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NAS WHITING FIELD
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TECHNICAL MEMORANDUM NUMBER 7 REMEDIAL INVESTIGATION AND FEASIBILITY STUDY PHASE IIB WORK PLAN NAS WHITING FIELD FL

11/1/1995

ABB ENVIRONMENTAL

REMEDIAL INVESTIGATION AND FEASIBILITY STUDY
TECHNICAL MEMORANDUM NO. 7
PHASE IIB WORKPLAN

NAVAL AIR STATION WHITING FIELD
MILTON, FLORIDA

UNIT IDENTIFICATION CODE: N60508
CONTRACT NO. N62467-89-D-0317/050

NOVEMBER 1995

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

ID-00215

REMEDIAL INVESTIGATION AND FEASIBILITY STUDY

TECHNICAL MEMORANDUM NO. 7
PHASE IIB WORKPLAN

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MILTON, FLORIDA

Unit Identification Code: N60508

Contract No. N62467-89-D-0317/050

Prepared by:

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November 1995

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-0317/050 are complete and accurate and comply with all requirements of this contract.

DATE: November 21, 1995

NAME AND TITLE OF CERTIFYING OFFICIAL: Terry Hansen, P.G.
Task Order Manager

NAME AND TITLE OF CERTIFYING OFFICIAL: Gerald Walker, P.G.
Project Technical Lead

(DFAR 252.227-7036)

FOREWORD

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

One of these programs is the Installation Restoration (IR) program. This program complies with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended by the Superfund Amendments and Reauthorization Act (SARA), the Resource Conservation and Recovery Act (RCRA) and the Hazardous and Solid Waste Amendments (HSWA) of 1984. These acts establish the means to assess and clean up hazardous waste sites for both private-sector and Federal facilities. The CERCLA and SARA acts form the basis for what is commonly known as the Superfund program.

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

The IR program is conducted in several stages as follows:

- preliminary assessment (PA)
- site inspection (SI) (formerly the PA and SI steps were called the initial assessment study [IAS] under the NACIP program),
- remedial investigation and feasibility study (RI/FS), and
- remedial design and remedial action (RD/RA).

The Southern Division, Naval Facilities Engineering Command (SOUTHNAVFACENGCOM) manages and the U.S. Environmental Protection Agency (USEPA) and the Florida Department of Environmental Protection (FDEP; formerly Florida Department of

Environmental Regulation [FDER]) oversee the Navy environmental program at NAS Whiting Field. All aspects of the program are conducted in compliance with State and Federal regulations, as ensured by the participation of these regulatory agencies.

Questions regarding the CERCLA program at NAS Whiting Field should be addressed to Mr. Jeff Adams, Code 1859, at (803) 743-0341.

EXECUTIVE SUMMARY

A remedial investigation and feasibility study (RI/FS) is being conducted at Naval Air Station (NAS) Whiting Field in Milton, Florida, by Southern Division, Naval Facilities Engineering Command (SOUTHNAVFACENGCOM) as part of the Department of Defense Installation Restoration (IR) program. The IR program was designed to identify and abate or control contaminant migration resulting from past operations at naval installations.

A phased approach was implemented to conduct the RI. Phase I was completed in May 1992. The subsequent phase of the RI was designated as Phase IIA. Field work for Phase IIA was completed in March 1994. Technical Memorandum No. 7, RI Phase IIB workplan, is the seventh in a series of seven technical memoranda that summarizes the results of the data gathered during the RI Phase IIA. These memoranda will form the supporting basis for the RI report and any additional work to be completed at the facility.

The purpose of the RI Phase IIB workplan is to outline additional assessment activities that will be used to characterize site-specific and facilitywide contamination at NAS Whiting Field. Data obtained from the Phase IIB activities will be used to evaluate the nature and extent of contamination and support feasibility studies and baseline risk assessments. The proposed operable units (OUs) at NAS Whiting Field are identified below.

OU 1, North Field Industrial Area
OU 2, Midfield and South Field Industrial Areas
OU 3, Northwest Disposal and Crash Crew Training Area
OU 4, Southwest Disposal Area
OU 5, Southeast Disposal Area
OU 6, Sludge Drying Beds
OU 7, Clear Creek Floodplain

Technical Memorandum No. 7 addresses the additional assessment activities that will be conducted at proposed Operable Units 3, 4, 5, and 6. A computer simulation of the shallow aquifer beneath NAS Whiting Field will be conducted prior to designing additional field efforts at proposed OUs 1 and 2. The computer model will be a joint effort by the Navy, the U.S. Geological Survey, and ABB Environmental Services, Inc. The groundwater model will be constructed from current data and will be used to assist in focusing additional investigation of the nature and extent of contaminants. The Navy has chosen to investigate OU 7 under a separate contract task order at a later time.

The field work for Phase IIB will include the following tasks:

- soil gas survey at landfills and disposal areas,
- surface soil sampling,
- subsurface soil sampling,
- *in situ* groundwater sampling,

- monitoring well installation, and
- groundwater sampling.

Samples will be analyzed for one or all of the following: target compound list organic analytes, target analyte list inorganic analytes, and total recoverable petroleum hydrocarbons. Table ES-1 summarizes soil gas collection sites, number of proposed soil and groundwater samples, number of monitoring wells to be installed, and number of *in situ* permeability tests (slug tests) to be conducted during the RI Phase IIB field activities.

Table ES-1
Summary of Proposed Field Activities

Remedial Investigation and Feasibility Study
Technical Memorandum No. 7, Phase IIB Workplan
Naval Air Station Whiting Field
Milton, Florida

Site Number	Site Name	Landfill Gas Survey	No. Surface Soil Samples	No. Soil Borings	No. Subsurface Soil Samples	*In Situ* Groundwater Samples No. Locations /No. Samples	No. Monitoring Wells	No. Monitoring Well Samples	Aquifer (Slug) Test
Operable Unit 3									
1	Northwest Disposal Area	X	8					4	
2	Northwest Open Disposal Area						2	3	1
17	Crash Crew Training Area			3	6		1	5	1
18	Crash Crew Training Area			3	12		2	5	1
Operable Unit 4									
15	Southwest Disposal Area	X	25			4/16	12	23	5
16	Open Disposal and Burning Area	X	17			4/16	12	24	5
Operable Unit 5									
9	Waste Fuel Disposal Pit	X	7					3	
10	Southeast Open Disposal Area (A)	X	5					2	
11	Southeast Open Disposal Area (B)	X	7			5/25	4	8	2
12	Tetraethyl Lead Disposal Area		6	1	5		1	2	1
13	Sanitary Landfill	X	5			5/25	4	7	2
14	Short-Term Sanitary Landfill	X	3				1	3	1
Operable Unit 6									
31A	Sludge Drying Beds		8						
31B	Sludge Drying Beds Disposal Area		3						
31C	Sludge Drying Beds Disposal Area		10	3	15		4	4	2
31D	Sludge Drying Beds Disposal Area		1						
31E	Sludge Drying Beds Disposal Area		8						
31F	Sludge Drying Beds Disposal Area		6						
Total Samples		**8 Sites**	**119**	**6**	**38**	**30/167**	**43**	**93**	**21**

Note: X = task will be completed at site.

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GLOSSARY

ABB-ES	ABB Environmental Services, Inc.
AFFF	aqueous film-forming foam
ARAR	applicable or relevant and appropriate requirement
AVGAS	aviation gasoline
BAT	Bengt-Arne-Torstensson
bls	below land surface
BTEX	benzene, toluene, ethylbenzene, and xylenes
BTX	benzene, toluene, and xylenes
CAR	Contamination Assessment Report
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CLP	Contract Laboratory Program
cm/sec.	centimeters per second
°F	degrees Fahrenheit
DCA	dichloroethane
DDE	dichlorodiphenyldichloroethane
DDT	dichlorodiphenyltrichloroethane
DOD	Department of Defense
EDB	ethylene dibromide
EP	extraction procedure
FFA	Federal Facility Agreement
FDEP	Federal Department of Environmental Protection (as of 7/93)
FDER	Federal Department of Environmental Regulation (before 7/93 now FDEP)
FGS	Florida Geological Survey (formerly BOG)
FS	Feasibility Study
ft/day	feet per day
ft^2/day	square feet per day
ft/ft	feet per foot
GC	gas chromatograph
HASP	Health and Safety Plan
HRS	Hazard Ranking System
HSA	hollow stem auger
HSWA	Hazardous and Solid Waste Amendment
IAS	Initial Assessment Study
IR	Installation Restoration
MCL	maximum contaminant level
mg/kg	milligrams per kilogram
mg/ℓ	milligrams per liter
msl	mean sea level

GLOSSARY (Continued)

NACIP	Navy Assessment and Control of installation Pollutants
NAS	Naval Air Station
NCP	National Oil and Hazardous Substances Contingency Plan
NEESA	Naval Energy and Environmental Support Activity
NFA	no further action
NOAA	National Oceanographic and Atmospheric Administration
NPL	National Priority List
NWFWMD	Northwest Florida Water Management District
NTU	nephelometric turbidity unit
OLF	outlying landing field
OU	Operable Unit
OVA	organic vapor analyzer
PA	Preliminary Assessment
PCBs	polychlorinated biphenyls
PCPT	piezocone penetrometer test
QA	quality assurance
QC	quality control
QAPP	Quality Assurance Program Plan
RA	remedial action
RCRA	Resource Conservation and Recovery Act
RD	remedial design
RI	Remedial Investigation
RPM	Remedial Project Manager
SARA	Superfund Amendments and Reauthorization Act
SI	Site Inspection
SOUTHNAV-FACENGCOM	Southern Division, Naval Facilities Engineering Command
SU	standard unit
SVOC	semivolatile organic compound
TAL	target analyte list
TCE	trichloroethene
TCL	target compound list
TCLP	toxicity characteristic leachate procedure
TRPH	total recoverable petroleum hydrocarbons
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
UST	underground storage tank
VOC	volatile organic compound
WHF	Whiting Field

1.0 INTRODUCTION

ABB Environmental Services, Inc. (ABB-ES), under contract to the Department of Navy, Southern Division, Naval Facilities Engineering Command (SOUTHNAVFACENGCOM) is submitting Technical Memorandum No. 7 for the Phase IIA Remedial Investigation and Feasibility Study (RI/FS) for Naval Air Station (NAS) Whiting Field located in Milton, Florida. The RI/FS is being conducted under contract No. N62467-89-D-0317.

