media, and geologic and hydraulic conditions of OU 2 are discussed in Chapters 3.0, 4.0, and 5.0 of the OU 2 RI report. These site characteristic data are summarized in the following paragraphs.

Contaminant Sources. The OU 2 contaminant sources are the wastes deposited in disposal pits and areas adjacent to the pits. At Site 5, the source generally consists of the contaminated soil in the pit and adjacent areas and the free product. Contaminated surface soil was detected over much of the area of investigation, including areas away from the disposal pit. At Site 17, the contaminated soil in and adjacent to the pit is the source. There are no known upgradient contaminant sources at either site with respect to groundwater flow.

Surface Soil. Site 5 surface soil contaminants included SVOCs, particularly polyaromatic hydrocarbons (PAHs), TRPH, pesticides, one polychlorinated biphenyl (PCB) (Aroclor-1260), and inorganics. VOCs were detected, but in relatively low concentrations, and appeared to be randomly distributed. SVOCs, pesticides, and inorganics were detected over much of the area of investigation. Most detections and the highest concentrations, however, were detected in an area north of the disposal pit and not in the pit proper. TRPH was detected over most of the area of investigation. Arochlor-1260 was detected primarily in the pit and adjacent areas, with the greatest concentration being detected at a location just north

of the drainage ditch. The distribution of surface soil contamination is shown on Figure 2-7. Maximum and average contaminant concentrations illustrated on Figure 2-7 were as shown below.

Parameter	Maximum µg/kg	Average	Max Conc. Sample
Total VOCs	38 J	8	CEF-5-SS7
Total SVOCs	11,390	2,110	CEF-5-SS23
TRPH	28,000 (mg/kg)	1,440	CEF-5-SS4
DDT	48 J	17	CEF-5-SS1
Aroclor-1260	2,200 J	441	CEF-5-SS4
Beryllium	290	280	CEF-5-SS27
Cadmium	810	785	CEF-5-SS19
Manganese	75,300 J	19,700	CEF-5-SS20

Notes: µg/kg = micrograms per kilogram.
J = estimated.
mg/kg = milligrams per kilogram.
DDT = dichlorodiphenyltrichloroethane.

At Site 17 VOCs were detected in surface soil east and south of the pit. Highest concentrations were of the solvents acetone and 2-butanone. SVOCs were detected over much of the area of investigation, though many detections were of phthalate esters, which are common laboratory contaminants. Phenolic compounds were detected in the eastern part of the pit and the eastern part of the area of investigation. TRPH was detected in the pit and immediately adjacent areas. PCBs were not detected in the surface soil. Inorganics were detected over most of the area of investigation and appear to be naturally occurring.

The distribution of surface soil contamination is shown on Figure 2-8. Maximum and average contaminant concentrations illustrated on Figure 2-8 were as shown below.

Parameter	Maximum (µg/kg)	Average	Max Conc. Sample
Total VOCs	6,600 J	1,420	CEF-17-SS8
Total SVOCs	1,110 J	233	CEF-17-SS3
TRPH	210 (mg/kg)	76	CEF-17-SS8

Risks to human health or the environment posed by contaminants in the surface soil at OU 2 are discussed in Section 2.6, Summary of Site Risks.

Subsurface Soil. VOCs in the subsurface soil at Site 5 include solvents and petroleum-related contaminants. The greatest VOC concentrations were detected within the disposal pit and west and north of the disposal pit. SVOCs were detected in the disposal pit, the areas immediately adjacent to the pit, and along the north side of the drainage ditch. SVOCs were also detected in the northernmost part of the area of investigation. This northern location appears to be contamination separate from that detected in the disposal pit area and is included in the IRA. TRPH was detected over much of the area of investigation. Highest TRPH concentrations, however, are associated with the disposal pit. Pesticides were detected at perimeter locations of the area of investigation and appear to be randomly distributed. Aroclor-1260 was detected in the southern part of the area of investigation, extending from just north of the disposal pit to the drainage ditch. Concentrations greater than 1 part per million were detected in the western part of the disposal pit and at one location north of the

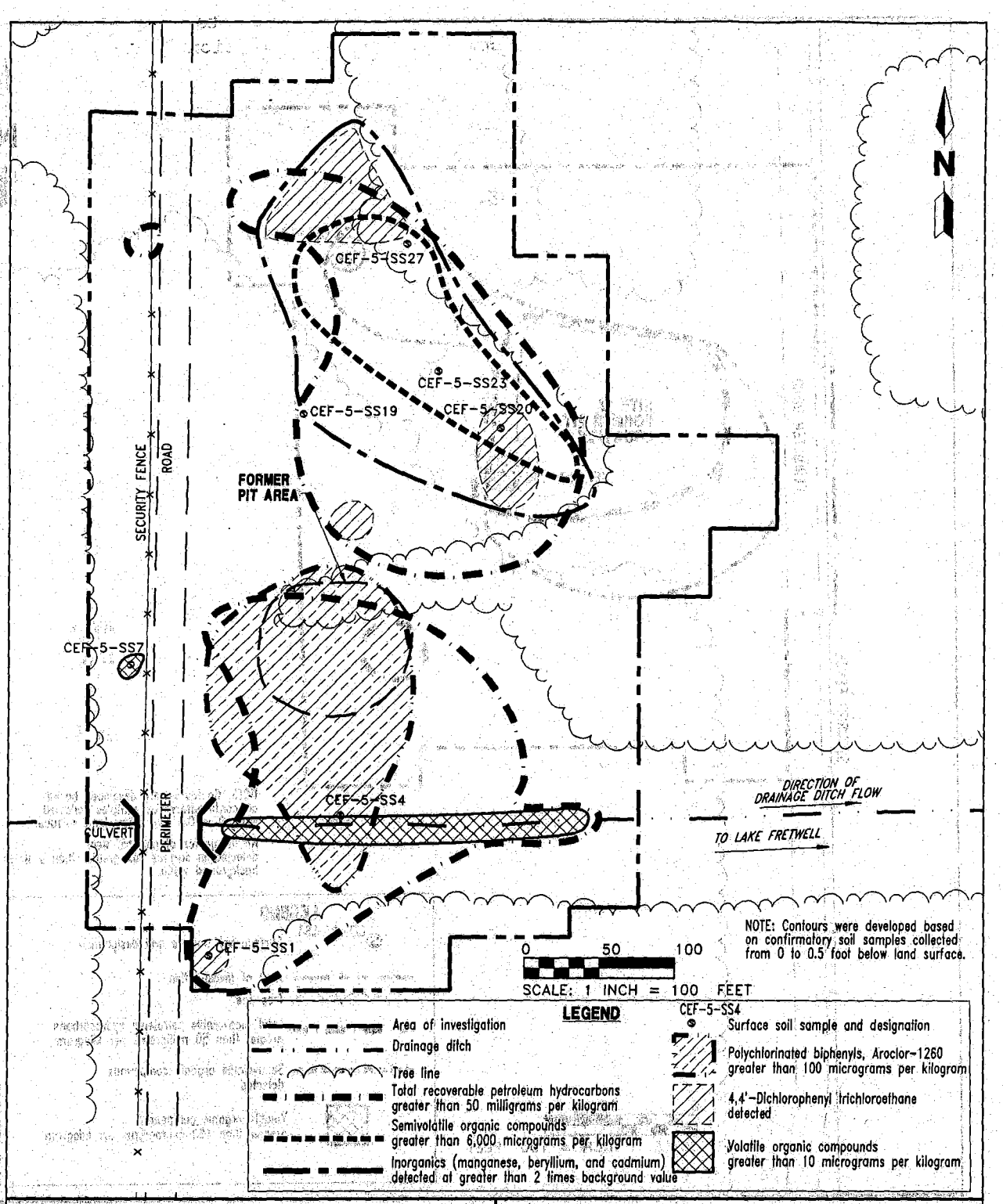

FIGURE 2-7
SITE 5, SURFACE SOIL CONTAMINATION

RECORD OF DECISION
OPERABLE UNIT 2

NAS CECIL FIELD
JACKSONVILLE, FLORIDA

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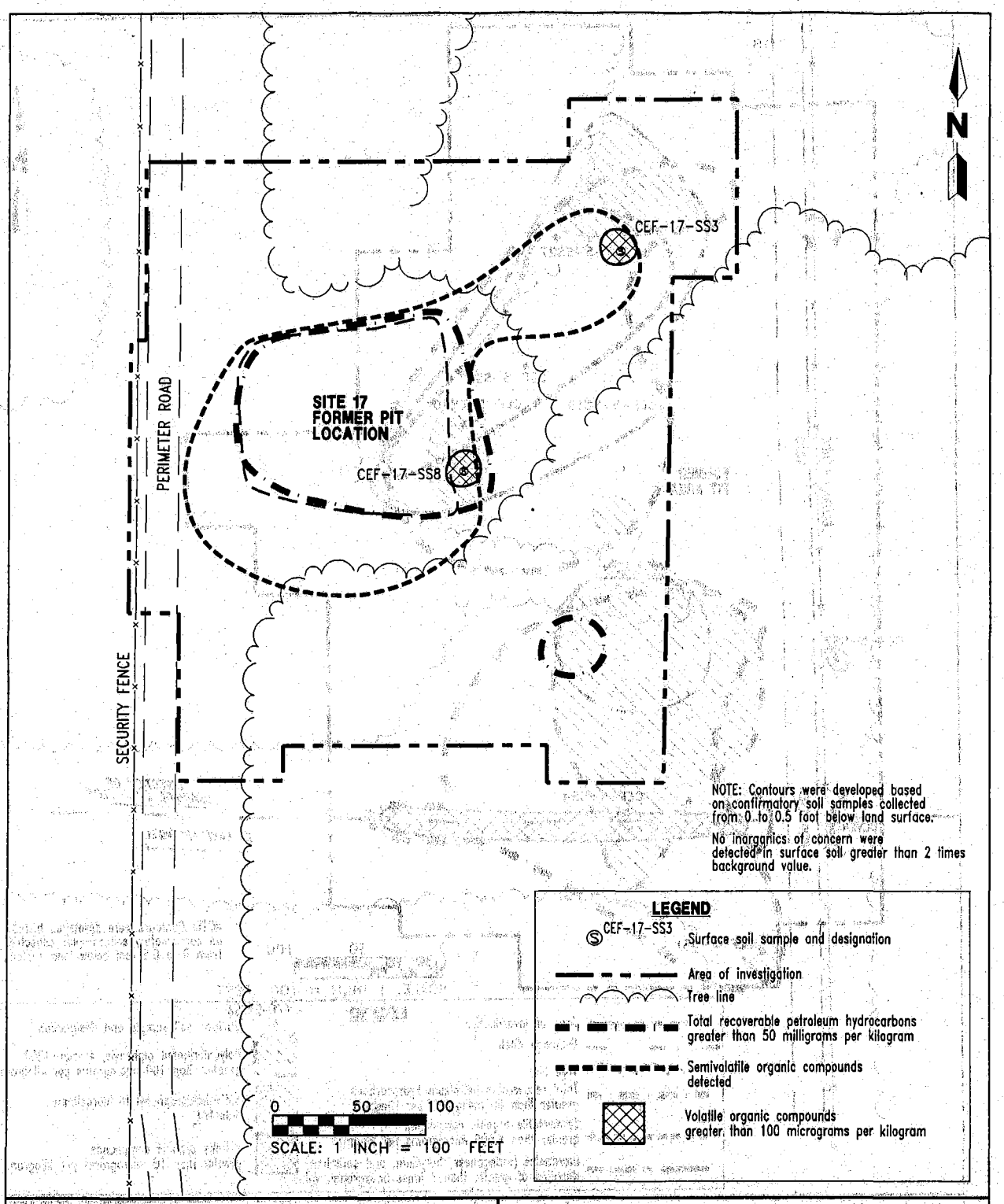

FIGURE 2-8
SITE 17, SURFACE SOIL CONTAMINATION

REPORT OF DECISION
OPERABLE UNIT 2

NAS CECIL FIELD
JACKSONVILLE, FLORIDA

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drainage ditch. Inorganics were detected throughout the area of investigation at concentrations not significantly different from background concentrations. The distribution of subsurface soil contamination at Site 5 is shown on Figure 2-9. Maximum and average concentrations of contaminants illustrated on Figure 2-9 were as shown below.

Parameter	Maximum (μg/kg)	Average	Max Conc. Sample
Total VOCs	72,900 J	12,200	BOR-5-6
Total SVOCs	122,000	23,300	BOR-5-6
TRPH	28,000 J	5,320(mg/kg)	CF-5-BR10S
DDT	11 J	7.8	CF-5-MS19S
Aroclor-1260	1,500 J	622	BOR-5-1

VOCs in the subsurface soil at Site 17 include solvents and petroleum-related contaminants, with the greatest concentrations being detected within the disposal pit and immediately east of the disposal pit. The distribution of SVOCs and TRPH is similar to that of VOCs, with greatest contaminant concentrations generally occurring in the eastern area of the disposal pit. Pesticides were detected at relatively low concentrations and appear to be randomly distributed. PCBs were not detected in the subsurface soil at Site 17. Inorganics were detected throughout the area of investigation; only thallium was detected at concentrations significantly different from background concentrations. (Thallium was not detected in background samples.) The distribution of subsurface soil contamination is shown on Figure 2-10. Maximum and average concentrations of contaminants illustrated on Figure 2-10 were as shown below.

Parameter	Maximum (μg/kg)	Average	Max Conc. Sample
Total VOCs	78,000	5,170	BOR-17-2
Total SVOCs	87,600	12,700	CF-17-BR10S
TRPH	25,000 (mg/kg)	3,550	BOR-17-1
Pesticides	10	2.8	BOR-17-1

Risks to human health or the environment posed by contaminants in the surface soil at OU 2 are discussed in Section 2.6, Summary of Site Risks.

Groundwater. Contamination at Site 5 and 17 is limited to the surficial aquifer, generally to the upper 25 feet of the aquifer.

Approximately 300 gallons of free product were detected at Site 5. The free product is located in the northeastern part of the disposal pit (Figure 2-11). Monitoring well CEF-5-6S is located in the eastern part of the product. Analysis and evaluation indicate that the product is either weathered kerosene or jet fuel containing 26 milligrams per liter (mg/ℓ) PCBs.

VOCs and SVOCs detected in Site 5 groundwater included solvents and petroleum-related contaminants. VOCs, SVOCs, and TRPH were detected from the disposal pit area southward to the drainage ditch. (Acetone was detected at low concentrations in samples from two monitoring wells located south of the drainage ditch).

Groundwater data indicated several inorganics at concentrations in excess of drinking water standards. Groundwater samples, however, were turbid and those concentrations were associated with particulate matter and not the groundwater

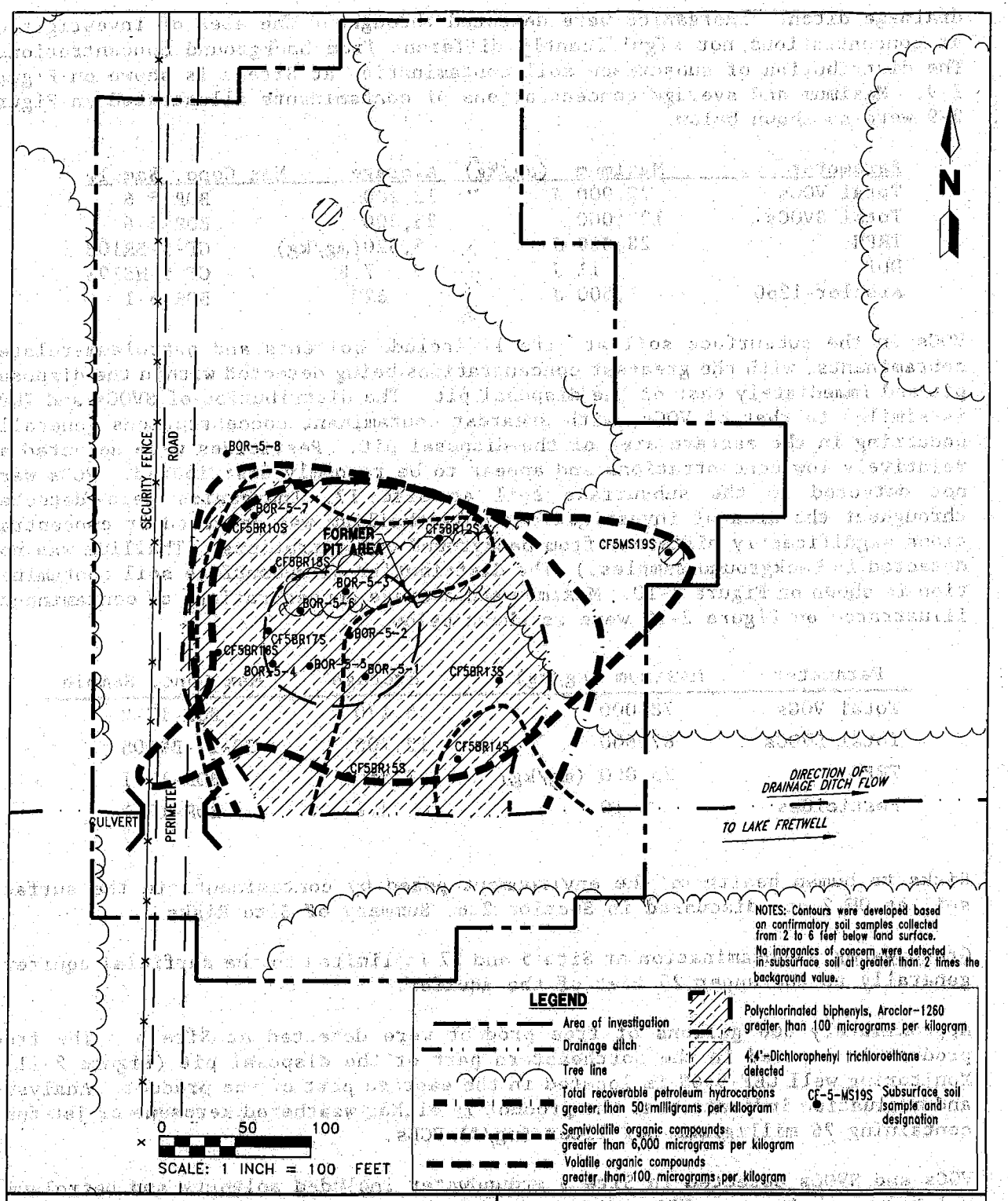

FIGURE 2-9
SITE 5, SUBSURFACE SOIL CONTAMINATION

RECORD OF DECISION
OPERABLE UNIT 2

NAS CECIL FIELD
JACKSONVILLE, FLORIDA

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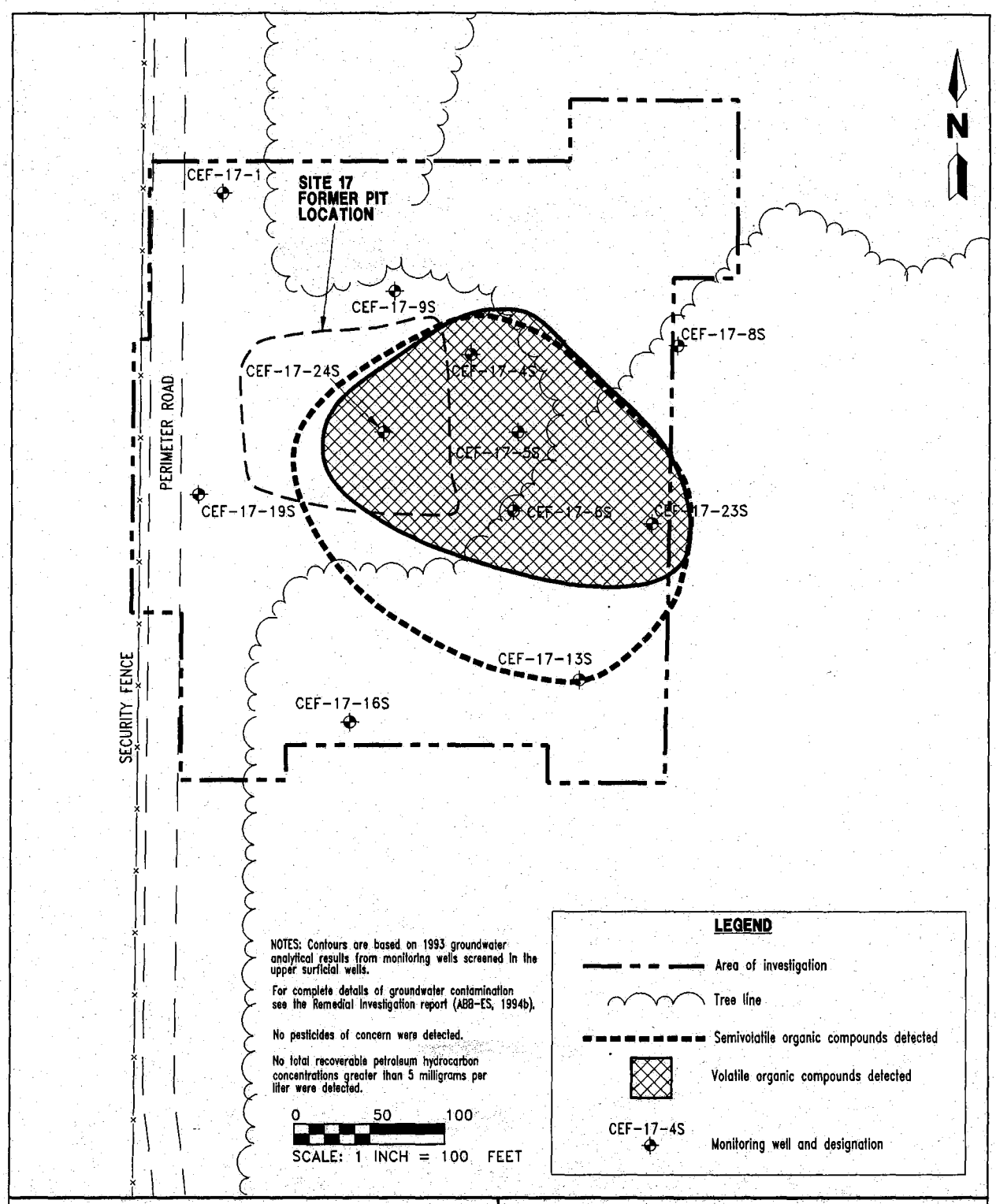

FIGURE 2-12
SITE 17, GROUNDWATER CONTAMINATION

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RECORD OF DECISION
OPERABLE UNIT 2

NAS CECIL FIELD
JACKSONVILLE, FLORIDA

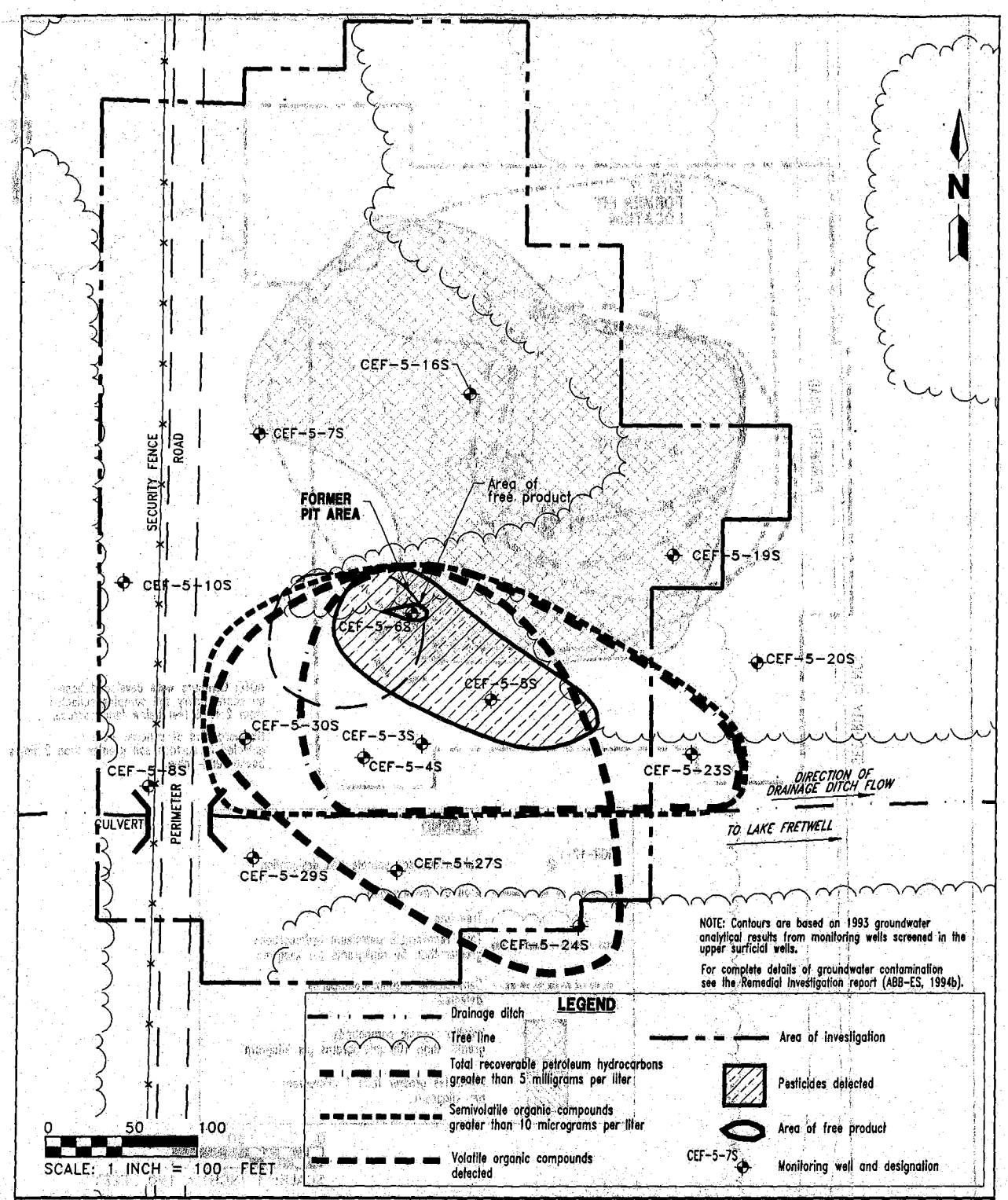

FIGURE 2-11
SITE 5, GROUNDWATER CONTAMINATION

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RECORD OF DECISION
OPERABLE UNIT 2