Technical Memorandum No. 7, workplan for Phase IIB, is one in a series of seven technical memoranda completed for the Phase IIA RI. These technical memoranda form the supporting basis for the RI report and any additional work to be completed at NAS Whiting Field. The Phase IIA RI field program was conducted between April 1992 and February 1994. The following is a list of Phase IIA technical memoranda:

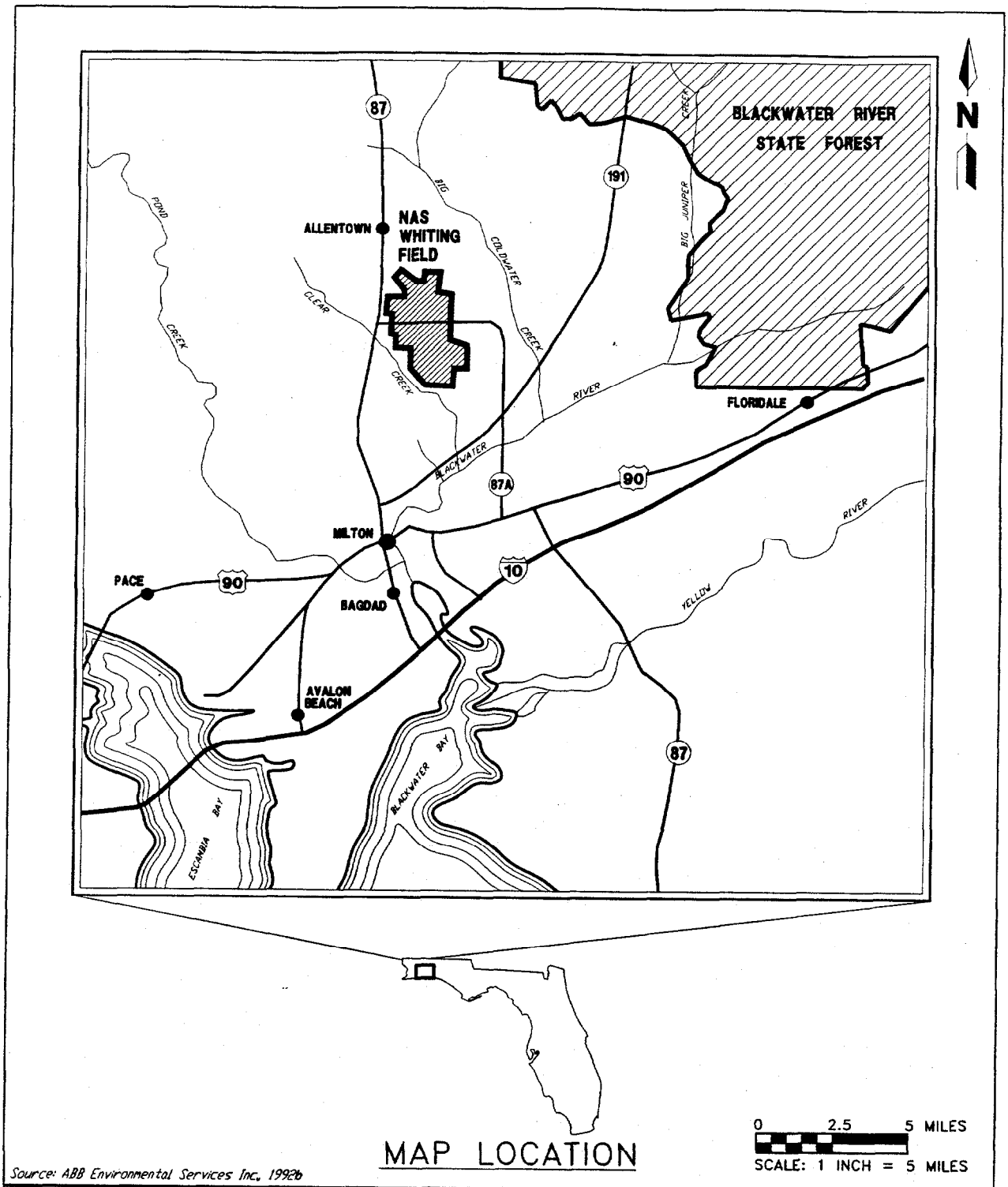
No. 1, Surface Water and Sediment Assessment;
No. 2, Geologic Assessment;
No. 3, Soils Assessment;
No. 4, Hydrogeologic Assessment;
No. 5, Groundwater Assessment;
No. 6, Definition of Operable Units; and
No. 7, Workplan and Recommendations for Phase IIB RI.

Installation Location and Description. NAS Whiting Field is located in Santa Rosa County, in Florida's northwest coastal area, approximately 7 miles north of Milton and 20 miles northeast of Pensacola (Figure 1-1). NAS Whiting Field presently consists of two air fields separated by an industrial area. The installation is approximately 2,560 acres in size. Figure 1-2 presents the installation layout and locations of RI/FS sites at NAS Whiting Field.

NAS Whiting Field, home of Training Air Wing Five, was constructed in the early 1940s. Subordinate commands currently stationed at NAS Whiting Field include training squadrons VT-2, VT-3, VT-6, HT-8, and HT-18 (SOUTHNAVFACENGCOM, 1988). The facility was commissioned as the Naval Auxiliary Air Station Whiting Field in July 1943 and has served as a naval aviation training facility ever since its commissioning. The facility's mission has been to train student naval aviators in the use of basic instruments, formation and tactic phases of fixed-wing and propeller-driven aircraft, and basic and advanced helicopter training.

1.1 PURPOSE OF THE REMEDIAL INVESTIGATION AND FEASIBILITY STUDY (RI/FS)

The purpose of the NAS Whiting Field RI/FS is to identify and characterize risks to public health and the environment that might be posed by toxic or hazardous chemicals present onsite as a result of past waste disposal practices or spills. To achieve this objective, an RI is being conducted to assess the nature and extent of contaminants associated with a number of sites at the installation. The data collected during the RI field program will be used in the FS to screen, evaluate, and select remedial alternatives to provide permanent, feasible solutions to environmental contamination problems at NAS Whiting Field.



Source: ABB Environmental Services Inc., 1992b

FIGURE 1-1
FACILITY LOCATION MAP

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REMEDIAL INVESTIGATION (RI)
PROGRAM PHASE IIA
TECHNICAL MEMORANDUM No. 7,
RI PHASE IIB WORKPLAN

NAS WHITING FIELD
MILTON, FLORIDA

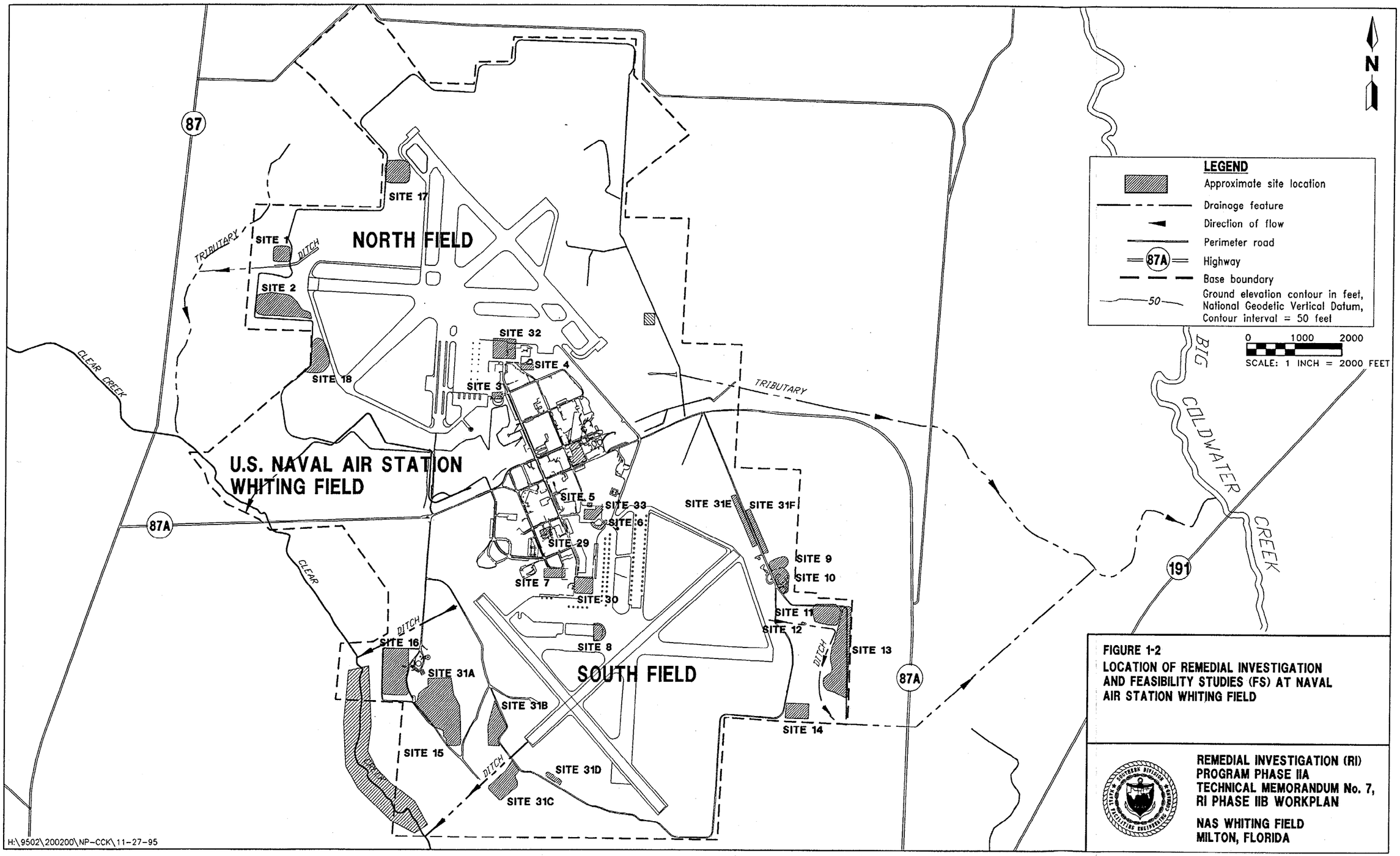

FIGURE 1-2
LOCATION OF REMEDIAL INVESTIGATION AND FEASIBILITY STUDIES (FS) AT NAVAL AIR STATION WHITING FIELD

REMEDIAL INVESTIGATION (RI)
PROGRAM PHASE IIA
TECHNICAL MEMORANDUM No. 7,
RI PHASE IIB WORKPLAN

NAS WHITING FIELD
MILTON, FLORIDA

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1.2 REGULATORY SETTING. The Navy Installation Restoration (IR) program was designed to identify and abate or control contaminant migration resulting from past operations at naval installations. The IR program is the Navy response authority under Section 120 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986 and Executive Order 12580. CERCLA requires that Federal facilities comply with the act, both procedurally and substantively. SOUTHNAVFACENGCOM is the agency responsible for the Navy IR program in the southeastern United States. Therefore, SOUTHNAVFACENGCOM has the responsibility to process NAS Whiting Field through preliminary assessment (PA), site inspection (SI), priority listing, RI/FS, and remedial response selection in compliance with the guidelines of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (40 Code of Federal Regulations [CFR] 300).

Section 105(a)(8)(A) of SARA requires the U.S. Environmental Protection Agency (USEPA) to develop criteria to set priorities for remedial action based on relative risk to public health and the environment. To meet this requirement, USEPA has established the Hazard Ranking System (HRS) as Appendix A to the NCP. First promulgated in 1982, the HRS was amended in December 1990, effective March 14, 1991 (55 Federal Register No. 241:51532-51667), to comply with requirements of Section 105(c)(1) of SARA to increase the accuracy of the assessment of relative risk. The newly promulgated HRS (March 1991) has been substantially revised and is designed to prioritize sites after the SI phase of the CERCLA process.

The HRS score for NAS Whiting Field was generated in 1993. The score was sufficient to place NAS Whiting Field on the National Priority List (NPL). In January 1994, the USEPA placed NAS Whiting Field on a proposed list of sites to be included on the NPL (40 CFR 300, Federal Register, 18 January 1994), and on May 31, 1994, NAS Whiting Field was placed on the NPL effective June 30, 1994 (40 CFR 300, Federal Register, May 31, 1994). As a result, the RI/FS for NAS Whiting Field must follow the requirements of the NCP, as amended by SARA, and regulatory guidance for conducting RI/FS programs under CERCLA.