NAS CECIL FIELD
JACKSONVILLE, FLORIDA

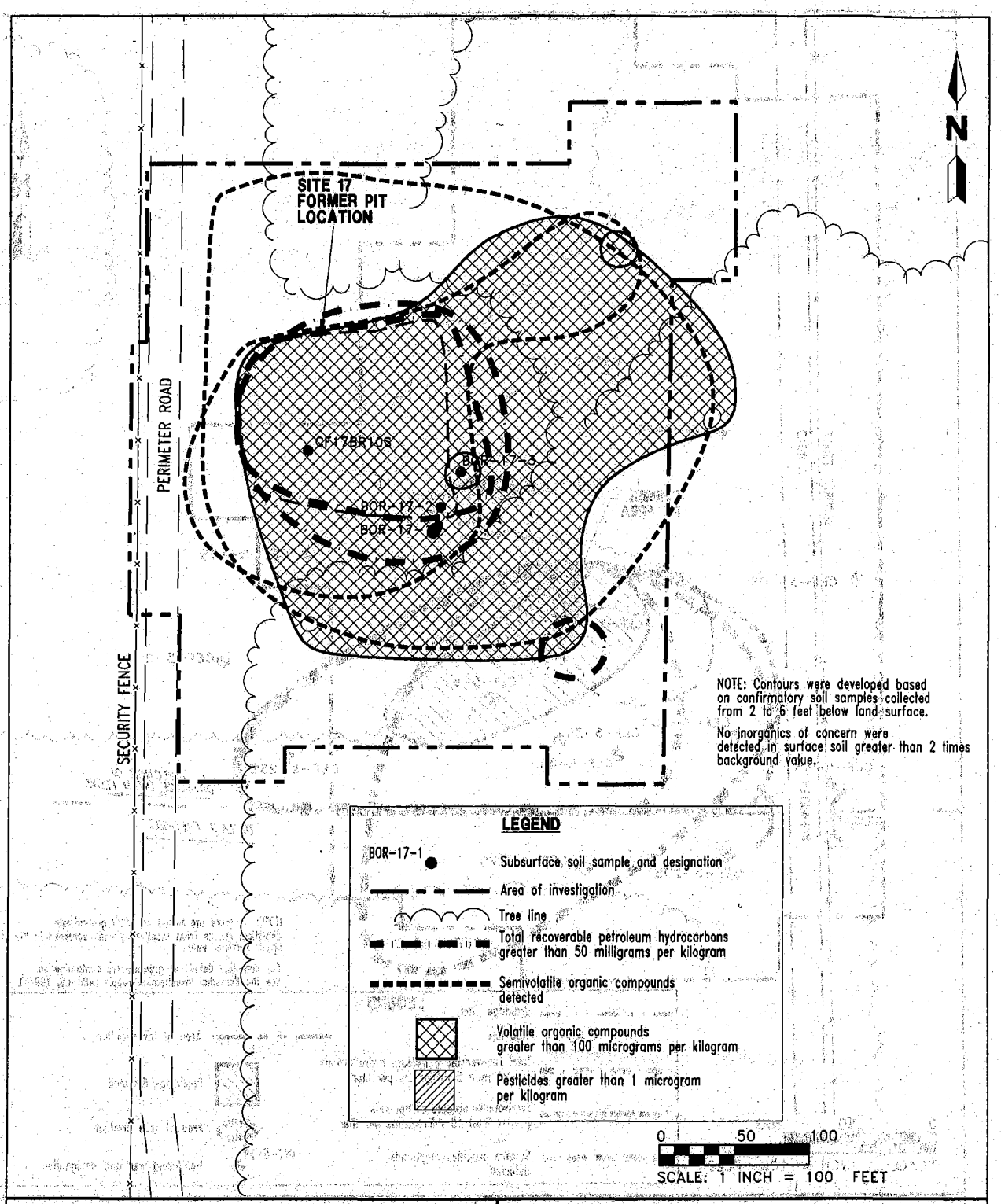

FIGURE 2-10
SITE 17, SUBSURFACE SOIL CONTAMINATION

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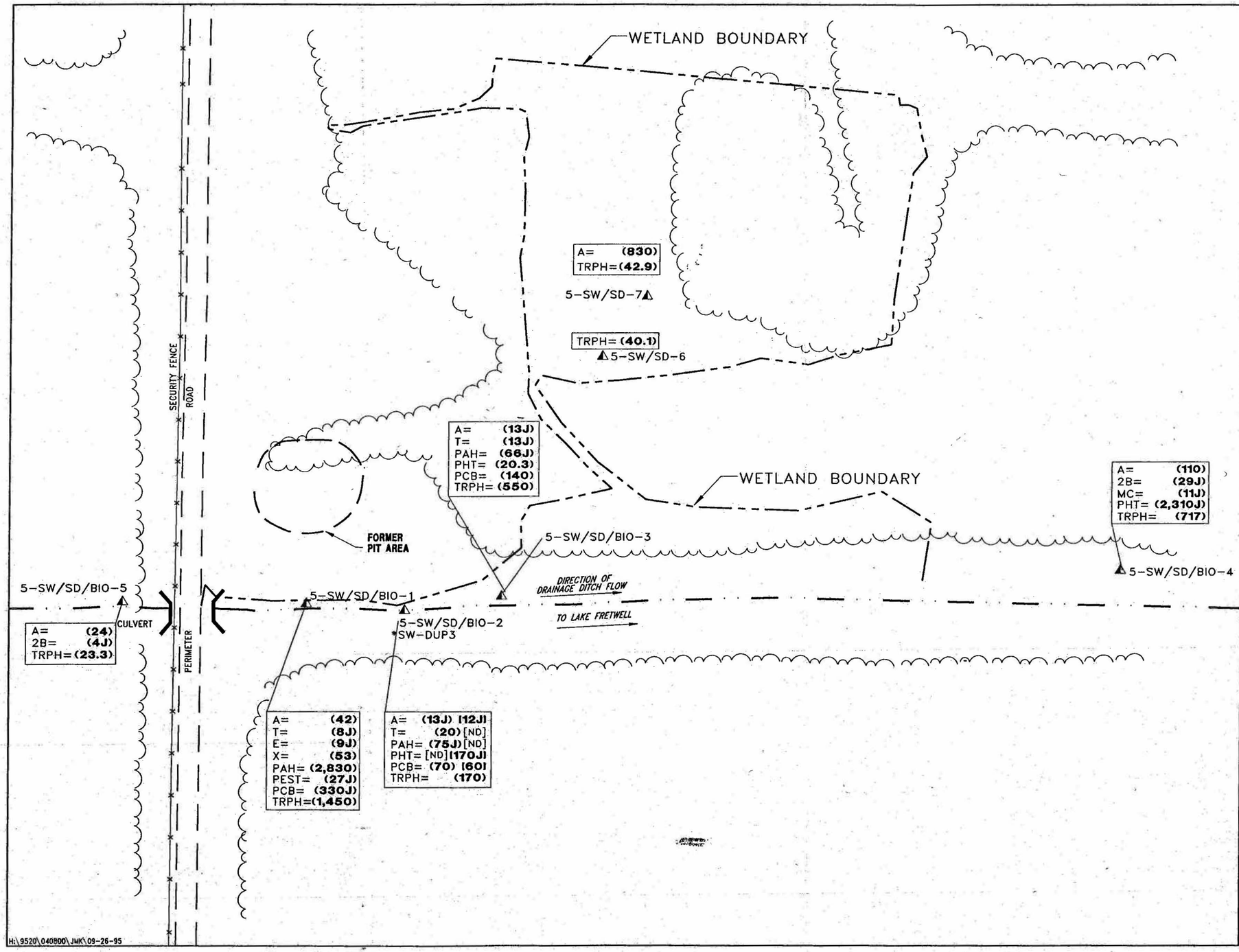
REPORT OF DECISION
OPERABLE UNIT 2

NAS CECIL FIELD
JACKSONVILLE, FLORIDA



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LEGEND

	Tree line
▲ 5-SW/SD-7	Surface water and sediment sample designation
(13J)	Reported concentration of compound
[12J]	Reported concentration of compound in duplicate sample
ND	not detected
J	estimated value
A	acetone
MC	methylene chloride
2-B	2-Butanone
T	toluene
E	ethylbenzene
X	xylene
PAH	polynuclear aromatic hydrocarbons (nonphthalate)
PHT	phthalate esters
PEST	pesticides
PCB	polychlorinated biphenyls
TRPH	total recoverable petroleum hydrocarbons

NOTES:

TRPH reported in milligrams per kilogram (mg/kg).

All other compounds reported in micrograms per kilograms (µg/kg).

Survey points for surface water sampling locations are located on the north bank of the stream; samples were collected from the stream.

• SW-DUP3 is a duplicate sediment sample.

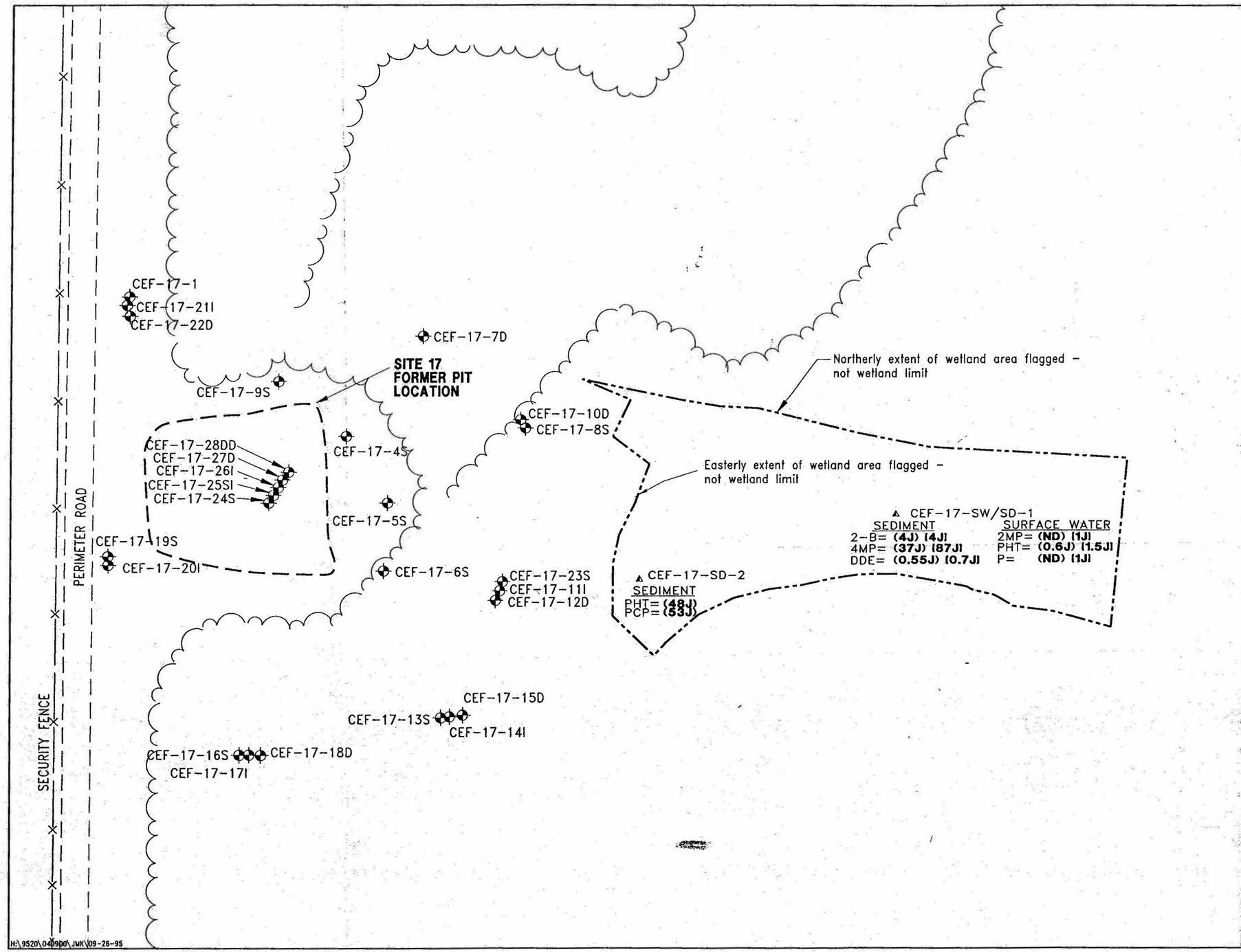
0 50 100

SCALE: 1 INCH = 100 FEET

FIGURE 2-13
SITE 5, ORGANICS IN SEDIMENT

RECORD OF DECISION
OPERABLE UNIT 2

NAS CECIL FIELD
JACKSONVILLE, FLORIDA



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LEGEND

	Tree line
CEF-17-12D	Monitoring well designation
CEF-17-SW/SD-1	Surface water and sediment sample designation
(37J)	Reported concentration of compound
(87)	Reported concentration of compound in duplicate sample
ND	Not detected
J	Estimated value
2-B	2-butanone
P	phenol
2MP	2-methyphenol
4MP	4-methyphenol
DDE	4,4'-dichlorodiphenyldichloroethene
PHT	phthalate esters
PCP	pentachlorophenol

NOTES:

Sediment concentrations reported in micrograms per kilogram ($\mu g/kg$).

Surface water concentrations reported in micrograms per per liter ($\mu g/l$).

0 40 80

SCALE: 1 INCH = 80 FEET

FIGURE 2-14

SITE 17, ORGANIC COMPOUNDS IN SURFACE WATER AND SEDIMENT

RECORD OF DECISION
OPERABLE UNIT 2

NAS CECIL FIELD
JACKSONVILLE, FLORIDA

2.6 SUMMARY OF SITE RISKS. The risk assessment completed for OU 2 identified human health risk at both sites and ecological risks at Site 5.

At Site 5, the calculated incremental cancer risks and noncancer hazards associated with surface soil, subsurface soil, surface water, and sediment were all acceptable per USEPA guidance of 1 in 10,000 to 1 in 1,000,000 (10^{-4} to 10^{-6} for carcinogenic endpoints and a hazard index of less than 1 for noncarcinogenic endpoints). The cancer risk derived for domestic use of the groundwater from the surficial aquifer (ingestion of groundwater and inhalation of VOCs while showering with groundwater) by an adult was 3 in 10,000 ($3X10^{-4}$). The risk was due primarily to β-HCH. A hazard index of 10 was associated with domestic use of groundwater by an adult. The noncarcinogenic hazard is due primarily to the ingestion of the SVOCs 4-methylphenol and naphthalene and the VOC acetone. Risks posed by inorganics indicated only arsenic from the groundwater sample from well CEF-5-14I poses a human health incremental cancer risk of 8 in 100,000 ($8X10^{-5}$). Arsenic was detected at a concentration of 4.4 $\mu g/\ell$, well below the drinking water standard of 50 $\mu g/\ell$. Monitoring well CEF-5-MW-14I is located in the northwest part of Site 5, approximately 280 feet from and upgradient of the former disposal pit. Human health risks posed by contaminants at Site 5 are given in Table 2-2, Cancer and Noncancer Risks Posed by Domestic Use of Site 5 Groundwater to an Adult Resident.

Potential risks for ecological receptors at Site 5 were evaluated for ecological contaminants of potential concern (ECPCs) in surface soil, surface water, sediment, and groundwater. A summary of these risks is presented in Table 2-3, Site 5 Ecological Assessment Summary.

Risks for soil invertebrates and plants were evaluated based on the results of laboratory toxicity testing of surface soil samples from Site 5 with earthworms (*Eisenia foetida*) and one plant species, lettuce (*Lactuca sativa*). With the exception of soil from station CF5-SS-4, no risks associated with exposure to surface soil were identified for terrestrial wildlife, soil invertebrates, or plants. At station CF5-SS-4, significant worm mortality and reduced lettuce seed germination rates were observed. It is likely that elevated TRPH or Aroclor-1260 concentrations (28,000 and 2.2 milligrams per kilogram [mg/kg], respectively) contributed to the observed effects in the surface soil laboratory toxicity tests.

Evaluation of contamination in surface water and sediment is based on collection of analytical samples from the drainage ditch and wetland adjacent to Site 5. At each sampling station, surface water and sediment samples were analyzed to determine the extent and type of contamination; additionally, sediment samples were submitted for laboratory toxicity testing with two organisms (the water flea [*Ceriodaphnia dubia*] and the amphipod [*Hyalella azteca*), and samples of the benthic macroinvertebrate community were collected. The results of the three analyses were analyzed in a weight-of-evidence approach to identify and characterize risks for aquatic receptors.

Review of analyses of the benthic macroinvertebrate sampling results indicate little impairment of the benthic community at the Site 5 tributary. However, evaluation of the sediment toxicity test data suggests that certain organisms may be affected by exposure to sediment. The data suggest that the responses may be associated with elevated concentrations of Aroclor-1260, 4,4'-DDT, or TRPH emanating from Site 5.

Table 2-2
Cancer and Noncancer Risks Posed by Domestic Use of Site 5 Groundwater to an Adult Resident

Record of Decision
Operable Unit 2
Naval Air Station Cecil Field
Jacksonville, Florida

Chemical	Concentration ($\mu g/\ell$)	Total Cancer Risk[1] (Percent of Total)	Total Noncancer Hazard Index[2] (Percent of Total)
Acetone	8,500	NA	2 (8.8%)
Benzene	16	8×10^{-8} (2.9%)	2 (5.8%)
2-Hexanone	60	NA	NA
Toluene	180	NA	4×10^{-2} (<1%)
Trichloroethene	16.6	3×10^{-6} (1%)	7×10^{-2} (<1%)
Bis(2-Ethylhexyl)phthalate	66.7	1×10^{-5} (3.9%)	9×10^{-2} (<1%)
2,4-dimethylphenol	38.5	NA	5×10^{-2} (<1%)
2-methylnaphthalene	116	NA	NA
4-methylphenol	508	NA	3 (10.8%)
Naphthalene	226	NA	2×10^{-1} (<1%)
Alpha-chlordane	0.15	2×10^{-6} (<1%)	7×10^{-2} (<1%)
Beta-hexachlorocyclohexane	4.5	1×10^{-4} (33.9%)	NA
Aluminum	504,000	NA	14 (53.8%)
Antimony	29.4	NA	2×10 (<7.7%)
Arsenic[3]	4.4	NC	NC
Barium	187	NA	7×10^{-2} (<1%)
Beryllium	3.2	2×10^{-4} (57.1%)	2×10^{-1} (<1%)
Cadmium	3	NA	2×10^{-1} (<1%)
Calcium	25,300	NA	NA
Chromium	187	NA	1 (3.8%)
Iron	35,600	NA	NA
Lead	108	NA	NA
Magnesium	4,230	NA	NA
Manganese	68	NA	4×10^{-1} (1.4%)
Mercury	0.31	NA	3×10^{-2} (<1%)
Potassium	3,260	NA	NA
Selenium	6.8	NA	4×10^{-2} (<1%)
Sodium	9,990	NA	NA
Vanadium	314	NA	1 (4.6%)
Total Route-Specific Cancer and Noncancer Risk:		3×10^{-4}	26

[1] Cancer risk values are rounded to one significant figure. Percent was calculated before rounding.
[2] Hazard index values are rounded to one significant figure. Percent was calculated before rounding.
[3] Arsenic was detected in one sample collected from a location upgradient of Site 5. Sample was collected in May 1995, after the field phase of the remedial investigation.
Example: 2×10^{-4} is equal to 2 in 10,000.

Notes: $\mu g/\ell$ = micrograms per liter.
NA = not applicable.
% = percent of total risk or hazard.
< = less than.
NC = not calculated.

Table 2-3
Site 5 Ecological Assessment Summary

Record of Decision
Operable Unit 2
Naval Air Station Cecil Field
Jacksonville, Florida

Receptor	Medium			
	Surface Soil	Surface Water	Sediment	Future Groundwater/ Discharge
Terrestrial and wetland wildlife	None	None	None	NA
Terrestrial plant	PCB, TRPH	NA	NA	NA
Soil invertebrate	PCB, TRPH	NA	NA	NA
Benthic macroinvertebrates	NA	None	PCB, 4,4'-DDT, TRPH[1]	None[2]

[1] Drainage ditch only.
[2] Wetland and drainage ditch.

Notes: None = no effect.
NA = not applicable.
PCB = polychlorinated biphenyl.
TRPH = total recoverable petroleum hydrocarbon.
DDT = dichlorodiphenyl trichloroethane.

At Site 17, the calculated cancer risks and noncancer hazards associated with surface soil, subsurface soil, surface water, and sediment were all acceptable per USEPA guidance. The cancer risk derived for domestic use of the groundwater from the surficial aquifer by an adult was 2 in 1,000 (2×10^{-3}), greater than 90 percent of which is due to the VOC methylene chloride. A hazard index of 30 was associated with domestic use of groundwater by an adult. Approximately 37 percent of the hazard index can be attributed to the presence of the VOC methylene chloride. Other contaminants contributing to the hazard index are the SVOCs 2,4-dimethylphenol, 2-methylphenol, 4-methylphenol, and phenol and the VOC benzene. Inorganics were assessed as posing risks. Evaluation of inorganic concentrations indicated no risks are posed by inorganics. Human health risks posed by contaminants at Site 17 are given in Table 2-4, Cancer and Noncancer Risks Posed by Domestic Use of Site 17 Groundwater to an Adult Resident.

Potential risks for ecological receptors were evaluated for ECPCs in surface soil, surface water, and sediment at Site 17. A summary of these risks is presented in Table 2-5. Results indicate that there are no ecological risks at Site 17.

2.7 DESCRIPTION OF ALTERNATIVES. This section provides a narrative of each alternative evaluated. A detailed tabular assessment of each alternative can be found in Table 8-1 of the FS. Alternatives were developed for sediment at Site 5 and groundwater at Sites 5 and 17. Soil at both sites is being addressed by ongoing interim remedial actions that are intended to be the final actions for soil at each site. No other media contain contaminants above risk-based levels.

2.7.1 Sediment Alternatives Analyzed Three sediment alternatives were analyzed for Site 5. They include SD-1, No Action; SD-2, Excavation and Biological Treatment; and SD-3, Excavation and Offsite Disposal. No sediment alternatives were developed for Site 17.

SD-1 No-Action. Evaluation of the no action alternative is required by law. This alternative will leave the site the way it exists today. Ecological risks from the sediment would not be immediately improved as SD-1 relies on natural degradation and dispersion processes that will occur over several years. Contamination would be left in place with potential for movement to other surface water bodies, such as Lake Fretwell. Site conditions would be reviewed once every 5 years, and future remedial actions would not be prevented.

Capital costs to implement SD-1 are $0. The present worth of operations and maintenance (O&M) cost, based on 5 percent for 30 years, is $154,000.

SD-2 Excavation and Biological Treatment. This alternative involves excavating approximately 330 yd^3 of sediment and treating it in the biological treatment cell constructed for the interim remedial action for Site 5 soil. Up to the top 2 feet of sediment would be removed along the length of the drainage ditch. Sampling would be used to identify the extent of excavation needed. Once in the treatment cell, the sediment will be placed in windrows and monitored for biological activity. Nutrients will be added, the proper moisture content maintained, and the optimum oxygen level will be kept by mechanically turning the windrow when necessary. The treatment goal is to reduce TRPH concentrations in the sediment from the current average concentration of 490 mg/kg to 50 mg/kg.

Table 2-4
Cancer and Noncancer Risks Posed by Domestic Use of Site 17 Groundwater to an Adult Resident

Record of Decision
Operable Unit 2
Naval Air Station Cecil Field
Jacksonville, Florida

Chemical	Concentration ($\mu g/\ell$)	Total Cancer Risk[1] (Percent of Total)	Total Noncancer Hazard Index[2] (Percent of Total)
Benzene	14.6	7×10^{-6} (<1%)	1 (4.6%)
1,2-Dichloroethene	12	NA	4×10^{-2} (<1%)
Methylene chloride	24,000	2×10^{-3} (95.4%)	1×10^{1} (37%)
Trichloroethene	14.4	2×10^{-6} (<1%)	6×10^{-2} (<1%)
bis(2-Ethylhexyl)phthalate	6	1×10^{-6} (<1%)	8×10^{-3} (<1%)
2,4-Dimethylphenol	953	NA	1 (4.6%)
2-Methylphenol	3,830	NA	2 (7.4%)
4-Methylphenol	692	NA	4 (13.5%)
Naphthalene	21.1	NA	1×10^{-2} (<1%)
Phenol	5,550	NA	3×10^{-1} (1%)
beta-Hexachlorocyclohexane	0.03	6×10^{-7} (<1%)	NA
Aluminum	201,000	NA	6 (19.5%)
Arsenic	6.2	1×10^{-4} (5.4%)	6×10^{-1} (2%)
Calcium	62,900	NA	NA
Chromium	104	NA	6×10^{-1} (2%)
Iron	9,050	NA	NA
Lead	38.9	NA	NA
Magnesium	3,330	NA	NA
Manganese	221	NA	1 (4.2%)
Potassium	3,230	NA	NA
Sodium	20,500	NA	NA
Vanadium	54.6	NA	2×10^{-1} (1%)
Total Route-Specific Cancer and Noncancer Risk:		2×10^{-3}	40

[1] Cancer risk values are rounded to one significant figure. Percent was calculated before rounding.
[2] Hazard index values are rounded to one significant figure. Percent was calculated before rounding.
Example: 2×10^{-4} is equal to 2 in 10,000.

Notes: $\mu g/\ell$ = micrograms per liter.
< = less than.
NA = not applicable.
% = percent of total risk or hazard.

Table 2-5
Site 17 Ecological Assessment Summary

Record of Decision
Operable Unit 2
Naval Air Station Cecil Field
Jacksonville, Florida

Receptor	Medium			
	Surface Soil	Surface Water	Sediment	Future Groundwater Discharge
Terrestrial wildlife	None	NE	NE	NA
Terrestrial plant	None[1]	NA	NA	NA
Soil invertebrate	None	NA	NA	NA
Benthic macroinvertebrates	NA	NE	None	NA

[1] Slight reduction of lettuce seed germination believed to be associated with a nonecological contaminants of potential concern (ECPC) stressor.

Notes: NA = not applicable.
None = no effect.
NE = not evaluated.

Treatment time is estimated to be 90 days. The drainage ditch will be backfilled with clean material. Once treated, the sediment will be used as fill material for industrial applications.

Two major ARARs are associated with SD-2. The first is Chapter 62-775, Florida Administrative Code (FAC), Florida Soil Thermal Treatment Facilities Regulations, which establishes the 50 mg/kg cleanup level. The second is Executive Order 11990, 40 CFR Part 6, Protection of Wetlands. Excavation of sediment would destroy some wetland habitat, but cleanup would improve wetland over the long term. SD-2 is expected to be in compliance with all ARARs. No treatability study was performed on sediment; however, a treatability study was performed on Site 5 soil with similar contaminants which concluded that soil could be bioremediated to reach the cleanup goal.

The estimated time for design, construction, and implementation is 4 months. The estimated capital costs are $199,000, and the estimated O&M cost is $37,000. The estimated total cost is $236,000 over an estimated 4-month field implementation period. The cost to construct the treatment cell (currently under construction) is estimated to be $700,000.

SD-3 Excavation and Offsite Disposal. This alternative involves excavating approximately 380 yd^3 of sediment and disposing of it in an offsite landfill. For cost estimating purposes, it was assumed the sediment would be transported to a Subtitle C facility. Excavation and backfill would be the same as described in SD-2. The major ARAR associated with SD-3 is Executive Order 11990, 40 CFR Part 6, Protection of Wetlands. The same issues described in SD-2 apply. SD-3 is expected to be in compliance with all ARARs. No treatability study was performed.

The estimated time for design and construction is 1 month. The estimated capital costs are $327,000. There are no O&M costs associated with SD-3.