1.3 PURPOSE OF WORKPLAN. The purpose of Technical Memorandum 7 is to:

- present existing site background information,
- summarize previous sampling events,
- identify data gaps that require additional investigative work, and
- present proposed field investigative methods and sample locations to investigate areas where data gaps exist.

Because results of previous investigations have been summarized in Technical Memoranda 1 through 6, detailed summaries of the analytical results from previous investigations are not included; however, the appropriate reports and technical memoranda are referenced as needed.

Technical Memorandum 7 is organized into eight chapters (Chapters 1.0 to 9.0). Chapter 1.0 presents the purpose and regulatory setting for the RI/FS at NAS Whiting Field. Chapter 2.0 summarizes the environmental setting for NAS Whiting

Field. Chapter 3.0 presents the rationale for grouping sites into proposed operable units (OUs). Chapter 4.0 presents the anticipated investigative methods not presented in the NAS Whiting Field workplan (E.C. Jordon, 1990) to be used to collect samples. Chapter 5.0 discusses site history and previous investigations conducted at each site. Chapter 6.0 identifies data gaps at each proposed OU and Chapter 7.0 presents the proposed technical approach for data collection activities for each proposed OU. Chapter 8.0 summarizes the project management and program organization for the Phase IIB field activities. Chapter 9.0 presents professional review certification.

2.0 ENVIRONMENTAL SETTING

This chapter summarizes the environmental setting at NAS Whiting Field.

2.1 CLIMATE. Background information on the climate was taken from the verification study (Geraghty & Miller, 1986). The climate of northwest Florida is generally humid and subtropical, with warm summers and mild winters. Temperatures average 81 degrees Fahrenheit (°F) in the summer and 54 °F during the winter months. Rainfall is abundant, generally ranging from 55 to 67 inches per year. During the fall months, short-term dry spells are frequent.

The two dominant wet periods occur in late winter or early spring and during June through August. The period occurring during late winter and early spring is generally the result of thunderstorm activity caused by warm, moist air moving in from the Gulf of Mexico.

2.2 TOPOGRAPHY AND LAND USE DISTRIBUTION. NAS Whiting Field is located on an escarpment between Big Coldwater Creek to the east and Clear Creek to the west. Both creeks are tributaries of the Blackwater River. Elevations in the area range from 30 to 190 feet above mean sea level (msl). A drop in elevation by as much as 100 feet reflects the relatively steep scarps on the west, east, and south flanks of NAS Whiting Field.

Erosion was initially a concern as the land surface was cleared during construction of the north and south air fields in the early 1940s. Soil conservation measures in the form of extensive contouring and construction of lined ditches were instituted to control surface water runoff from the upland areas of the base. The drainage ditch system conveys surface water runoff from NAS Whiting Field to Clear Creek on the western site boundary and Big Coldwater Creek to the southeast (Geraghty & Miller, 1986). Land elevation contours and constructed drainage ditch features are shown on Figure 1-2.

Agricultural and forestry are the primary land use in adjacent areas surrounding the facility. Residential homes and businesses are located within several miles to the southwest of the facility comprising the city of Milton. Wetlands are present along Clear Creek to the west of the facility and along Big Coldwater Creek to the east of the facility.

2.3 GEOLOGY. The majority of Santa Rosa County, including NAS Whiting Field, is located in the Western Highland subdivision of the Coastal Plain Physiographic Province. The Coastal Plain Province is part of the major division, Atlantic Plain, of the United States that extends eastward from Texas and as far north as New York. The Coastal Plain is primarily underlain by beds of sand, silt, clay, and limestone that dip gently toward the coast. These sediments were deposited during periods of prehistoric sea level fluctuations. The Western Highland subdivision consists of a well-drained southward sloping plateau that has been eroded by streams. Three prehistoric marine shorelines can be recognized from existing topographic profiles across Escambia and Santa Rosa Counties (Marsh, 1966).

According to Musgrove and others (1965), the lithology and stratification of material encountered at NAS Whiting Field are consistent with descriptions of the Citronelle Formation. The Citronelle Formation consists principally of quartz sand that contains numerous lenses, beds, and stringers of clay and gravel that may change abruptly over short distances. The sand typically has a light yellowish brown to reddish brown coloration, although some is white or light grey in color. The grains typically are angular to subangular and very poorly sorted, ranging from very fine- to very coarse-grained. Clay occurs in lenses as thick as 60 feet and is primarily white or grey in color, although lavender and yellow brown are not uncommon. Rapid facies changes, absence of fossils, and presence of sand and gravel suggest that the shallow sediment of the sand and gravel aquifer was deposited in an environment similar to the current Mississippi River delta. The sediment was probably deposited in stream channels that continually shifted along the face of the delta. The clay lenses were deposited in quiet pools or abandoned channels, whereas the gravel was deposited in swiftly moving streams nearby.

2.4 HYDROGEOLOGY. Groundwater in northwest Florida occurs within three major zones. These zones are referred to as aquifer systems and include: the surficial aquifer system (referred to as the sand-and-gravel aquifer in the western panhandle), the intermediate system, and the Floridan aquifer system (Northwest Florida Water Management District [NWFWMD] 1982; Scott and others, 1992).

Sand and Gravel Aquifer. The sand-and-gravel aquifer is the major water-bearing unit in Santa Rosa County and the only aquifer studied in the NAS Whiting Field IR program. The aquifer consists of a complex sequence of sand, gravel, silt, and clay believed to be between 200 and 350 feet thick in the vicinity of the installation (Musgrove, 1965). The presence of clay layers interbedded in the sand and gravel aquifer often creates localized artesian conditions where the less permeable clay confines the aquifer. In some areas, the aquifer may be subdivided into upper and lower zones, which are separated by layers of clay or clayey sand. These semi-confining layers typically are leaky, and the upper part serves as the primary source of water to the more productive lower zone of the aquifer. Groundwater can potentially move laterally along the semi-confining layers until it discharges into the local streams or other surface water features (NWFWMD, 1991; Scott and others, 1992).

The aquifer is recharged entirely by rainfall. The western panhandle of Florida receives between 55 to 67 inches of rainfall per year (NWFWMD, 1988). Approximately 60 percent of the total volume of rainfall is returned to the water cycle by evapotranspiration before entering the aquifer systems. Water level measurements suggest that the sand-and-gravel aquifer fluctuates with the amount of rainfall received in a recharge area.

Virtually all of the groundwater used in Santa Rosa County is drawn from the sand-and-gravel aquifer. The water quality of the sand-and-gravel aquifer is satisfactory for most uses. The concentrations of naturally occurring total dissolved solids is low due to the insolubility of quartz sand through which the water migrates (Katz and Choquette, 1991; NWFWMD, 1991). However, rainwater dissolves carbon dioxide in the atmosphere, creating carbonic acid that lowers the pH of the groundwater. The pH may fall as low as 4.9 in some areas,

which may result in high local concentrations of iron (Florida Geological Survey [FGS] and others, 1992).

Hydraulic properties of the sand-and-gravel aquifer were studied throughout Escambia County (NWFWMD, 1991). The study included transmissivity, hydraulic conductivity, thickness, and storativity. The results indicated that the transmissivity of the main producing zone is variable throughout the county (5,000 to 20,000 square feet per day [ft^2/day]) and that the values from the western part of the county fall within the lower end of the range. The average storativity for the main producing zone is on the order of $1x10^{-4}$ (dimensionless). Transmissivity calculated from multi-well aquifer tests ranged from 5,800 to 7,800 ft^2/day with storage coefficients of $2.9x10^{-4}$ to $5.7x10^{-4}$ (dimensionless).

The NWFWMD conducted tests of hydraulic properties in 1986 and estimated that vertical hydraulic conductivities of the low permeability zone ranged from 0.03 feet per day (ft/day) to 1.3 ft/day (NWFWMD, 1991). Variability in hydraulic conductivity values in the sand-and-gravel aquifer is likely a result of the wide range of grain sizes and variable grain size distributions that have been observed in the aquifer sediments.

Hydraulic characteristics of the sand-and-gravel aquifer calculated from a pumping test conducted on the south production well (W-3) at NAS Whiting Field (ABB-ES, 1992c) are as follows:

- transmissivity = 10,000 to 20,000 ft^2/day,
- hydraulic conductivity = 100 to 150 ft/day, and
- storativity = 0.045 and 0.08 (dimensionless).

The groundwater flow direction of the sand-and-gravel aquifer at NAS Whiting Field appears to be toward the south-southwest (toward Clear Creek) in the western half of installation and toward the southeast in the eastern half (Figure 2-1).

Horizontal hydraulic gradients at the facility ranged from 0.0039 foot per foot (ft/ft) to 0.0048 ft/ft (ABB-ES, 1995b). Vertical hydraulic gradients are primarily in the downward direction; however, upward, downward, and reversals of gradients were detected locally at some of the sites (ABB-ES, 1995b).

Hydraulic conductivity values of the sand-and-gravel aquifer have been calculated from single-hole permeability tests (slug test) during two previous investigations. The geometric mean of hydraulic conductivities for the facility have been reported at $1.91x10^{-2}$ centimeters per second (cm/sec) (ABB-ES, 1992c) and $1.58x10^{-3}$ cm/sec (ABB-ES, 1995b). Seepage velocities that were calculated during two previous investigations for the facility were reported at 0.64 ft/day (ABB-ES, 1992c) and 0.004 ft/day (ABB-ES, 1995b).

The Intermediate Aquifer System. The intermediate aquifer system in Escambia and Santa Rosa Counties is not a significant water-producing unit (Scott, 1992). The aquifer principally serves as a confining layer between the sand-and-gravel and upper Floridan aquifers. In the vicinity of NAS Whiting Field, the upper Pensacola clay is absent; thus, the Escambia sand, if present, is indistinguishable from the sediment of the sand-and-gravel aquifer (Musgrove and others, 1965).