2.7.2 Groundwater Alternatives Analyzed Six groundwater alternatives have been developed to address groundwater contaminants at each site. At Site 5, contaminants have migrated to the southeast approximately 300 feet from the disposal pit (source) area. At Site 17, contaminants have migrated to the east approximately 130 feet from the eastern edge of the pit. Groundwater alternatives evaluated include GW-1, No Action; GW-2, Natural Attenuation; GW-3, Air Sparging; GW-4, Groundwater Extraction and Treatment by Air Stripping and Carbon Adsorption; GW-5, Groundwater Extraction and Treatment by UV/OX; and GW-6, *In Situ* Air Stripping/Biological Treatment.

GW-1 No-Action. Evaluation of the no action alternative is required by law. This alternative will leave the site the way it exists today. Site conditions would be reviewed once every 5 years, and future remedial actions would not be prevented.

Capital costs to implement GW-1 are $0. The present worth of O&M costs, based on 5 percent for 15 years, is $104,000.

GW-2 Natural Attenuation. This alternative consists of a monitoring and modeling program to determine the effectiveness of naturally occurring biodegradation. A series of monitoring wells would be installed and initially sampled quarterly. Some monitoring wells will be installed within the plume to characterize

contaminant concentrations. Others will be located downgradient of the plume, beginning at the plume's leading edge and outward to monitor possible contaminant migration and to help determine if additional enhancement is needed. Analyses will be performed for chemicals of concern (to monitor degradation rates) and other parameters (to monitor for biological activity) including dissolved oxygen, sulfate/sulfide, total and dissolved iron, methane/ethene, oxidation/reduction potential, pH, temperature, conductivity, alkalinity, nitrate, carbon dioxide, and chloride. GW-2 would also include implementation of land-use restrictions or other institutional controls to prevent exposure to and use of groundwater as a potable water supply. In the short term, this alternative would not comply with chemical-specific ARARs; however, GW-2 is expected to comply with all ARARs in the long term. Until ARARs are met, use of groundwater will be restricted.

The estimated time for design and construction is 6 months. The estimated time of operation is 15 years. The estimated capital costs are $20,000. The estimated present worth of O&M costs, based on 5 percent for 15 years, is $212,000. The estimated present worth total cost is $232,000.

GW-3 Air Sparging. This alternative would reduce risks by treating groundwater *in situ*. Air sparging involves pumping air through wells into the groundwater. Organic compounds are removed from the groundwater by transferring them into the gas phase. The gas is then extracted from the vadose zone (soil above the water table), passed through granular activated carbon, and vented to the atmosphere. Contamination would also be reduced by introducing oxygen to the subsurface soil and groundwater to increase biological activity.

Remediation under this alternative would proceed until remedial action objectives (including target cleanup levels) are met. The target cleanup levels identified would be in compliance with chemical-specific ARARs. It is possible that health risk-based RAOs will be met before all of the individual target cleanup levels have been reached. The alternative would comply with location and action-specific ARARs.

The estimated time for design and construction is 8 months. The estimated time of operation is 4 years. The estimated capital costs are $1,083,000. The estimated present worth of O&M costs, based on 5 percent for 4 years, is $555,000. The estimated present worth total cost is $1,633,000.

GW-4 Groundwater Extraction and Treatment by Air Stripping and Carbon Adsorption. Groundwater would be pumped from the shallow aquifer using three to five extraction wells. Extracted groundwater would be treated with an air stripper to remove volatile organic compounds. Semivolatile organic compounds and pesticides would be removed using carbon adsorption. Treated groundwater would be discharged into a specially designed infiltration basin, which would allow the clean groundwater to eventually filter back into the aquifer. Compliance with ARARs is the same as GW-3.

The estimated time for design and construction is 8 months. The estimated time of operation is 6 years. The estimated capital costs are $1,533,000. The estimated present worth of O&M costs, based on 5 percent for 6 years, is $1,482,000. The estimated present worth total cost is $3,015,000.

GW-5 Groundwater Extraction and Treatment by UV/OX. Groundwater would be pumped from the shallow aquifer using three to five extraction wells. Extracted

groundwater would be treated with ultraviolet light (UV) and an oxidant (OX) (e.g., hydrogen peroxide) to destroy contaminants. Treated groundwater would be discharged into a specially designed infiltration basin, which would allow the clean groundwater to filter back into the aquifer. Compliance with ARARs is the same as GW-3.

The estimated time for design and construction is 8 months. The estimated time of operation is 6 years. The estimated capital costs are $1,575,000. The estimated present worth of O&M costs, based on 5 percent for 6 years, is $1,304,000. The estimated present worth total cost is $2,879,000.

GW-6 *In Situ* Stripping and Biological Treatment. Vertical wells would be installed that circulate groundwater through the well, and air would be introduced to strip volatile organic compounds and promote biological breakdown of other contaminants. Stripped volatile organics are collected from the upper portion of the well and treated as necessary prior to release to the atmosphere. This is an innovative technology which poses the risk of not reaching cleanup goals.

This alternative would eventually achieve chemical-specific ARARs for VOCs such as benzene and methylene chloride through *in situ* air stripping. It would further achieve removal of SVOCs through biodegradation in groundwater. This alternative would not reduce the concentrations of inorganic contaminants such as aluminum, antimony, arsenic, iron, and manganese, except through natural biological, chemical, and physical processes which may be modified by *in situ* air stripping. Groundwater and biological monitoring will be used to model degradation to assess compliance with ARARS. Biological monitoring will include dissolved oxygen, carbon dioxide, sulfate/sulfide, total and dissolved iron, oxidation and/or reduction potential, pH, temperature, conductivity, and nitrate. Location and action-specific ARARs would be met.

The estimated time for design and construction is 8 months. The estimated time of operation is 4 years. The estimated capital costs are $1,082,000. The estimated present worth of O&M costs, based on 5 percent for 4 years, is $555,000. The estimated present worth total cost is $1,632,000.

2.8 SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES. This section evaluates and compares each of the alternatives with respect to the nine criteria outlined in Section 300.430(s) of the NCP. These criteria are categorized as threshold, primary balancing, or modifying. Table 2-6 gives an explanation of the evaluation criteria.

A detailed analysis was performed on the alternatives using the nine evaluation criteria in order to select a site remedy. The following is a summary of the comparison of each alternative's strength and weakness with respect to the nine evaluation criteria. Table 2-7 presents the evaluation of contaminated sediment remedial alternatives. Table 2-8 presents the evaluation of contaminated groundwater remedial alternatives.

2.9 SELECTED REMEDIES. Three remedies were selected to supplement the ongoing interim remedial actions at OU 2: one for the sediment at Site 5 and one each for the groundwater at Site 5 and at Site 17.

Table 2-6
Explanation of Evaluation Criteria

Record of Decision
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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. 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. 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.
	Short-Term Effectiveness. The risks that implementation of a particular remedy may pose to workers and nearby residents (e.g., whether contaminated dust will be produced during excavation), as well as the reduction in risks that results by controlling the contaminants, is assessed. The length of time needed to implement each alternative is also considered.
	Implementability. The technical feasibility and administrative ease (e.g., the amount of coordination with other government agencies that is needed) of a remedy, including availability of necessary goods and services, is assessed.
	Cost. The benefits of implementing a particular alternative are weighed against the cost of implementation.
Modifying	U.S. Environmental Protection Agency (USEPA) 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 an opportunity to comment on the remedy selection process and the preferred alternative and then responds to those comments.

Table 2-7
Comparative Analysis of Contaminated Sediment Remedial Alternatives

Record of Decision
Operable Unit 2
Naval Air Station Cecil Field
Jacksonville, Florida

Criterion	Alternative SD-1: No Action	Alternative SD-2: Excavation and Onsite Biological Treatment	Alternative SD-3: Excavation and Offsite Disposal
Overall Protection of Human Health and the Environment			
How risks are eliminated, reduced, or controlled.	Alternative SD-1 would not eliminate, reduce, or control the risk to ecological receptors.	Alternative SD-2 would provide an increased level of protection to the environment because risks via direct contact or ingestion of contaminants at the site are minimized. Worker health and safety requirements would be maintained.	Analysis is the same as that for Alternative SD-2.
Short-term or cross-media effects.	No short-term or cross-media adverse effects are expected.	Cross-media contamination through volatilization during excavation and handling may occur.	Analysis is the same as for Alternative SD-2.
Compliance with ARARs			
Chemical-, location-, and action-specific ARARs.	SD-1 would not comply with ARARs.	SD-2 would comply if 50 parts per million (ppm) total recoverable petroleum hydrocarbon (TRPH) level can be achieved and effects to wetland are minimized.	SD-3 would comply if effects to wetland are minimized.
Long-Term Effectiveness and Permanence			
Magnitude of residual risk	Removal or treatment processes would not be used to address site contamination during the implementation of the no action alternative; therefore, no reduction of risk to ecological receptors would be achieved.	The reduction in risk at Site 5 would be permanent because contaminated sediment would be removed and treated. Actual risk associated with hazardous constituents in sediment is reduced through treatment for destruction of TRPH constituents.	Analysis is similar to Alternative SD-2 with the additional risk reduction from reducing exposure to PCBs. Sediment would not be treated.
Adequacy of controls	Implementation of Alternative SD-1 would provide no immediate and long-term source control at Site 5.	Implementation of Alternative SD-2 would provide immediate and long-term source control at Site 5 that would meet the RAO for sediment.	Analysis is the same as Alternative SD-2.
Reliability of controls	No control of contaminants is provided. Based on past site investigations, site conditions are expected to remain unchanged. Five-year site reviews would be used to assess change in site conditions over time to ensure long-term effectiveness and permanence.	Biological treatment is reliable for petroleum wastes; however, treatment time may be longer than expected if sediment differs from anticipated conditions. Biological treatment is not expected to be reliable for PCBs.	Land disposal is reliable at isolating wastes to prevent migration and exposure but requires perpetual maintenance.

See notes at end of table.

Table 2-7 (Continued)
Comparative Analysis of Contaminated Sediment Remedial Alternatives

Record of Decision
Operable Unit 2
Naval Air Station Cecil Field
Jacksonville, Florida

Criterion	Alternative SD-1: No Action	Alternative SD-2: Excavation and Onsite Biological Treatment	Alternative SD-3: Excavation and Offsite Disposal
Reduction of Mobility, Toxicity, and Volume			
Treatment process and remedy.	Removal, containment, or treatment processes would not be provided.	Soil would be treated by microorganisms to destroy TRPH contaminants. PCBs are not treated.	Contaminants are contained in a permitted facility, but not treated.
Amount of hazardous material destroyed or treated.	No hazardous material would be destroyed or treated.	An estimated 330 yd^3 of contaminated sediment would be treated.	Analysis is the same as that for Alternative SD-2 except that contaminants are contained, not treated.
Reduction of mobility, toxicity, or volume through treatment.	No treatment occurs.	SD-2 would achieve a permanent reduction in toxicity, mobility, and volume of TRPH contaminants in sediment. PCBs would not be significantly treated.	No treatment occurs.
Irreversibility of treatment.	No treatment occurs.	Biological treatment is irreversible.	No treatment occurs.
Type and quantity of treatment residuals.	No treatment residuals would be produced.	Surplus water generated would be sent to the wastewater treatment plant. Treated soil would be disposed of as fill on Naval Air Station (NAS) Cecil Field property.	Decontamination water would be treated at the NAS Cecil Field wastewater treatment plant.
Short-Term Effectiveness			
Protection of community during remedial action.	Protection of the public would not be necessary if this alternative were implemented. No risk to human health is posed by the sediment.	Dust control would be required during excavation of sediment. Fact sheets and posters providing information to the public regarding the remedial action would be distributed.	Analysis is the same as for Alternative SD-2.
Protection of workers during remedial actions.	Exposure to monitoring personnel would be minimal.	Worker exposure would be more extensive than for SD-1, but they would be required to follow an approved health and safety plan.	Analysis is the same as for Alternative SD-2.
Environmental effects.	No adverse environmental effects would be caused.	The existing habitat and populations in and adjacent to the drainage ditch would be removed and destroyed. Several years may be required for conditions to be fully restored. Releases to air are expected to have minimal environmental effect.	Analysis is the same as for Alternative SD-2.
Time until RAOs are achieved.	This alternative will not meet the RAOs in the near future. RAOs may be met after decades of natural remedial processes.	Approximately 4 months are necessary to meet the RAOs for Site 5.	Approximately 1 month is necessary to meet the RAOs for Site 5.

See notes at end of table.

Table 2-7 (Continued)
Comparative Analysis of Contaminated Sediment Remedial Alternatives

Record of Decision
Operable Unit 2
Naval Air Station Cecil Field
Jacksonville, Florida

Criterion	Alternative SD-1: No Action	Alternative SD-2: Excavation and Onsite Biological Treatment	Alternative SD-3: Excavation and Offsite Disposal
Implementability			
Ability to construct technology.	No construction necessary.	Materials for construction of a biological treatment area are available and easily constructed onsite and are available when the initial remedial action is complete.	Materials for excavation, transport, and disposal of sediment are readily available.
Reliability of technology.	Monitoring technology is well developed.	Treatment standards for contaminated sediment would be met by biological mechanisms.	Land disposal reliably reduces migration and exposure.
Ease of undertaking additional remedial action, if necessary.	Would provide no impediment to additional remediation.	SD-2 would provide no impediment to additional remediation. Sediment could be reprocessed until treatment TRPH standards are met.	SD-3 would provide no impediment to additional remedial actions, if necessary.
Monitoring considerations.	Five-year site reviews would be required.	Air monitoring would be conducted as appropriate during excavation. Medical monitoring of workers within the exclusion zone would be required.	Analysis is the same as for Alternative SD-2.
Coordination with other regulatory agencies.	Coordination with USEPA and FDEP necessary.	Coordination with NAS Cecil Field personnel required for duration of remedial activities. Coordination with USEPA and FDEP necessary.	Analysis is the same as for Alternative SD-2.
Availability and capacity of treatment, storage, and disposal services.	Treatment, storage, and disposal services are not required for this alternative.	Offsite treatment, storage, or disposal services are not required for implementation of this alternative. Treatment is to occur in an onsite biological treatment pad. Disposal is to occur at a location on NAS Cecil Field property, as fill.	Availability of permitted TSD facilities for treatment of contaminated sediment would be required at the time of remedial action. Local vendors handle nonhazardous wastes only. Availability of vendors who accept sediment with PCBs in Florida is limited.
Availability of technologies, equipment, and specialists.	Monitoring equipment, services, and personnel are readily available.	Construction contractors, equipment, and laboratories are available.	Analysis is the same as for Alternative SD-2.
Cost			
Total present worth (including contingency).	$154,000	$236,000	$327,000

Notes: ARARs = applicable or relevant and appropriate requirements.
PCBs = polychlorinated biphenyls.
RAO = remedial action objective.
yd^3 = cubic yard.
USEPA = U.S. Environmental Protection Agency.
FDEP = Florida Department of Environmental Protection.
TSD = treatment, storage, and disposal.