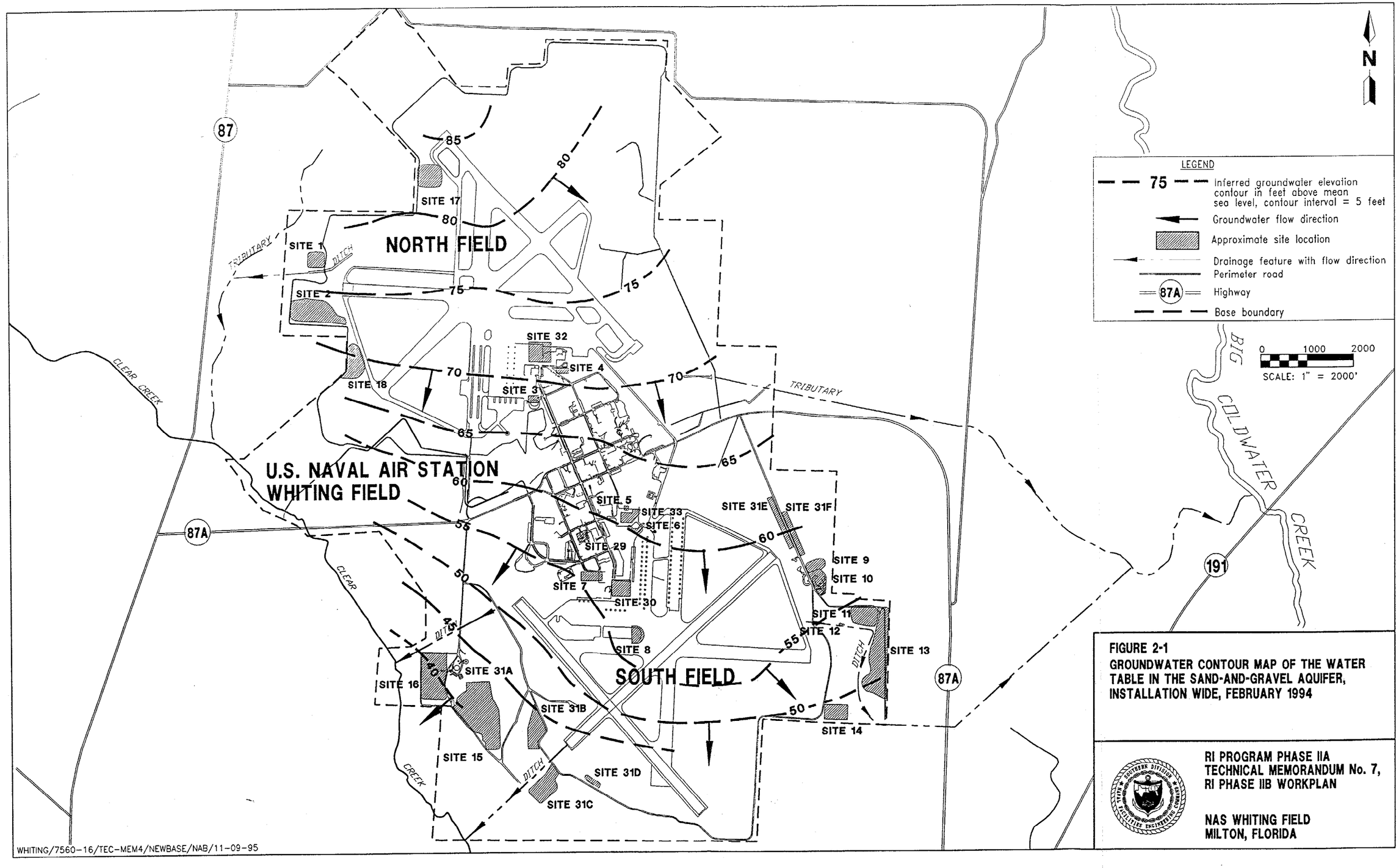

FIGURE 2-1
GROUNDWATER CONTOUR MAP OF THE WATER TABLE IN THE SAND-AND-GRAVEL AQUIFER, INSTALLATION WIDE, FEBRUARY 1994

RI PROGRAM PHASE IIA
TECHNICAL MEMORANDUM No. 7,
RI PHASE IIB WORKPLAN

NAS WHITING FIELD
MILTON, FLORIDA

WHITING/7560-16/TEC-MEM4/NEWBASE/NAB/11-09-95

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The Floridan Aquifer System. The Floridan aquifer system is present throughout the Florida panhandle. The system is over 1,000 feet thick in the vicinity of NAS Whiting Field (Musgrove and others, 1965). In Santa Rosa and Escambia Counties, the system consists of an upper and lower aquifer separated by a confining layer (the Bucatauna Clay of the Byram Formation). The carbonate sequence, containing the upper and lower Floridan aquifers, dips below the level of the Gulf of Mexico in Escambia County and becomes saline. Additionally, the carbonate rock is highly soluble in the acidic groundwater, which causes the water to be highly mineralized. Consequently, the aquifer is not commonly used as a source of water in the western part of the Florida panhandle (NWFWMD, 1982; Scott and others, 1992).

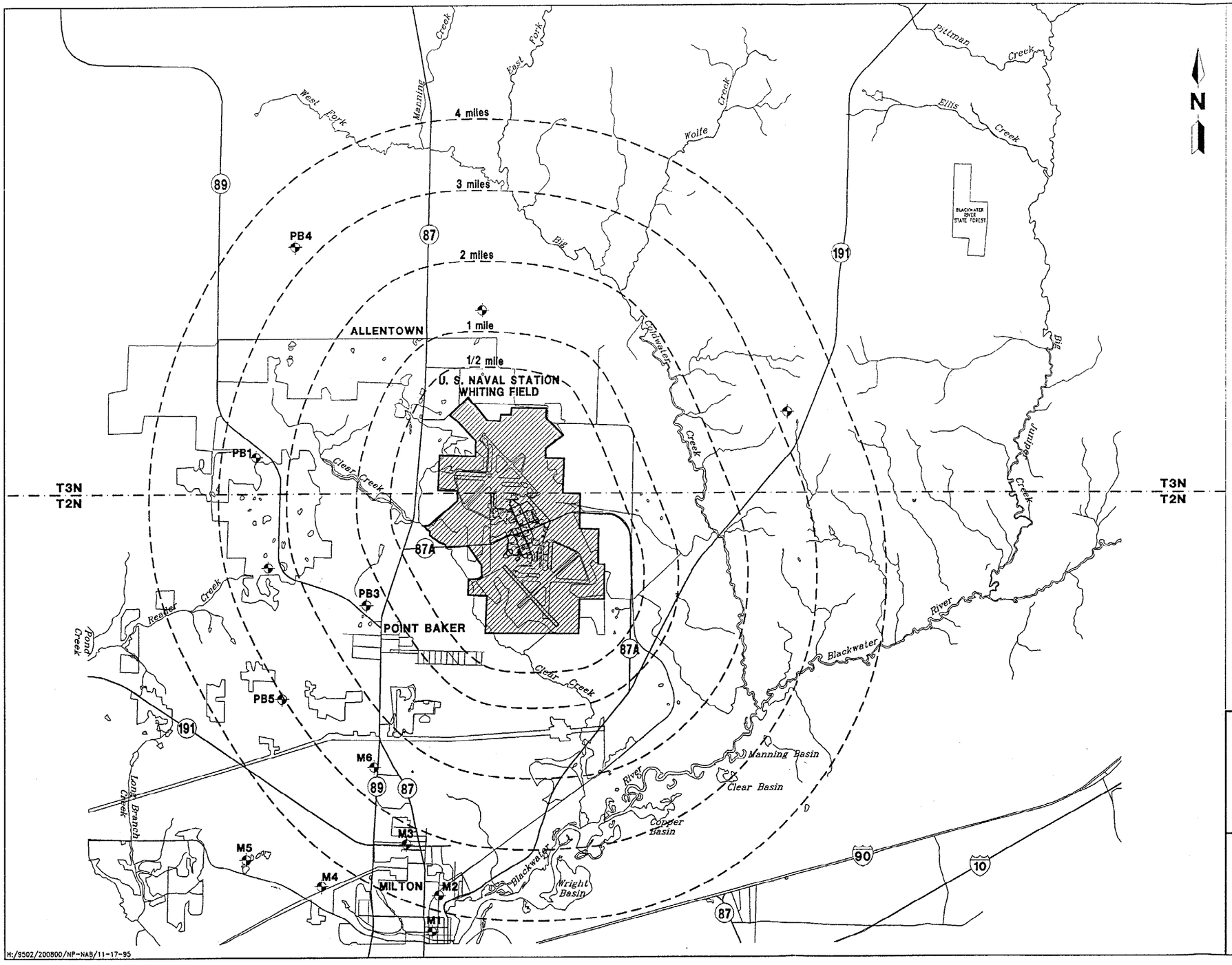
2.5 WATER SUPPLY. Based on information provided by the NAS Whiting Field Public Works Department, the City of Milton, and Point Baker Water Works, all potable and industrial water supply-wells within 4 miles of NAS Whiting Field are screened in the sand-and-gravel aquifer. Production wells are completed between 150 to 350 ft below land surface (bls), depending on the surface elevation and the occurrence of clay lenses (Geraghty & Miller, 1986). Figure 2-2 displays potable community supply wells located within a 4-mile radius of NAS Whiting Field. Figure 2-3 displays potable supply wells located at NAS Whiting Field.

The NAS Whiting Field, City of Milton, and Point Baker potable water supply systems are independent of each other. Each system uses its wells in various combination to meet water demand and balance pumpage rates. Because of this, the service to individual customers is a complex function of pumpage. The City of Milton serves its population from two different supply systems. Water from Milton city wells 1, 2, and 3 serve the area south of County Road 191; populations north of County Road 191 are served by a system fed by city wells 4, 5 and 6.

Point Baker wells 1, 3, and 5 are interconnected to serve the population to the south and west of NAS Whiting Field. Point Baker well 4 is separate and serves the population located northwest of NAS Whiting Field along Route 87 and the community of Allentown. Point Baker well 2 is a dry well.

According to the utility companies and NWFWMD records, only three private wells are located to the east of NAS Whiting Field. During 1991, however, a development of five houses was completed immediately southwest of NAS Whiting Field along Clear Creek. The Point Baker system did not extend to these houses, and they are reportedly served by individual private wells.

2.6 PREVIOUS FACILITY INVESTIGATIONS. Numerous investigations have been conducted at NAS Whiting Field prior to the implementation of the Phase IIA RI/FS. These investigations include an initial assessment study (IAS), verification study, and Phase I of the RI, which was conducted in response to CERCLA requirements. In addition, three other investigations have been completed at NAS Whiting Field. One investigation focused on the Battery Acid Seepage Pit (Site 5), and was initiated under a consent order with the Florida Department of Environmental Regulation (FDER, since redesignated as the Florida Department of Environmental Protection [FDEP]). A second investigation of six petroleum sites was conducted



SOURCE: ABB, Environmental Services Inc.

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FIGURE 2-2
LOCATION OF PUBLIC SUPPLY WELLS WITHIN 4 MILES OF NAS WHITING FIELD BOUNDARY