Table 2-8
Comparative Analysis of Groundwater Remedial Alternatives

Record of Decision
Operable Unit 2
Naval Air Station Cecil Field
Jacksonville, Florida

Criterion	Alternative GW-1: No Action	Alternative GW-2: Natural Attenuation	Alternative GW-3: Air Sparging	Alternative GW-4: Air Stripping and Carbon Adsorption	Alternative GW-5: UV/OX	Alternative GW-6: *In Situ* Stripping and Biological Treatment
Overall Protection of Human Health and the Environment						
How risks are eliminated, reduced, or controlled	Alternative GW-1 would not provide an increased level of protection to human health because risks via ingestion of contaminated groundwater would not be reduced. Worker health and safety requirements would be maintained.	Risks via ingestion of contaminated groundwater would be reduced over time through natural attenuation. Worker health and safety requirements would be maintained.	Risks via ingestion of contaminated groundwater would be reduced through air sparging treatment. Worker health and safety requirements would be maintained.	Analysis is the same as or less than that for Alternative GW-3. Risks would be reduced by extraction and air stripping and carbon treatment.	Analysis is the same as or less than that for Alternative GW-3. Risks would be reduced by extraction and ultraviolet light and oxidation (UV/OX) treatment.	Risks via ingestion of contaminated groundwater would be reduced through stripping and biodegradation. Worker health and safety requirements would be maintained.
Short-term or cross-media effects.	No short-term adverse effects are expected to occur during implementation of this alternative. No cross-media contamination would occur with this alternative.	Analysis is the same as for Alternative GW-1.	No short-term adverse effects are expected to occur during implementation of this alternative. Contamination would be volatilized from groundwater into soil vapor; however, vapors would be collected and treated.	No short-term adverse effects are expected to occur during implementation of this alternative. Contamination would be volatilized from groundwater during air stripping; however, off-gases would be collected and treated.	No short-term adverse effects are expected to occur during implementation of this alternative. No cross-media effects would be anticipated.	No short-term adverse effects are expected to occur during implementation of this alternative. Volatilized contaminants would be captured and treated.
Compliance with ARARs						
Chemical-, location-, and action-specific ARARs.	Would not comply with maximum contaminant levels (MCLs) and Florida Petroleum Contamination Site Cleanup Criteria until natural mechanisms reduce concentrations or groundwater is reclassified as GW-III.	Analysis is the same as for Alternative GW-1.	GW-3 would comply.	GW-4 would comply.	GW-5 would comply.	GW-6 would comply.

See notes at end of table.

Table 2-8 (Continued)
Comparative Analysis of Groundwater Remedial Alternatives

Record of Decision
Operable Unit 2
Naval Air Station Cecil Field
Jacksonville, Florida

Criterion	Alternative GW-1: No Action	Alternative GW-2: Natural Attenuation	Alternative GW-3: Air Sparging	Alternative GW-4: Air Stripping and Carbon Adsorption	Alternative GW-5: UV/OX	Alternative GW-6: *In Situ* Stripping and Biological Treatment
Long-Term Effectiveness and Permanence						
Magnitude of residual risk.	If future residential land use exposure scenarios become a reality, human health risk would exceed acceptable levels. Natural processes would eventually reduce risk to acceptable levels.	Institutional controls would reduce risk as long as they are enforced. Natural processes would eventually reduce risk to acceptable levels.	The risk at OU 2 would be permanently reduced to acceptable levels.	Analysis is the same as for Alternative GW-3.	Analysis is the same as for Alternative GW-3.	Analysis is the same as for Alternative GW-3.
Adequacy of controls.	No controls are implemented.	Controls would adequately prevent use of groundwater for drinking purposes.	Air sparging is an innovative alternative and is believed to be an adequate control for remediation of sites with volatile contaminants and petroleum wastes.	Groundwater extraction and treatment provides adequate controls to prevent releases and attain objectives.	Analysis is the same as for Alternative GW-4.	*In Situ* Stripping and Biological Treatment is an innovative alternative and is believed to be an adequate control for remediation of sites with volatile contaminants and petroleum wastes.
Reliability of controls.	No controls are implemented.	Controls are reliable as long as legal requirements are enforced.	Air sparging is not well demonstrated.	Groundwater extraction and treatment systems are generally reliable but sometimes fail to meet target cleanup levels.	Analysis is the same as for Alternative GW-4.	*In Situ* Stripping and Biological Treatment is not well demonstrated.
Reduction of Mobility, Toxicity, and Volume						
Treatment process and remedy.	No treatment occurs.	No treatment occurs.	Groundwater would be treated by microorganisms to destroy organic contaminants. Volatilized contaminants would be treated by the vapor phase carbon or incineration.	Groundwater contaminants would be treated by air stripping and carbon adsorption. Contaminants would be destroyed during vapor treatment or carbon regeneration.	Groundwater contaminants would be destroyed by UV/OX.	Analysis is the same as for Alternative GW-3.

See notes at end of table.

Table 2-8 (Continued)
Comparative Analysis of Groundwater Remedial Alternatives

Record of Decision
Operable Unit 2
Naval Air Station Cecil Field
Jacksonville, Florida

Criterion	Alternative GW-1: No Action	Alternative GW-2: Natural Attenuation	Alternative GW-3: Air Sparging	Alternative GW-4: Air Stripping and Carbon Adsorption	Alternative GW-5: UV/OX	Alternative GW-6: *In Situ* Stripping and Biological Treatment
Reduction of Mobility, Toxicity, and Volume (continued)						
Amount of hazardous material destroyed or treated.	No contaminants would be treated. Natural biological mechanisms may destroy some hazardous materials.	Analysis is the same as Alternative GW-1.	Approximately 5.6 million gallons of contaminated water would be treated by this alternative.	Analysis is the same as for Alternative GW-3.	Analysis is the same as for Alternative GW-3.	Analysis is the same as for Alternative GW-3.
Reduction of mobility, toxicity, or volume through treatment.	No reduction.	No reduction.	Mobility, toxicity, and volume of contamination would be reduced through treatment.	Analysis is the same as for Alternative GW-3.	Analysis is the same as for Alternative GW-3.	Analysis is the same as for Alternative GW-3.
Irreversibility of treatment.	No treatment occurs.	No treatment occurs.	Biological treatment is irreversible. Vapor treatment by incineration is irreversible. Vapor treatment by carbon is irreversible if carbon is thermally regenerated.	Analysis is the same as for Alternative GW-3.	Treatment by UV/OX is irreversible.	Analysis is the same as for Alternative GW-3.
Type and quantity of treatment residuals.	No treatment residuals would be generated.	No treatment residuals would be generated.	A limited amount of ash or vapor-phase carbon would be produced during treatment of vapors and would be handled by an offsite vendor. Decontamination water would be treated at the NAS Cecil Field wastewater treatment plant.	Analysis is the same as for Alternative GW-3. Liquid-phase carbon and iron sludge would also be handled by an offsite vendor.	Treatment generates only iron sludge, which would be handled by an offsite vendor.	Analysis is the same as for Alternative GW-3.
Short-Term Effectiveness						
Protection of community during remedial action.	No effects on the public would be anticipated. Fact sheets and posters providing information to the public regarding the remedial action would be distributed.	Analysis is the same as for Alternative GW-1.	Analysis is the same as for Alternative GW-1.	Analysis is the same as for Alternative GW-1.	Analysis is the same as for Alternative GW-1.	Analysis is the same as for Alternative GW-1.

See notes at end of table.

Table 2-8 (Continued)
Comparative Analysis of Groundwater Remedial Alternatives

Record of Decision
Operable Unit 2
Naval Air Station Cecil Field
Jacksonville, Florida

Criterion	Alternative GW-1: No Action	Alternative GW-2: Natural Attenuation	Alternative GW-3: Air Sparging	Alternative GW-4: Air Stripping and Carbon Adsorption	Alternative GW-5: UV/OX	Alternative GW-6: *In Situ* Stripping and Biological Treatment
Short-Term Effectiveness (continued)						
Protection of workers during remedial actions.	No construction would occur onsite. Workers would follow an approved health and safety plan during monitoring.	Analysis is the same as for Alternative GW-1.	Workers would be required to follow an approved health and safety plan. During construction, workers within the exclusion zone would be dressed in modified Level D protection and would be on a special medical monitoring program.	Analysis is the same as for Alternative GW-2.	Analysis is the same as for Alternative GW-3.	Analysis is the same as for Alternative GW-3.
Environmental effects.	No environmental effects would be expected.	Analysis is the same as for Alternative GW-1.	Some disturbance of existing vegetation would be necessary to implement this alternative.	Analysis is the same as for Alternative GW-3.	Analysis is the same as for Alternative GW-3.	Analysis is the same as for Alternative GW-3.
Time until remedial action objectives are achieved.	Fifteen years.	Fifteen years.	Four years.	Six years.	Six years.	Four years.
Implementability						
Ability to construct technology.	No construction necessary.	No construction necessary.	Materials for construction and services are readily available.	Materials for construction and services are readily available.	Materials for construction and services are readily available.	Materials for construction and services are readily available.
Reliability of technology.	Monitoring technology is well established.	Enforcement and monitoring technology is well established.	Air sparging technology should be reliable for volatile and easily biodegradable contaminants, although it is not well demonstrated. May not be reliable for pesticides.	Treatment technology is reliable; however, extraction sometimes does not reach desired remedial end points.	Analysis is the same as for Alternative GW-4.	Analysis is the same as for Alternative GW-3.
Ease of undertaking additional remedial action, if necessary.	GW-1 would not hinder additional treatment if necessary.	Analysis is the same as for Alternative GW-1.	Analysis is the same as for Alternative GW-1.	Analysis is the same as for Alternative GW-1.	Analysis is the same as for Alternative GW-1.	Analysis is the same as for Alternative GW-1.

See notes at end of page.

Table 2-8 (Continued)
Comparative Analysis of Groundwater Remedial Alternatives

Record of Decision
Operable Unit 2
Naval Air Station Cecil Field
Jacksonville, Florida

Criterion	Alternative GW-1: No Action	Alternative GW-2: Natural Attenuation	Alternative GW-3: Air Sparging	Alternative GW-4: Air Stripping and Carbon Adsorption	Alternative GW-5: UV/OX	Alternative GW-6: *In Situ* Stripping and Biological Treatment
Implementability (continued)						
Monitoring considerations.	Sampling and analysis would occur every 5 years to support the 5-year review report.	Sampling and analysis would occur quarterly for the first year and annually after the first year.	Air monitoring would be conducted for the vapor treatment system. Groundwater and soil gas would be monitored to evaluate progression of cleanup.	Air monitoring would be conducted for the vapor treatment system. Groundwater would be monitored to evaluate progression of cleanup.	Groundwater would be monitored to evaluate progression of cleanup.	Analysis is the same as for Alternative GW-3.
Coordination with other regulatory agencies.	Coordination with NAS Cecil Field personnel and the base reuse committee required for long-term administration. USEPA, FDEP, county, and city would be notified of actions being conducted.	Analysis is the same as for Alternative GW-1.	Analysis is the same as for Alternative GW-1.	Analysis is the same as for Alternative GW-1.	Analysis is the same as for Alternative GW-1.	Analysis is the same as for Alternative GW-1.
Availability and capacity of treatment, storage, and disposal services.	No services required.	No services required.	Capacity and facilities are available to handle vapor treatment system residuals.	Capacity and facilities are available to handle vapor treatment system residuals and spent liquid-phase carbon.	Capacity and facilities are available to handle spent iron filters.	Capacity and facilities are available to handle vapor treatment system residuals.
Availability of technologies, equipment, and specialists.	Monitoring services and equipment are available.	Monitoring services, equipment, and administrative services are readily available.	Equipment and materials are readily available. Air sparging vendors are available to provide expertise.	Equipment, materials, and treatment specialists are readily available.	Analysis is the same as for Alternative GW-4.	Only a couple of vendors offer these types of wells.
Ability to obtain approvals from other agencies.	Approval from State and USEPA required. Lack of physical controls may make approval more difficult.	Analysis is the same as for Alternative GW-1.	Approval from State and USEPA is required. Innovative and less demonstrated technology may make approval more difficult.	Approval from State and USEPA's required. Difficulty obtaining approval is not anticipated.	Analysis is the same as for Alternative GW-4.	Analysis is the same as for Alternative GW-4.

See notes at end of table.

Table 2-8 (Continued)
Comparative Analysis of Groundwater Remedial Alternatives

Record of Decision
Operable Unit 2
Naval Air Station Cecil Field
Jacksonville, Florida

Criterion	Alternative GW-1: No Action	Alternative GW-2: Natural Attenuation	Alternative GW-3: Air Sparging	Alternative GW-4: Air Stripping and Carbon Adsorption	Alternative GW-5: UV/OX	Alternative GW-6: *In Situ* Stripping and Biological Treatment
Cost						
Total present worth, (including contingency)	$104,000	$232,000	$1,633,000	$3,015,000	$2,879,000	$1,632,000

Notes: UV/OX = ultraviolet light and oxidation.
ARARs = applicable or relevant and appropriate requirements.
OU = operable unit.
NAS = Naval Air Station.
USEPA = U.S. Environmental Protection Agency.
FDEP = Florida Department of Environmental Protection.

2.9.1 Site 5 Sediment The selected sediment alternative is SD-2, Excavation and Biological Treatment. SD-2 is estimated to cost $236,000 and take 4 months to implement. SD-2 was selected because there will be a reduction in the toxicity, mobility, and volume of contaminants through treatment that will occur entirely onsite eliminating the need to transport untreated contaminants offsite.

2.9.2 Site 5 Groundwater The selected Site 5 groundwater alternative is either GW-3, Air Sparging, or GW-6, *In Situ* Air Stripping and Biological Treatment. The soil excavation sequence of the ongoing interim remedial action at Site 5 requires the groundwater remediation system be installed in stages. A combination of GW-3 and GW-6 provides an opportunity to evaluate the performance of two similar innovative technologies. Initially, an air sparging well and an *in situ* stripping well will be installed. These wells will be monitored for performance and ease of operation and maintenance while the excavation proceeds. Whichever technology performs the best will be installed in later stages to remediate the entire groundwater plume. The Navy estimates that either of the preferred alternatives would cost $816,500 over 4 years.

The more aggressive alternatives GW-3 and GW-6 were selected for Site 5 to prevent the continued release of contaminants from groundwater to the nearby drainage ditch (GW-2 does not meet this objective). GW-4 and GW-5 meet this objective, but require aboveground facilities and associated financial, labor, and energy resources to treat both water and volatilized organics.

2.9.3 Site 17 Groundwater The selected Site 17 groundwater alternative is GW-2, Natural Attenuation. Upon completion of the IRA, additional monitoring wells will be installed. Some will be installed within the plume to characterize conditions after the IRA. Other wells will be installed downgradient of the plume to monitor possible plume migration. Groundwater will be sampled and the results analyzed for several parameters, including certain chemicals of concern to monitor degradation rates and other parameters to monitor for biological activity. These include dissolved oxygen, sulfate/sulfide, total and dissolved iron, methane/ethene, oxidation/reduction potential, pH, temperature, conductivity, alkalinity, nitrate, carbon dioxide, and chloride. If necessary, groundwater will be treated onsite at those locations where chemicals of concern exist at concentrations above the ambient levels of the plume. Natural attenuation will be used for those locations where chemical concentrations are at or below ambient concentrations of the plume.

Natural attenuation was selected at Site 17 because evaluation of measurements made and data collected during the site investigations indicate that this process is currently active. Evidence indicates a high probability that intrinsic bioremediation will work at this site. However, in the absence of conclusive evidence, the site will be aggressively monitored to provide analytical data to support the effectiveness of the intrinsic bioremediation. The plume is not currently discharging to a surface water body or any other receptor, nor would it be expected to discharge in the near future. While the goal of cleanup is to reach drinking water criteria, it is noted that land at Site 17 is undeveloped with a shallow depth to groundwater (0 to 4 feet bls). The shallow depth to groundwater would inhibit future residential development and the associated possibility of using contaminated groundwater as a potable water supply. Additionally, the site's location, immediately west of the east-west runway, makes future residential use of the land a low probability. In the event the site would be developed for residential use, a community water distribution system is located within 6,000 feet of Site 17. This system draws water from a

Table 2-9 (Continued)
Synopsis of Potential Federal and State Location-Specific ARARs

Record of Decision
Operable Unit 2
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Jacksonville, Florida

Federal or State Standards and Requirements	Requirements Synopsis	Consideration in the Remedial Response Process
Protection of Floodplains, Executive Order 11988	Federal agencies are required to reduce the risk of flood loss, to minimize impact of floods, and to restore and preserve the natural and beneficial values of floodplains.	**Applicable**. The potential effects of any action will be evaluated to ensure that the planning and decision making reflect consideration of flood hazards and floodplain management, including restoration and preservation of natural, undeveloped floodplains.
Chapter 17-312, FAC, Florida Dredge and Fill Activities	Establishes permit requirements for dredging, filling, excavating, or placing material in or over waters of the State.	**To be considered**. The substantive requirements of the permitting process should be considered when developing and implementing remedial activities at OU 2 that involve Rowell Creek or the drainage ditch that leads to Lake Fretwell.
Chapter 17-611, FAC, Wetlands Application Regulations	Sets requirements for discharge of domestic wastewater to wetland.	**Applicable**. This rule addresses the discharge of domestic wastewater to wetland. The discharge limits established are for carbonaceous biological oxygen demand, total suspended solids, nitrogen, and phosphorus. This rule may be applicable for remedial alternatives that would result in discharges to wetland where these limits may be approached.

Notes: ARARs = applicable or relevant and appropriate requirements.
CFR = Code of Federal Regulations.
FAC = Florida Administrative Code.

Table 2-10
Synopsis of Potential Federal and State Chemical-Specific ARARs

Record of Decision
Operable Unit 2
Naval Air Station Cecil Field
Jacksonville, Florida

Federal or State Standards and Requirements	Requirements Synopsis	Consideration in the Remedial Response Process
Clean Water Act (CWA), Ambient Water Quality Criteria (40 CFR Part 131)	Federal Ambient Water Quality Criteria (AWQC) are nonenforceable, health-based criteria for surface water used in setting discharge limits for NPDES permits. AWQC provide levels of exposure from drinking the water and consuming aquatic life that are protective of human health. AWQC also provide acute and chronic concentrations for protection of freshwater and marine organisms.	**Relevant and appropriate.** Because of the potential discharge of surface runoff and groundwater at Site 5 to the drainage ditch and Lake Fretwell, AWQC are relevant and appropriate for consideration as criteria to evaluate conditions in the Site 5 drainage ditch and possible drinking water effects as a result of leaching from soil to groundwater.
CWA, Toxic Pollutant Effluent Standards (40 CFR Part 129)	This regulation establishes the concentration of a toxic pollutant in navigable waters and states that a discharge from a site to navigable water shall not result in adverse impacts to aquatic life or to consumers of aquatic life.	**Relevant and appropriate.** This rule is a potential ARAR for remedial alternatives that include discharge of treated groundwater or surface water to a surface water body (e.g., Rowell Creek or the drainage ditch that leads to Lake Fretwell). These standards may be incorporated into NPDES permits where applicable for the proposed discharge of surface water.
Occupational Safety and Health Act (OSHA), Occupational Safety and Health Regulations (20 CFR Part 1910, Subpart Z)	Establishes permissible exposure limits for workplace exposure to a specific listing of chemicals.	**Applicable.** Standards are applicable for worker exposure to OSHA hazardous chemicals during remedial activities. During implementation of remedial alternatives for OU 2, these requirements are ARARs.
Safe Drinking Water Act (SDWA), Maximum Contaminant Level Goals (MCLGs) (40 CFR Part 141)	Establishes drinking water quality goals at levels of no known or anticipated adverse health effects with an adequate margin of safety. These criteria do not consider treatment feasibility or cost elements.	**Relevant and appropriate.** MCLGs greater than zero are relevant and appropriate standards for groundwater or surface water that is currently or potentially a source of drinking water. Currently, the groundwater at OU 2 is not used as a drinking water supply, and surface water near OU 2 is classified as Class III water for recreation and propagational uses only. MCLGs may be used for evaluating leaching of contaminants from soil to groundwater. MCLGs would not be ARARs under a future land use scenario that prevents use of groundwater as a drinking water source.
SDWA, National Primary Drinking Water Standards, Maximum Contaminant Levels (MCLs) (40 CFR Part 141)	Establishes enforceable standards for specific contaminants that have been determined to adversely affect human health. These standards are protective of human health for individual chemicals and are developed using MCLGs, available treatment technologies, and cost data.	**Relevant and appropriate.** MCLs established by the SDWA are relevant and appropriate standards where the MCLGs are not determined to be ARARs. MCLs apply to finished water of public water supply systems and are considered relevant and appropriate for groundwater or surface water that is currently or potentially a drinking water source. Currently, the groundwater at OU 2 is not used as a drinking water supply and surface water near OU 2 is classified as Class III water for recreation and propagational uses only. MCLs may be used for evaluating leaching of contaminants from soil to groundwater. MCLs would not be ARARs under a future land-use scenario that prevents use of groundwater as a drinking water source.
SDWA, National Secondary Drinking Water Standards (40 CFR Part 143)	Establishes welfare-based standards for public water systems for specific contaminants or water characteristics that may affect the aesthetic or economic qualities of a public water supply.	**To be considered.** Secondary MCLs (SMCLs) are nonenforceable limits intended as guidelines for use by States in regulating water supplies.

See notes at end of table.

Table 2-10 (Continued)
Synopsis of Potential Federal and State Chemical-Specific ARARs

Record of Decision
Operable Unit 2
Naval Air Station Cecil Field
Jacksonville, Florida

Federal and State Standards and Requirements	Requirements Synopsis	Consideration in the Remedial Response Process
Toxic Substances Control Act (TSCA), Polychlorinated biphenyl (PCB) requirements (13 USC 2601-2629, 40 CFR Part 761)	Authorizes USEPA to establish regulations governing chemical substances or mixtures that present an unreasonable risk of injury to human health and the environment. Establishes requirements for marking, storing, disposing of, recording, cleaning spills, and reporting wastes containing PCBs.	**Relevant and appropriate.** Because disposal of PCB wastes occurred prior to TSCA, wastes at Site 5 are not specifically regulated by TSCA. If soil or sediment containing PCBs is excavated for treatment, storage, or disposal, then these regulations will be relevant and appropriate.
Chapter 17-302, Florida Administrative Code (FAC), Florida Surface Water Quality Standards (FSWQS)	Defines classifications of surface water and establishes water quality standards (WQS) for surface water within each classification. The State's antidegradation policy is also established in this rule.	**Relevant and appropriate.** Surface water near OU 2 (e.g., Rowell Creek and Lake Fretwell) is classified by the Florida Department of Environmental Protection (FDEP) as Class III water and as such is designated for recreation, propagation, and management of fish and wildlife and is not used as a drinking water resource. Remedial alternatives that address surface water contamination or include an option for discharge of treated groundwater or surface water to surface water will consider FSWQS. These standards may also be relevant and appropriate for groundwater remediation if no MCL exists, groundwater discharges to surface water and contaminants are affecting aquatic organisms, or other health-based standards are not available.
Chapter 17-520, FAC, Florida Water Quality Standards	Establishes the groundwater classification system for the State and provides qualitative minimum criteria for groundwater based on the classification.	**Relevant and appropriate.** The classification system established in this rule defines potable water sources. The groundwater at OU 2 is classified as G-II and is suitable for potable water use and has a total dissolved solids content of less than 10,000 milligrams per liter (mg/ℓ).
Chapter 17-550, FAC, Florida Drinking Water Standards	Established to implement the Federal SDWA by adopting the national primary and secondary drinking water standards and by creating additional rules to fulfill State and Federal requirements.	**Applicable.** Drinking water standards are commonly considered applicable regulations for aquifers and related groundwater classified as a current or potential potable water supply source. Drinking water standards should be considered ARARs during a CERCLA cleanup for groundwater or surface water that is currently or potentially a source of drinking water.
Chapter 17-650, FAC, Florida Water Quality Based Effluent Limitations	All activities and discharges, except dredge and fill, must meet effluent limitations based on technology or water quality.	**Relevant and appropriate.** All activities and discharges, other than dredge and fill activities, are required to meet effluent limitations based on technology (technology based effluent limit) and/or water quality (water quality based effluent limit), as defined by this rule. The substantive permitting requirement established in this rule may be a potential relevant and appropriate requirement for remedial actions where treated water is discharged to a surface water body (e.g., Rowell Creek or Lake Fretwell).

See notes at end of table.

Table 2-10 (Continued)
Synopsis of Potential Federal and State Chemical-Specific ARARs

Record of Decision
Operable Unit 2
Naval Air Station Cecil Field
Jacksonville, Florida

Federal and State Standards and Requirements	Requirements Synopsis	Consideration in the Remedial Response Process
Chapter 17-770, FAC, Florida Petroleum Contaminated Site Cleanup Criteria, February 1990	Establishes a cleanup process to be followed at all petroleum-contaminated sites. Cleanup levels for G-I and G-II groundwater are provided for both the gasoline and kerosene and mixed product analytical groups.	**Applicable.** This is an applicable requirement because OU 2 includes petroleum-contaminated sites discharging to G-II groundwater.
Chapter 17-775, FAC, Florida Soil Thermal Treatment Facilities Regulations, December 1990	Establishes criteria for the thermal treatment of petroleum or 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.** The soil cleanup values established in this rule for total recoverable petroleum hydrocarbons (TRPHs), volatile organic compounds (VOCs), volatile organic halocarbons (VOHs), polynuclear aromatic hydrocarbons (PAHs), and metals may be relevant and appropriate requirements for contaminated soil and sediment and may be applicable if thermal treatment is used.
Florida Groundwater Guidance Concentrations	Establishes risk-based groundwater concentrations for use as screening values and potential cleanup criteria for chemicals that do not have an established Florida MCL.	**To be considered.** These guidance concentrations are not promulgated standards that must be met. The concentrations will be considered and compared to site-specific, risk-based cleanup concentrations.

Notes: ARARs = applicable or relevant and appropriate requirements.
CFR = Code of Federal Regulations.
NPDES = National Pollution Discharge Elimination System.
OU = operable unit.
USC = U.S. Code.
USEPA = U.S. Environmental Protection Agency.
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act.