REMEDIAL INVESTIGATION (RI)
PROGRAM PHASE IIA
TECHNICAL MEMORANDUM No. 7,
RI PHASE IIB WORKPLAN

NAS WHITING FIELD
MILTON, FLORIDA

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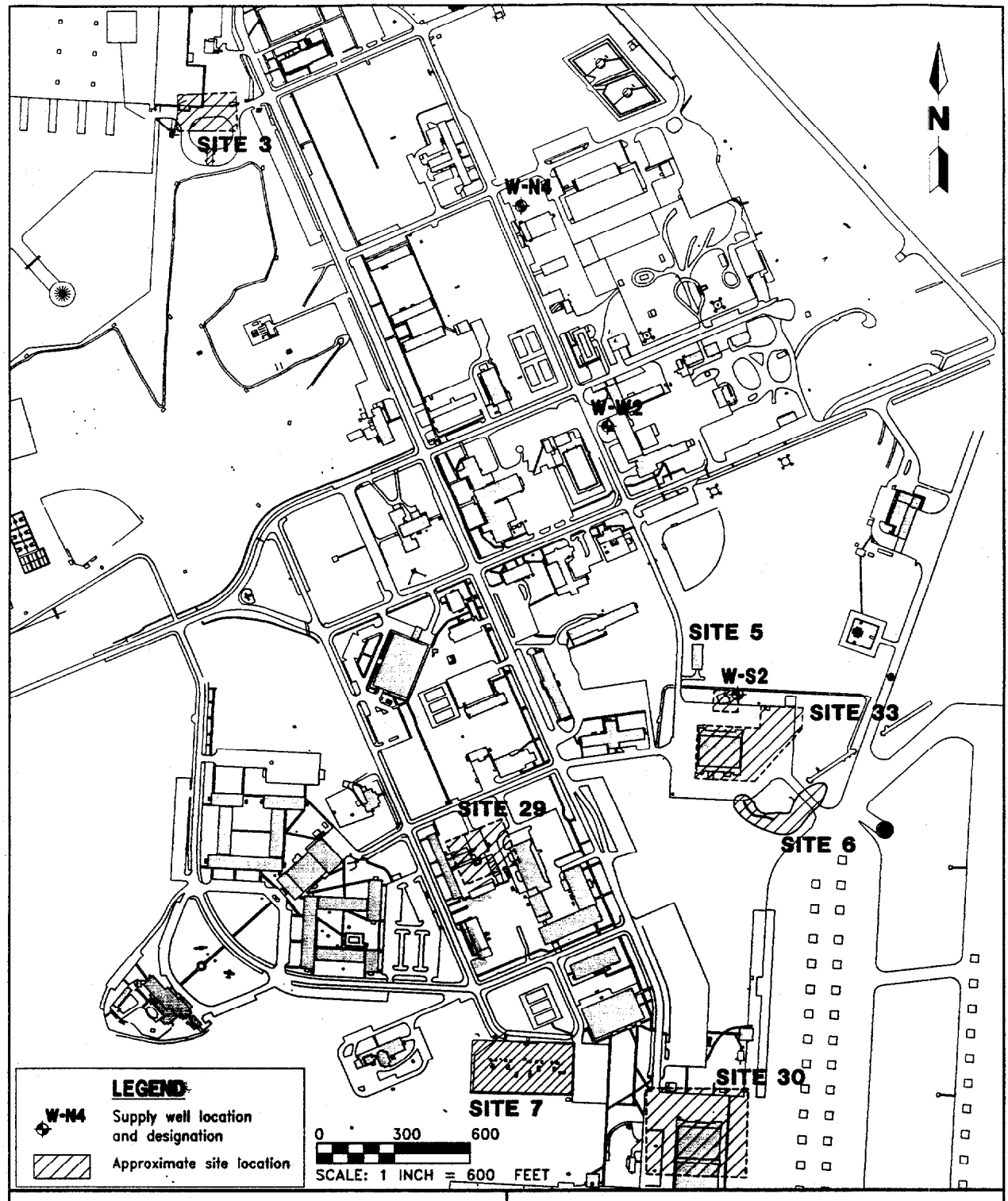

FIGURE 2-3
FACILITY SUPPLY WELLS

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REMEDIAL INVESTIGATION (RI)
PROGRAM PHASE IIA
TECHNICAL MEMORANDUM No. 7,
RI PHASE IIB WORKPLAN

NAS WHITING FIELD
MILTON, FLORIDA

under the Navy's underground storage tank (UST) program. The third investigation, of the Clear Creek floodplain, was conducted concurrent with Phase IIA. Table 2-1 presents the investigations previously completed and the following sections briefly summarize the investigations and results.

Initial Assessment Study, 1985. Historical records reviewed during the IAS (Envirodyne Engineers, 1985) suggest that throughout its years of operation, NAS Whiting Field has generated a variety of wastes related to pilot training, the operation and maintenance of aircraft and ground support equipment, and facility maintenance programs. Figure 1-2 provides a map showing the location of all sites that have been identified for investigation at NAS Whiting Field. Interviews with facility personnel and record reviews indicated that prior to the establishment of hazardous waste management programs and programs to recycle waste oil during the 1970s, most of the hazardous wastes were reportedly disposed of onsite. Waste materials were disposed of either in dumpsters that were emptied into onsite disposal areas or they went into waste oil bowsers, which probably were used to generate practice fires during crash crew training activities.

Envirodyne Engineers (1985) estimated that thousands of gallons of wastes, including waste paints, paint thinners, solvents, waste oils, waste gasoline, hydraulic fluids, aviation gasoline (AVGAS), tank bottom sludge, polychlorinated biphenyl (PCB) transformer fluids, and paint stripping wastewater, were potentially dumped into onsite disposal areas. These disposal areas consisted of natural or man-made depressions located within the confines of NAS Whiting Field. In addition to the waste materials routinely disposed of onsite in the disposal areas, additional materials have been reportedly released onsite as the result of accidents or equipment failure by Navy personnel (Envirodyne Engineers, 1985). Based on a review of historical data, aerial photographs, field inspections, and interviews with facility personnel, 16 disposal or spill sites that likely are sources of contaminant migration were initially identified at NAS Whiting Field by the IAS (Envirodyne Engineers, 1985).

The IAS report (Envirodyne Engineers, 1985) concluded that 15 of the 16 sites warranted further investigation, under the Navy's IR program, to assess potential long-term impacts. Only one site, Site 2, the Northwest Open Disposal Area, was determined not to warrant further consideration (Envirodyne Engineers, 1985).

A confirmation study was recommended by the IAS to evaluate the 15 sites requiring further investigation. The recommendation included sampling and monitoring of the sites to confirm the presence or absence of suspected contamination and to further quantify the extent of any problems that might exist (Envirodyne Engineers, 1985).

Confirmation Study, 1985-1986. The confirmation study consisted of two parts: verification and characterization. In June 1994, Geraghty & Miller, Inc., prepared for the Navy a plan of action for the verification study entitled Hydrogeologic Assessment and Groundwater Monitoring Plan, U.S. Naval Air Base, Whiting Field, Florida, which was subsequently submitted to the FDER. This plan outlined the details of the proposed scope of work for the verification study. In December 1985, during discussions with FDER, two sites (Sites 17 and 18) were added to the verification study. Both sites, in use since 1951, were locations where waste fuels and solvents were burned in crash crew training exercises.

Table 2-1
Summary of Site Investigations

Remedial Investigation and Feasibility Study
Technical Memorandum No. 7, Phase IIB Workplan
Naval Air Station Whiting Field
Milton, Florida

RI/FS Site Number	Site Name	Previous Studies			RI/FS Phase I	Navy's UST Program	RI/FS Phase IIA
		IAS	Verification Study	Consent Order			
1	Northwest Disposal Area	*	*		*		*
2	Northwest Open Disposal Area	*			*		*
3	Underground Waste Solvent Storage Area	*	*		*		*
4/1467[1]	North AVGAS Tank Sludge Disposal Area	*	*			*	
5	Battery Acid Seepage Pit	*		*			*
6	South Transformer Oil Disposal Area	*	*		*		*
7/1466[1]	South AVGAS Tank Sludge Disposal Area	*	*			*	
8/3054[1]	AVGAS Fuel Spill Area	*	*			*	
9	Waste Fuel Disposal Pit	*	*		*		*
10	Southeast Open Disposal Area (A)	*	*		*		*
11	Southeast Open Disposal Area (B)	*	*		*		*
12	Tetraethyl Lead Disposal Area	*	*		*		*
13	Sanitary Landfill	*	*		*		*
14	Short-Term Sanitary Landfill	*	*		*		*
15	Southwest Landfill	*	*		*		*
16	Open Disposal and Burning Area	*	*		*		*
17	Crash Crew Training Area		*		*		*
18	Crash Crew Training Area		*		*		*
29	Auto Hobby Shop						*
30	South Field Maintenance Hangar Area						*
31	Sludge Drying Beds and Disposal Areas						*
32	North Field Maintenance Hangar Area						*
33	Midfield Maintenance Hangar Area						*

[1] Remedial Investigation (RI) Site Number / underground storage tank (UST) Site Number.

Notes: RI/FS = Remedial Investigation and Feasibility Study.
IAS = Initial Assessment Study.
UST = underground storage tank.
AVGAS = aviation gasoline.

The results of the verification study provided an assessment of physical and chemical conditions existing at NAS Whiting Field (Geraghty & Miller, 1986). The conclusions of the study indicated that a characterization study was needed to further characterize the nature and extent of contamination at all sites.

The three-phase (IAS, confirmation study, and remedial measures) IR program was modified in 1987-88 to be congruent with CERCLA and SARA regulatory requirements. The updated nomenclature included:

- preliminary assessment (PA),
- site inspection (SI)
- remedial investigation (RI),
- feasibility study (FS), and
- planning and implementation of remedial design.

Under the updated rules, the IAS became equivalent to a PA, and the first part of the confirmation study (the verification study) functioned as the SI. Subsequently, the characterization study was not performed and the existing investigations were used to support the updated program.

Battery Shop Site Investigation, 1985. In 1985, FDER issue a consent order for Site 5, Battery Acid Seepage Pit. Data from this investigation were compiled in a report entitled Detection and Monitoring Program, Battery Shop Site, Final Report, NAS Whiting Field, Florida (Geraghty & Miller, 1985) and submitted to FDER. Results indicated no significant contamination had resulted from past activities at the Battery Acid Shop, and it was recommended by FDER that the consent order be closed on April 15, 1987.

Site 5 was not included in the Phase I RI; however, the presence of benzene in groundwater samples collected from the existing monitoring wells surrounding the seepage pit at Site 5 warranted further consideration during the RI investigation of Site 33. Sites 33 and 5 are located in the Midfield Industrial Area.

Phase I Remedial Investigation, 1990-1992. In December 1990, ABB-ES, under contract to the Department of the Navy, SOUTHNAVFACENGCOM, initiated an RI at NAS Whiting Field. The objective of the Phase I of the RI was to characterize the nature and extent of contamination at sites identified during the IAS. The Phase I RI program addressed 14 of 18 previously identified sites at the installation (Table 2-1). Limited investigations were conducted at Sites 2 and 12 during the Phase I RI because no contaminants had been detected during the verification study. Sites 4, 7, and 8 were not investigated during Phase I of the RI because they were under investigation by the Navy's UST program. Site 5 was not studied because no contamination attributable to the site was detected during the consent order.

No contamination attributable to Sites 2 and 12 was detected during the Phase I RI and no further action (NFA) was proposed by the Navy for both sites. However, at a project managers meeting in Atlanta, Georgia, on November 13, 1992, USEPA and FDER requested that additional investigations be conducted at Sites 2 and 12

before NFA would be accepted. Subsequently, Sites 2 and 12 were included for further study within the IR program.

Five additional sites were identified during the Phase I RI and subsequently added to the Phase IIA RI program for investigation. The site numbers and names are as follows:

Site 29, Auto Hobby Shop;
Site 30, South Field Maintenance Hangar;
Site 31, Sludge Drying Beds and Disposal Areas;
Site 32, North Field Maintenance Hangar; and
Site 33, Midfield Maintenance Hangar.

Site numbers 19 through 28 were not initially used at NAS Whiting Field because they identify sites located at Outlying Landing Field (OLF) Barin in Foley, Alabama. A separate investigation is being conducted at the OLF Barin sites.

Table 2-2 summarizes the historical information collected on the identified sites at NAS Whiting Field.

UST Investigations, 1991-1994. RI Sites 4, 7, and 8 (also referred to as UST Sites 1467, 1466, and 3054, respectively) have been investigated under the Navy's UST program and were not incorporated into the Navy's IR program during Phase I. During a project managers meeting at Whiting Field on July 7, 1992, an agreement was reached between the Navy, USEPA, and FDER to sample monitoring wells at Sites 4 and 7 for full scan target compound list (TCL) and target analyte list (TAL) analytes. Based on the results of these analyses, a decision would be made regarding whether Sites 4 and 7 should remain in the Navy's UST program or be transferred into the Navy's IR program. The UST field work was conducted between August 16 and 30, 1993, and included the collection of groundwater samples from 11 monitoring wells at Site 4 (UST Site 1467) and 19 monitoring wells at Site 7 (UST Site 1466).

The results of the UST program investigation were reported in the Jurisdiction Assessment Report (ABB-ES, 1994d). The report concluded that the benzene, toluene, ethylbenzene, and xylene (BTEX) and trichloroethene (TCE) plumes at the Sites 4 and 7 are co-mingled and that petroleum contaminants could not be remediated without design considerations for TCE contamination. Based on these findings, the report recommended that the sites be returned to the IR program. Correspondence from USEPA and FDEP concurred with the recommendations that the sites be returned to the IR program.

Site 8 (UST Site 3054) was investigated under a separate contamination assessment conducted in August 1992 and July 1993. The results of the investigation were reported in the contamination assessment report (CAR) addendum for Site 3054 (IR Site 8), NAS Whiting Field, Milton, Florida (ABB-ES, 1993c). Based on the data presented in the CAR addendum, NFA was recommended for the site. In correspondence dated January 20, 1994, the FDEP formally accepted the NFA recommendations presented in the CAR addendum for Site 3054. The NFA recommendation was incorporated into a site rehabilitation completion order that has been signed by the Director of the FDEP Division of Waste Management.

Table 2-2
Summary of Potential Disposal Sites

Remedial Investigation and Feasibility Study
Technical Memorandum No. 7, Phase IIB Workplan
Naval Air Station Whiting Field
Milton, Florida

RI/FS Site No.	Site Name and Type	Location	Period of Operation	Types of Material Disposed	Comments
1	Northwest Disposal Area (landfill)	North Field, west side	1943-1965	Refuse, waste paints, thinners, solvents, waste oils, and hydraulic fluids.	Secondary disposal area during this period; site covers 5 acres.
2	Northwest Open Disposal Area (landfill)	North Field, west side	1976-1984	Construction and demolition debris, tires, and furniture.	Former borrow pit location, commonly referred to as the "Wood Dump."
3	Underground Waste Solvent Storage Area (tank)	North Field, south of Building 2941	1980-1984	Waste solvents, paint stripping residue, and 120-gallon spill.	Wastes generated by paint stripping operations.
4	North AVGAS Tank Sludge Disposal Area	North Field, north of Tow Lane	1943-1968	Tank bottom sludge containing tetraethyl lead.	Sludge disposal in shallow holes near tanks.
5	Battery Acid Seepage Pit (contaminated soil)	South Field, southwest of Building 1454	1964-1984	Waste electrolyte solution containing heavy metals and waste battery acid.	Pits located 110 feet from potable supply well (W-S2).
6	South Transformer Oil Disposal Area (contaminated soil)	South Field, southeast of Building 1454	1940's-1960's	PCB-contaminated dielectric fluid.	Disposal in "0-2" drainage ditch.
7	South AVGAS Tank Sludge Disposal Area (landfill and tanks)	South Field, west of Building 1406	1943-1968	Tank bottom sludge containing tetraethyl lead.	Sludge disposed in shallow holes near tanks.
8	AVGAS Fuel Spill Area (contaminated soil)	South Field, south of Building 1406	Summer 1972	AVGAS containing tetraethyl lead.	Fuel spill of about 25,000 gallons on an area of about 2 acres.
9	Waste Fuel Disposal Pit (landfill)	South Field, east side	1950's-1960's	Waste AVGAS containing tetraethyl lead.	Fuel disposed in former borrow pit.
10	Southeast Open Disposal Area (A) (landfill)	South Field, southeast area	1965-1975	Construction and demolition debris, waste solvents, paint, oils, hydraulic fluid, PCBs, pesticides, and herbicides.	Secondary disposal area during this period; site covers about 4 acres.
11	Southeast Open Disposal Area (B) (landfill)	South Field, southeast area	1943-1970	Construction and demolition debris, waste solvents, paint, oils, hydraulic fluid, and PCBs.	Secondary disposal area during this period; site covers about 3 acres.

See notes at end of table.

Table 2-2 (Continued)
Summary of Potential Disposal Sites

Technical Memorandum No. 7, Phase IIB Workplan
Naval Air Station Whiting Field
Milton, Florida

RI/FS Site No.	Site Name and Type	Location	Period of Operation	Types of Material Disposed	Comments
12	Tetraethyl Lead Disposal Area (waste pile)	South Field, southeast area	May 1, 1968	Tank bottom sludge and fuel filters contaminated with tetraethyl lead.	Disposal area posted with warning; site consists of two earth covered mounds; 25 foot by 25 foot area.
13	Sanitary Landfill (landfill)	South Field, southeast area	1979-1984	Refuse, waste solvents, paint, hydraulic fluids, and asbestos.	Primary sanitary landfill, potentially received hazardous wastes the first year of operation.
14	Short-Term Sanitary Landfill (landfill)	South Field, southeast area	1978-1979	Refuse, waste solvents, oils, paint, and hydraulic fluids.	Primary sanitary landfill for brief period; relocated due to drainage problems.
15	Southwest Landfill (landfill)	South Field, southwest area	1965-1979	Refuse, waste paints, oils, solvents, thinners, asbestos, and hydraulic fluid.	Primary landfill for this time period; covers about 15 acres.
16	Open Disposal and Burning Area (landfill)	South Field, southwest area	1943-1965	Refuse, waste paints, oils, solvents, thinners, PCBs, and hydraulic fluid.	Primary disposal area for this time period; covers about 10 acres.
17	Crash Crew Training Area (contaminated soil)	North Field, west side	1951-1991	JP-5 fuel.	Waste fuels and some solvents ignited, then extinguished.
18	Crash Crew Training Area (contaminated soil)	North Field, west side	1951-1991	JP-5 fuel.	Waste fuels and some solvents ignited, then extinguished.
29	Auto Hobby Shop	Area around Building 1404	1943-present	Paint, oils, and solvents	Abandoned underground waste oil tanks.
30	South Field Maintenance Hangar	Area around Building 1406	1943-present	Fuels, solvents, and oils	Abandoned underground waste oil tanks.
31	Sludge Drying Beds and Disposal Areas	Wastewater Treatment Plant and along perimeter roads.	1943-1990	Wastewater Treatment Plant sludge.	Sludge from beds spread on ground along perimeter road.
32	North Field Maintenance Hangar	Area around Building 1424	1943-present	Fuels, solvents, and oils	Abandoned underground waste oil tanks.
33	Midfield Maintenance Hangar	Area around Building 1454	1943-present	Fuels, solvents, and oils	Abandoned underground waste oil tanks.

Notes: RI/FS = Remedial Investigation and Feasibility Study.
AVGAS = aviation gasoline.
PCB = polychlorinated biphenyls.
JP-5 = jet propellant 5.

Clear Creek Floodplain Investigation. In 1993, ABB-ES was contracted by the SOUTHNAVFACENGCOM to conduct an investigation of Clear Creek adjoining Site 16 at NAS Whiting Field. Sediment contamination of the Clear Creek floodplain was detected during the Phase I RI and the Phase IIA ecological survey. The objective of the floodplain investigation was to identify and characterize the nature and extent of contaminated sediment in the Clear Creek floodplain in the vicinity of Site 16, and also attempt to determine the source of the contamination. To achieve this objective, field activities included a geophysical survey and the sampling and analyses of sediment samples.

The results of the investigation suggest sediment from the Clear Creek floodplain study area contains volatile organic compounds (VOCs), pesticides, PCBs, and metals in excess of background concentrations and sediment applicable or relevant and appropriate requirements (ARARs). Sediment that contains large percentages of organic materials appears to contain the majority of the contaminants due to their adsorptive properties. The thickness of the organic-rich contaminated sediment is approximately 1 to 5 feet. The organic-rich sediment is located at the land surface, or under 1 to 5 feet of water in former beaver ponds, tributaries, and a bog.

3.0 PROPOSED OPERABLE UNITS

To facilitate additional RI/FS investigative activities, all potential sources of contamination identified at the installation have been organized into operable units (OUs). Organization into an OU represents an incremental step toward comprehensively addressing site (facility) problems. By organizing the individual sites into OUs, investigative methods can be combined and remedial actions can be facilitated.

Sites at NAS Whiting Field were organized into proposed OUs based on the following criteria:

- geographic proximity of sites,
- similarity of contaminants,
- similarity of aquifer contamination zones,
- similarity of potential investigative methods,
- potential scope and complexity of investigation, and
- similarity of potential remedial actions.

Technical Memorandum No. 6 (ABB-ES, 1995d) outlines the proposed OUs and the rationale for their groupings.

Definition of the Seven Proposed Operable Units. Seven OUs were initially proposed at a remedial project managers (RPM) meeting held in Tallahassee, Florida, on May 24, 1994 (Figure 3-1). The meeting was attended by representatives from the USEPA, FDEP, SOUTHNAVFACENGCOM, and ABB-ES. Although seven OUs have currently been proposed, it is possible that these proposed OUs may be redefined as more data are collected and evaluated during the RI/FS process. Listed below are the proposed OU designations, sites included in the OUs, and rationale for organization.

Proposed OU 1 - North Field Industrial Area

Site 3, Underground Waste Solvent Storage Tank
Site 4, North AVGAS Tank Sludge Disposal Area
Site 32, North Field Maintenance Hangar

Sites 3, 4, and 32 are grouped into a single OU based on geographic proximity in the northern part of the industrial area (Figure 3-1), similarity of groundwater contaminants (see Table 2-2), investigative methods, and potential remedial actions.

Proposed OU 2 - Midfield and South Field Industrial Areas

Site 5, Battery Acid Seepage Pit
Site 6, South Transformer Oil Disposal Area
Site 7, South AVGAS Tank Sludge Disposal Area
Site 8, AVGAS Fuel Spill Area
Site 29, Auto Hobby Shop
Site 30, South Field Maintenance Hangar
Site 33, Midfield Maintenance Hangar