Table 2-11
Synopsis of Potential Federal and State Action-Specific ARARs

Record of Decision
Operable Unit 2
Naval Air Station Cecil Field
Jacksonville, Florida

Federal and State Standards and Requirements	Requirements Synopsis	Consideration in the Remedial Response Process
Clean Air Act (CAA), New Source Performance Standards (NSPS) (40 Code of Federal Regulations (CFR) Part 60)	This regulation establishes 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.	**Relevant and appropriate.** Because NSPSs are source-specific requirements, they are not generally considered applicable to Comprehensive Environmental Response, Compensation, and Liability Act (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 onsite cleanup action are sufficiently similar to the pollutant and source category regulated.
CAA, National Ambient Air Quality Standards (NAAQS) (40 CFR Part 50)	This regulation establishes primary (health-based) and secondary (welfare-based) standards for air quality for carbon monoxide, lead, nitrogen dioxide, particulate matter, ozone, and sulfur oxides emitted from a major source of air emissions.	**Relevant and appropriate.** 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 or sediment excavation, which may result in exposure to hazardous chemicals through dust and vapors.
Clean Water Act (CWA), National Pollution Discharge Elimination System (NPDES) (40 CFR Parts 122 and 125)	This regulation requires NPDES permits specifying the permissible concentration or level of contaminants in the effluent for the discharge of pollutants from any point source into waters of the United States.	**Relevant and appropriate.** Onsite discharge from a CERCLA site must meet only the substantive NPDES requirements; administrative permit requirements are waived, consistent with CERCLA Section 121(e)(1). Remedial alternatives for Operable Unit (OU) 2 may include a provision for discharge of treated groundwater to Rowell Creek or the drainage ditch leading to Lake Fretwell.
CWA, National Pretreatment Standards (40 CFR Part 403)	This regulation sets pretreatment standards through the National Categorical Standards for the General Pretreatment Regulations for the introduction of pollutants from nondomestic sources into POTWs to control pollutants that pass through, cause interference, or are otherwise incompatible with treatment processes at a POTW.	**Applicable.** If groundwater or surface water is discharged to a POTW as a part of a remedial alternative for OU 2, the discharge must meet local limits imposed by the POTW. A discharge from a CERCLA site must meet the POTW's pretreatment standards in the effluent to the POTW. Discharge to a POTW is considered an offsite activity and is, therefore, subject to both the substantive and administrative requirements of this rule.
Department of Transportation Rules for Transportation of Hazardous Materials (49 CFR Parts 107, 171, 173, 178, and 179).	This regulation establishes the procedures for packaging, labeling, and transporting of hazardous materials.	**Applicable.** These requirements will be applicable for transport of hazardous material from the site for laboratory analysis, treatment, or disposal.

See notes at end of table.

Table 2-11 (Continued)
Synopsis of Potential Federal and State Action-Specific ARARs

Record of Decision
Operable Unit 2
Naval Air Station Cecil Field
Jacksonville, Florida

Federal and 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 regulation requires establishment of programs to ensure worker health and safety at hazardous waste sites, including employee training requirements.	**Applicable.** Under 40 CFR 300.38, requirements apply to all response activities under the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). During the implementation of any remedial alternative at OU 2, these regulations must be attained.
OSHA, Recordkeeping, Reporting, and Related Regulations (29 CFR Part 1904)	This regulation provides recordkeeping and reporting requirements applicable to remedial activities.	**Applicable.** These requirements apply to all site contractors and subcontractors and must be followed during all site work. During the implementation of any remedial alternative at the site, these regulations must be attained.
OSHA, Safety and Health Standards, (29 CFR Part 1926)	This regulation specifies the type of safety training, equipment, and procedures to be used during site investigation and remediation.	**Applicable.** All phases of the remedial response project should be executed in compliance with this regulation. During the implementation of any remedial alternative at the site, these regulations must be attained.
Resource Conservation and Recovery Act (RCRA), Hazardous Waste Management System (40 CFR Part 260)	This regulation sets forth procedures that the USEPA will use to make information available to the public, and sets forth rules that treatment, storage, and disposal (TSD) facilities must follow to assert claims of business confidentiality with respect to information submitted to the USEPA pursuant 40 CFR Parts 261-265.	**Relevant and appropriate.** This regulation creates no substantive cleanup requirements.
RCRA, Identification and Listing of Hazardous Waste (40 CFR Part 261, 261.1-261.33)	This regulation 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 an RCRA-listed source process, (2) the wastes are RCRA-listed wastes from a nonspecific source, or (3) the waste is characteristically hazardous due to ignitability, corrosivity, reactivity, or toxicity.	**Relevant and appropriate.** Contaminated soil at OU 2 could be classified as an RCRA hazardous waste. Historical records do not suggest soil would be a listed waste, and soil contamination does not indicate soil would be characteristically hazardous; however, specific testing must be conducted to evaluate this possibility. Residuals from treatment methods may also be classified as RCRA hazardous wastes and must also be tested for RCRA hazardous characteristics.
RCRA, Standards Applicable to Generators of Hazardous Waste (40 CFR Part 262, Subparts A - D, 262.10-262.44)	These regulations 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.	**Applicable.** 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, Standards Applicable to Transporters of Hazardous Waste (40 CFR Part 263, Subparts A - C, 263.10-263.31)	This regulation establishes procedures for transporters of hazardous waste within the United States if the transportation requires a manifest under 40 CFR Part 262.	**Applicable.** If a remedial alternative involves offsite transportation of hazardous waste for treatment, storage, or disposal, these requirements must be attained.

See notes at end of table.

Table 2-11 (Continued)
Synopsis of Potential Federal and State Action-Specific ARARs

Record of Decision
Operable Unit 2
Naval Air Station Cecil Field
Jacksonville, Florida

Federal and State Standards and Requirements	Requirements Synopsis	Consideration in the Remedial Response Process
RCRA, Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities (TSDF) (40 CFR Part 264)	This regulation 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.	**Applicable.** If a remedial alternative for Site 5 sediment or OU 2 groundwater treatment residuals involves the management of RCRA hazardous wastes, this rule would be applicable at an offsite treatment, storage, or disposal unit. This regulation is relevant and appropriate for onsite non-RCRA hazardous wastes.
RCRA, General Facility Standards (40 CFR Subpart B, 264.10-264.18)	This regulation establishes general facility requirements including general waste analysis, security measures, inspections, and training requirements. 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.	**Applicable.** If a treatment facility is constructed onsite, these requirements would be applicable for hazardous wastes and relevant and appropriate for nonhazardous wastes.
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.	**Applicable.** Safety and communication equipment should be incorporated into all hazardous waste aspects of the remedial process and local authorities should be familiarized with site operations. This regulation is relevant and appropriate for any non-hazardous waste work.
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.	**Relevant and appropriate.** These requirements are relevant and appropriate for remedial actions involving the management of hazardous waste.
RCRA, Manifest System, Recordkeeping, and Reporting (40 CFR Part 264, Subpart E)	This regulation outlines procedures for manifesting hazardous waste for owners and operators of onsite and offsite facilities that treat, store, or dispose of hazardous waste.	**Applicable.** These regulations apply if a remedial alternative involves the offsite treatment, storage, or disposal of hazardous waste. For remedial actions involving onsite treatment or disposal of hazardous waste, these regulations are relevant and appropriate.
RCRA, Use and Management of Containers (40 CFR Part 264, Subpart I)	This regulation sets standards for the storage of containers of hazardous waste.	**Relevant and appropriate.** Remedial action implemented at OU 2 may involve the storage of containers that may contain RCRA hazardous waste. The onsite staging of study-generated RCRA wastes should meet the intent of this regulation. These requirements are applicable for containerized RCRA hazardous wastes at CERCLA sites and may be considered relevant and appropriate for wastes not classified as hazardous.
RCRA, Solid Waste Land Disposal Requirements (40 CFR Part 258)	This regulation sets forth requirements for disposal of waste within a solid waste landfill. It also sets forth construction and monitoring requirements of Subtitle D landfills.	**Applicable.** This rule stipulates that no free liquids, no hazardous wastes, and no reactive wastes may be disposed of within a Subtitle D landfill. These requirements are applicable if soil and wastes are disposed of at a Subtitle D landfill.

See notes at end of table.

Table 2-11 (Continued)
Synopsis of Potential Federal and State Action-Specific ARARs

Record of Decision
Operable Unit 2
Naval Air Station Cecil Field
Jacksonville, Florida

Federal and State Standards and Requirements	Requirements Synopsis	Consideration in the Remedial Response Process
Chapter 62-2, Florida Administrative Code (FAC), Florida Air Pollution Rules, September 1990	This rule establishes permitting requirements for owners or operators of any source that emits any air pollutant. This chapter also establishes ambient air quality standards for sulfur dioxide, PM_{10}, carbon monoxide, and ozone.	**Applicable.** Standards for PM_{10} would be applicable during remediation. Engineering controls and monitoring to control dust would be required.
Chapter 62-4, FAC, Florida Rules on Permits	This rule establishes procedures for obtaining permits for sources of pollution.	**Applicable.** The substantive permitting requirements must be met during a CERCLA remediation.
Chapter 62-522, FAC, Groundwater Permitting and Monitoring Requirements	This rule establishes permitting and monitoring requirements for installations discharging to groundwater.	**Applicable.** This rule should be considered when discharge to groundwater is a possible remedial action. The administrative permitting requirements would be waived under a CERCLA cleanup.
Chapter 62-532, FAC, Florida Water Well Permitting and Construction Requirements	This rule establishes the minimum standards for the location, construction, repair, and abandonment of water wells. Permitting requirements and procedures are also established in this rule.	**Applicable.** The substantive requirements of this rule are applicable for any remedial alternative at OU 2 that involves the construction, repair, or abandonment of monitoring, extraction, or injection wells.
Chapter 62-660, FAC, Florida Industrial Wastewater Facilities Regulations	This rule sets minimum treatment standards for effluent based on water quality considerations and technology.	**Relevant and appropriate.** This rule may be a relevant and appropriate requirement for any remedial alternative at OU 2 that involves discharge of treated water to surface waters of the State if surface water standards are not available or are not sufficiently protective.
Chapter 62-730, FAC, Florida Hazardous Waste Rules	This rule adopts by reference appropriate sections of 40 CFR and establishes minor additions to these regulations concerning the generation, storage, treatment, transportation, and disposal of hazardous wastes.	**Relevant and appropriate.** The substantive requirements of this rule are relevant and appropriate requirements for any remedial alternative that involves treatment of nonhazardous waste at OU 2. This rule is applicable for hazardous wastes at OU 2.
Chapter 62-736, FAC, Florida Rules on Hazardous Waste Warning Signs	This rule requires warning signs at NPL and Florida Department of Environmental Protection (FDEP)-identified hazardous waste sites to inform the public of the presence of potentially harmful conditions.	**Applicable.** This requirement is applicable for sites which are on the NPL or which have been identified by the FDEP as potentially harmful.
Chapter 62-775, 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 in order 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.	**Applicable.** This requirement is applicable to treatment alternatives that employ thermal treatment technologies. It may be relevant and appropriate for other treatment alternatives.

Notes: ARARs = applicable or relevant and appropriate requirements.
POTW = publicly owned treatment work.
USEPA = U.S. Environmental Protection Agency.
NPL = National Priority List.

REFERENCES

ABB Environmental Services, Inc. (ABB-ES), 1991, Remedial Investigation/ Feasibility Study Workplan, NAS Cecil Field, Operable Units 1, 2, and 7: prepared for Southern Division, Navy Facilities Engineering Command (SOUTHNAVFACENGCOM).

ABB-ES, 1992, Technical Memorandum for Supplemental Sampling, Operable Units 1, 2, and 7, NAS Cecil Field: prepared for SOUTHNAVFACENGCOM.

ABB-ES, 1994, Naval Air Station Cecil Field, Jacksonville, Florida, Interim Record of Decision, Oil Disposal Area Northwest, Site 5, Operable Unit 2, Tallahassee Florida: prepared for SOUTHNAVEFACENGCOM.

ABB-ES, 1994, Naval Air Station Cecil Field, Jacksonville, Florida, Interim Record of Decision, Oil and Sludge Disposal Area Southwest, Site 17, Operable Unit 2, Tallahassee Florida: prepared for SOUTHNAVEFACENGCOM.

ABB-ES, 1995, Naval Air Station Cecil Field, Jacksonville, Florida, Baseline Risk Assessment Report, Operable Unit 2, Tallahassee, Florida: prepared for SOUTHNAVFACENGCOM.

ABB-ES, 1995, Naval Air Station Cecil Field, Jacksonville, Florida, Feasibility Study, Operable Unit 2, Tallahassee, Florida: prepared for SOUTHNAVFACENGCOM.

ABB-ES, 1995, Naval Air Station Cecil Field, Jacksonville, Florida, Remedial Investigation, Operable Unit 2, Tallahassee, Florida: prepared for SOUTHNAVFACENGCOM.

ABB-ES, 1995, Naval Air Station Cecil Field, Jacksonville, Florida, Proposed Plan for Remedial Action, Operable Unit 2, Oil Disposal Area Northwest (Site 5) and Oil and Sludge Disposal Pit Southwest (Site 17), Tallahassee, Florida: prepared for SOUTHNAVFACENGCOM.

Envirodyne Engineers, 1985, Initial Assessment Study, NAS Cecil Field.

Geraghty & Miller, 1983, Hydrogeologic Assessment and Groundwater Monitoring Plan, NAS Cecil Field, Jacksonville, Florida.

Geraghty & Miller, 1984, As-built Groundwater Monitoring Network.

Geraghty & Miller, 1985, Year-End Report of Groundwater Monitoring.

Harding Lawson Associates, 1988, RCRA Facility Investigation, NAS Cecil Field.