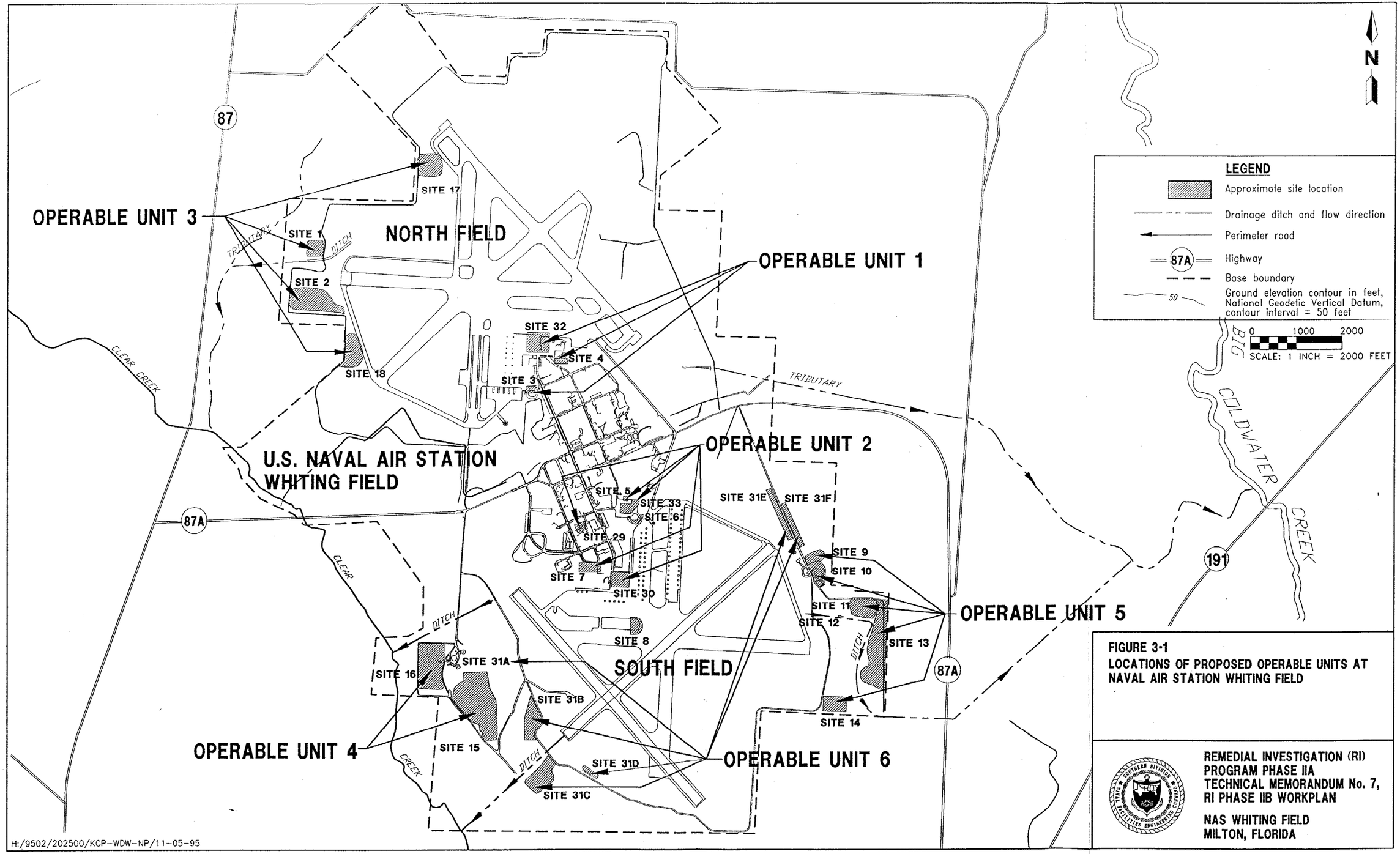

FIGURE 3-1
LOCATIONS OF PROPOSED OPERABLE UNITS AT
NAVAL AIR STATION WHITING FIELD

REMEDIAL INVESTIGATION (RI)
PROGRAM PHASE IIA
TECHNICAL MEMORANDUM No. 7,
RI PHASE IIB WORKPLAN

NAS WHITING FIELD
MILTON, FLORIDA

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Sites 5, 6, 7, 8, 29, 30, and 33 are grouped into a single OU based on geographic proximity in the southern half of the industrial area, similarity of groundwater contaminants (see Table 2-2 and Figure 3-1), potential investigative methods, and potential remedial actions.

Proposed OU 3 - Northwest Disposal and Crash Crew Training Area

Site 1, Northwest Disposal Area
Site 2, Northwest Open Disposal Area
Site 17, Crash Crew Training Area
Site 18, Crash Crew Training Area

Sites 1, 2, 17, and 18 are grouped as a single proposed OU based on their geographic proximity in the northern part of facility (Figure 3-1), similarity of past waste disposal practices, potential investigative methods, and potential remedial (or removal) actions. Sites 1 and 2 are similar disposal areas and may follow similar final decisions in the future based on previous investigation results. Site 17 and 18 have been identified as having similar contamination and additional investigations may follow a nontime-critical interim removal action.

Proposed OU 4 - Southwest Disposal Area

Site 15, Southwest Landfill
Site 16, Open Disposal and Burning Area

Sites 15 and 16 are grouped as a single OU based on their geographic proximity in the southwest part of facility (Figure 3-1), similarity of past waste disposal practices, potential investigative methods, and potential remedial (or removal) actions.

Proposed OU 5 - Southeast Disposal Area

Site 9, Waste Fuel Disposal Area
Site 10, Southeast Open Disposal Area (A)
Site 11, Southeast Open Disposal Area (B)
Site 12, Tetraethyl Lead Disposal Area
Site 13, Sanitary Landfill
Site 14, Short-term Sanitary Landfill

Sites 9 through 14 are grouped as a single OU based on their geographic proximity in the southeast part of facility (Figure 3-1). Sites 9, 10, 11, 13, and 14 have similar past waste disposal histories and similar investigative methods and potential remedial (or removal) actions are likely to be conducted.

Proposed OU 6 - Sludge Drying Beds

Site 31, Sludge Drying Beds and Disposal Areas
Site 31A, Sludge Drying Beds
Site 31B, Sludge Drying Bed Disposal Area
Site 31C, Sludge Drying Bed Disposal Area
Site 31D, Sludge Drying Bed Disposal Area
Site 31E, Sludge Drying Bed Disposal Area
Site 31F, Sludge Drying Bed Disposal Area

These sites were grouped as a single OU given their similarity of past waste disposal practices, potential investigation methods, and potential remedial (or removal) actions (Figure 3-1).

Proposed OU 7 - Clear Creek Floodplain

Sediment contamination of the Clear Creek floodplain was identified during the RI Phase IIA investigation, but the floodplain has not been assigned a site number. The results of assessment activities are presented in the Clear Creek floodplain investigative report (ABB-ES, 1993b). Additional investigative work and an ecological risk assessment have been identified by USEPA, FDEP, and Navy as tasks to be completed and will be conducted under a separate workplan.

It is proposed this site be identified as a separate OU because of its unique physical characteristics (wetlands), contaminant type, and potential investigative and potential remedial methods.

4.0 FIELD INVESTIGATIVE METHODS

Field investigative techniques will be used during the RI/FS to collect data from different sites and media at NAS Whiting Field. Investigative techniques for the RI/FS are described in the RI/FS workplan, Volume II (E.C. Jordan, 1990), which provides descriptions of sampling methods, field personnel responsibilities, sample management, chain of custody, project documentation, change in field methods, protocols on corrective actions, decontamination procedures, waste management handling, and other general project standards and procedures in Section 3.1, General Site Operations. These requirements will also be followed during Phase IIB activities and this sampling and analysis program.

Field and laboratory quality assurance and quality control (QA/QC) requirements for Phase IIB activities will comply with the RI/FS Quality Assurance Project Plan (QAPP) located in Appendix A of the RI/FS workplan, Volume II (E.C. Jordan, 1990). Health and safety requirements will be in accordance with the general Health and Safety Plan (HASP) located in Volume III of the RI/FS workplan (E.C. Jordan, 1990).

Field investigative methods not covered in the documents identified above are outlined below.

4.1 SOIL GAS SURVEY FOR METHANE. A soil gas survey for methane will be conducted at landfill and disposal areas to assess methane gas or other volatile organic compounds that may exist and are emanating from the landfill or disposal areas. Soil gas samples will be collected across the site and up to 500 feet beyond the site boundary. Sample locations initially will be spaced at 100 feet by 100 feet on a grid. The grid will be anchored by a random point in space to produce unbiased sampling locations. Spacing of grid locations may be changed based on site conditions.

At each location an open-ended stainless-steel tube will be pushed or manually driven in 6-inch increments to a depth of 3 feet bls. Organic vapor measurements will be made at each 6-inch increment. The air within the stainless-steel tube will be purged with a vacuum pump to obtain a representative sample of soil gas. Organic vapor concentrations will be measured in the field with a Foxboro organic vapor analyzer (OVA). Measurements of both total organic vapors and vapors after a granulated charcoal filter will be recorded in a bound field logbook. A comparison of the two measurements will allow a qualitative analysis of methane gas. No samples will be collected for laboratory analysis.

Sample results will be contoured on a map to evaluate the soil gas measurements.

4.2 *IN SITU* GROUNDWATER SAMPLING. *In situ* groundwater sampling will be conducted to assess the lateral and vertical extent of groundwater contamination and to assist in the placement of monitoring wells. Hydropunch II™, Aquaprobe™, and Bengt-Arne-Torstensson (BAT™) sampling methods use similar equipment but a specific technique has not been chosen. Sampling equipment will consist of a stainless-steel driven point, a stainless-steel screen section, and a retractable outer casing that will seat against the drive point and enclose the screen until the time of sample collection.

In situ groundwater sample collection will be completed by advancing a borehole to a depth approximately 4 to 5 feet above the potentiometric surface. The probe will then be placed inside the drill string and lowered to the bottom of the boring. The probe will then be advanced to the sampling interval by hammering or pushing with the drill rig. After the probe has been advanced to the desired sampling interval, the outer casing will be retracted exposing the screened section to the aquifer. Groundwater will then pass through the screen and into a bailer or other sampling container dependent on the specific sampling technique. Once the sample has been collected, the probe will be removed from the boring and decontaminated. Drilling will then continue to the next sample interval. Subsequent samples from the boring will be collected at 20-foot intervals. Generally five intervals will be sampled from each boring location.

Samples will be analyzed by a field gas chromatograph (GC) for BTEX and TCE compounds. Forty percent of the samples will be sent to an offsite laboratory for confirmatory analyses.

4.3 MODIFIED GROUNDWATER SAMPLING METHOD. Previous investigations have reported a correlation between inorganic analyte concentrations and high turbidity measurements in groundwater samples. While conducting the Phase IIA sampling event, it was noted that, during well purging operations using a submersible pump, the water turbidity remained very low throughout purging operations. Once a bailer was introduced for sample collection, the turbidity of the water greatly increased due to the impact and operating action of the bailer.

To reduce sample turbidity and address concerns of the associated inorganic analyte concentrations, two modifications to sampling procedures will be incorporated during the field investigation. During previous investigations the order of sample collection for specific analytes was as follows: VOCs, SVOCs, pesticides and PCBs, and inorganic analytes. The modified procedure will incorporate collecting the inorganic parameter fraction following the volatile compounds.

The second modification will be the collection of filtered groundwater samples if the groundwater turbidity is not reduced below 5 nephelometric turbidity units (NTU) by the modified sampling procedure. If the inorganic sample's turbidity exceeds 5 NTU, an additional inorganic sample will be collected and filtered (dissolved phase inorganics) using a 45-micron filter. The purpose of the additional groundwater sample is to support a baseline risk assessment and future FS work, if required. The data will be used as follows:

- The unfiltered data will be used in the initial calculations of the baseline risk assessment, thereby presenting a conservative approach to quantifying the risk posed by the inorganic parameters. Because it is known that the concentrations of inorganic parameters will be over-represented if any turbidity is present, and if the risk posed by the turbid unfiltered samples is acceptable, then all parties can be confident that the conclusions reached are conservative and protective of human health and the environment.

- However, if the unfiltered data suggest that an unacceptable risk is present, the dissolved or filtered data and turbidity measurements collected during sampling operations will be incorporated into the risk assessment and a second less conservative evaluation of the data will be completed. This second less conservative evaluation may be more representative of the nonturbid water consumed by the general public.

5.0 PREVIOUS INVESTIGATIONS

5.1 WASTE SITES AND OPERABLE UNITS. The sites at NAS Whiting Field have been divided into seven proposed OUs. This workplan addresses four of the proposed OUs (3, 4, 5, and 6) and presents the investigative methods and sampling locations for the OUs. The following presents a summary of previous investigations conducted at each of the sites.

The number of samples collected during previous investigations at each site is presented in Table 5-1. The monitoring well construction details for all previously installed monitoring wells is summarized in Table 5-2.

5.2 OPERABLE UNIT 3. OU 3 is composed of four sites located in the northwestern part of the facility. The sites are as follows:

Site 1, Northwest Disposal Area;
Site 2, Northwest Open Disposal Area;
Site 17, Crash Crew Training Area; and
Site 18, Crash Crew Training Area.

The locations of the sites are shown on Figure 1-2.

5.2.1 Site 1, Northwest Disposal Area

Site Description and Background. Background information was gathered from the IAS (Envirodyne Engineers, Inc., 1985). Site 1 is located along the northwestern facility boundary near the North Air Field and is approximately 5 acres in size (Figure 1-2). From 1943 until 1965 general refuse and wastes associated with operation and maintenance of aircraft may have been disposed of at this site. Anecdotal evidence suggests this may include unknown quantities of waste paints, paint thinners, solvents, waste oils, and hydraulic fluids. Access to the site was uncontrolled and there were no records of the types of wastes disposed of at the site.

The site is a surface depression with a drainage outlet along the southwestern site boundary. Because the soil at the site is predominantly silty sand, most onsite rainfall infiltrates directly into the soil; however, any surface water runoff that might occur would flow along the southwestern site boundary and would be intercepted by concrete drainage ditch "E." This ditch is present near the southern boundary of the site and conveys surface water from the North Air Field to Clear Creek.

The site is currently forested with pine trees approximately 25 to 40 feet in height. No buried wastes are exposed at the land surface, nor are there indications (e.g., stained soil or stressed vegetation) of other past waste disposal operations.

Verification Study. The verification study (Geraghty & Miller, 1986) at Site 1 included the installation of one monitoring well (WHF-1-1) and collection of a groundwater sample (Figure 5-1). The monitoring well was installed to a depth of 122 feet bls along the southwestern edge of the site. Comparison of the groundwater elevation data for the area indicated the well was located

Table 5-1
Summary of Previous Investigative Sampling Programs at Naval Air Station, Whiting Field

Remedial Investigation and Feasibility Study
Technical Memorandum No. 7, Phase IIB Workplan
Naval Air Station Whiting Field
Milton, Florida

Site Identification	Surface Soil Samples	Subsurface Soil Boring Samples	Subsurface Test Pit Samples	BAT Groundwater Samples, Location and No. of samples	Monitoring Well Samples	Surface Water and Sediment Samples
Operable Unit 3						
Site 1						
Verification Study					1	
RI Phase I				1		
RI Phase IIA	3		1		4	
Site 2						
Verification Study						
RI Phase I				1		
RI Phase IIA	1	6			1	
Site 17						
Verification Study					1	
RI Phase I						
RI Phase IIA	34	18		1	4	
Site 18						
Verification Study					1	
RI Phase I				2		
RI Phase IIA	47	24			3	
Operable Unit 4						
Site 15						
Verification Study					1	
RI Phase I	3			4/5		3
RI Phase IIA	5		5		11	
Site 16						
Verification Study					1	
RI Phase I	3			2/4		
RI Phase IIA	3		3		12	
Operable Unit 5						
Site 9						
Verification Study	6				1	
RI Phase I				1		
RI Phase IIA					3	
Site 10						
Verification Study					1	
RI Phase I				2/3		
RI Phase IIA	5		3		2	
Site 11						
Verification Study					1	
RI Phase I				1/2		
RI Phase IIA	5		3		4	

See notes at end of table.

Table 5-1 (Continued)
Summary of Previous Investigation Sampling Programs at Naval Air Station, Whiting Field

Remedial Investigation and Feasibility Study
Technical Memorandum No. 7, Phase IIB Workplan
Naval Air Station Whiting Field
Milton, Florida

Site Identification	Surface Soil Samples	Subsurface Soil Boring Samples	Subsurface Test Pit Samples	BAT Groundwater Samples Location and No. of samples	Monitoring Well Samples	Surface Water and Sediment Samples
Site 12						
Verification Study		2			1	
RI Phase I		6		2		
RI Phase IIA		8			1	
Site 13						
Verification Study					1	
RI Phase I				1/2		
RI Phase IIA	5		3		3	
Site 14						
Verification Study					1	
RI Phase I				1/2		
RI Phase IIA	5		2		2	
Operable Unit 6						
Site 31A						
RI Phase IIA	8					
Site 31B						
RI Phase IIA	3					
Site 31C						
RI Phase IIA	4					
Site 31D						
RI Phase IIA	1					
Site 31E						
RI Phase IIA	4					
Site 31F						
RI Phase IIA	4					

Notes: BAT = Bengt-Arne-Torstensson™.
RI = remedial investigation.

Table 5-2
Summary of Remedial Investigation and Feasibility Study
Monitoring Well Construction Details

Remedial Investigation and Feasibility Study
Technical Memorandum No. 7, Phase IIB Workplan
Naval Air Station Whiting Field
Milton, Florida

Monitoring Well Designation	RI Phase of Well Completion	Well Size (inches)	Land Surface Elevation (feet msl)	TOC Elevation (feet msl)	Total Well Depth (feet BTOC)	Approximate Screen Interval (feet BTOC)	Surface Casing Length (feet bls)
Background Locations							
WHF-BKG-1	IIA	2	192.52	195.46	121.60	106 to 121	NA
WHF-BKG-2	IIA	2	177.39	180.24	109.22	94 to 109	NA
WHF-BKG-3	IIA	2	144.82	147.57	80.50	65 to 80	NA
Northwest Disposal and Crash Crew Training Areas							
Site 1, Northwest Disposal Area							
WHF-1-1	VS	4	140.49	142.62	123.00	113 to 123	NA
WHF-1-1S	IIA	2	140.54	143.08	75.40	60 to 75	NA
WHF-1-2	IIA	2	142.59	145.61	78.80	63 to 78	NA
WHF-1-3	IIA	2	152.95	155.50	87.48	72 to 87	NA
Site 2, Northwest Open Disposal Area							
WHF-2-1	IIA	2	148.48	150.80	87.42	72 to 87	NA
Site 17, Crash Crew Training Area							
WHF-17-1	VS	4	192.61	194.71	159.00	149 to 159	NA
WHF-17-1S	IIA	2	192.48	194.96	115.50	100 to 115	0 to 35
WHF-17-2	IIA	2	194.33	197.35	121.90	106 to 121	0 to 43
WHF-17-3	IIA	2	198.89	201.21	126.50	111 to 126	NA
Site 18, Crash Crew Training Area							
WHF-18-1	VS	4	161.56	163.57	120.20	110 to 120	NA
WHF-18-2	IIA	2	162.15	164.75	107.86	92 to 107	NA
WHF-18-3	IIA	2	172.73	175.64	112.90	97 to 112	NA
Southwest Disposal Area							
Site 15, Southeast Landfill							
WHF-15-1	VS	4	64.17	66.35	73.20	63 to 73	NA
WHF-15-2I	IIA	2	57.24	60.10	63.20	53 to 63	NA
WHF-15-2S	IIA	2	57.18	59.58	32.90	17 to 32	NA
WHF-15-2D	IIA	2	57.05	59.39	112.44	107 to 112	NA
WHF-15-3D	IIA	2	67.84	69.44	119.48	109 to 119	NA
WHF-15-3I	IIA	2	67.26	69.69	87.83	77 to 87	NA
WHF-15-3S	IIA	2	67.35	69.29	37.94	22 to 37	NA
WHF-15-4S	IIA	2	140.62	143.29	109.15	94 to 109	NA
WHF-15-5S	IIA	2	101.73	104.14	68.18	58 to 68	NA
WHF-15-6D	IIA	2	72.56	75.08	123.36	113 to 123	NA
WHF-15-6S	IIA	2	71.87	74.29	43.73	28 to 43	NA

See notes at end of table.

Table 5-2 (Continued)
Summary of Remedial Investigation and Feasibility Study
Monitoring Well Construction Details

Remedial Investigation and Feasibility Study
Technical Memorandum No. 7, Phase IIB Workplan
Naval Air Station Whiting Field
Milton, Florida

Monitoring Well Designation	RI Phase of Well Completion	Well Size (inches)	Land Surface Elevation (feet msl)	TOC Elevation (feet msl)	Total Well Depth (feet BTOC)	Approximate Screen Interval (feet BTOC)	Surface Casing Length (feet bls)
Site 16, Open Disposal and Burning Area							
WHF-16-1	VS	4	47.47	50.04	43.00	33 to 43	NA
WHF-16-2	I	4	79.38	82.19	74.20	69 to 74	NA
WHF-16-2I	IIA	2	78.02	80.60	130.14	120 to 130	NA
WHF-16-2S	IIA	2	80.77	83.66	49.80	34 to 49	NA
WHF-16-3D	IIA	2	48.64	51.40	118.08	108 to 118	NA
WHF-16-3I	IIA	2	48.73	51.31	52.87	47 to 52	NA
WHF-16-3II	IIA	2	48.60	51.22	78.91	73 to 78	NA
WHF-16-3S	IIA	2	48.88	51.69	23.25	8 to 23	NA
WHF-16-4D	IIA	2	49.88	52.87	122.54	112 to 122	0 to 65
WHF-16-4II	IIA	2	50.62	53.01	64.80	54 to 64	NA
WHF-16-4S	IIA	2	52.19	54.79	22.38	7 to 22	NA
WHF-16-5	IIA	2	(1)	37.54	13.50	3 to 13	NA
Southeast Disposal Area							
Site 9, Waste Fuel Disposal Pit							
WHF-9-1	VS	4	144.66	146.55	118.40	108 to 118	NA
WHF-9-2	I	4	158.11	161.07	124.35	114 to 124	NA
WHF-9-3S	IIA	2	147.92	150.85	108.24	93 to 108	0 to 77
Site 10, Southeast Open Disposal Area (A)							
WHF-10-1	VS	4	144.19	146.73	118.20	108 to 118	NA
WHF-10-2	IIA	2	147.78	150.75	113.14	98 to 113	NA
Site 11, Southeast Open Disposal Area (B)							
WHF-11-1	VS	4	122.48	124.86	128.40	118 to 128	NA
WHF-11-1S	IIA	2	114.91	116.65	54.40	39 to 54	NA
WHF-11-2	I	4	145.19	148.12	125.84	120 to 125	NA
WHF-11-3	IIA	2	114.29	117.19	73.16	58 to 73	0 to 46
Site 12, Tetraethyl Lead Disposal Area							
WHF-12-1	VS	4	134.20	136.40	113.40	103 to 113	NA
Site 13, Sanitary Landfill							
WHF-13-1	VS	4	100.40	102.66	122.90	112 to 122	NA
WHF-13-1S	IIA	2	104.61	108.97	61.30	46 to 61	NA
WHF-13-2S	IIA	2	99.94	102.86	72.41	57 to 72	0 to 42
Site 14, Short-Term Sanitary Landfill							
WHF-14-1	VS	4	137.83	139.69	153.20	143 to 153	NA
WHF-14-2	IIA	2	142.86	145.80	118.30	103 to 118	0 to 94

See notes at end of table.

Table 5-2 (Continued)
Summary of Remedial Investigation and Feasibility Study
Monitoring Well Construction Details

Remedial Investigation and Feasibility Study
Technical Memorandum No. 7, Phase IIB Workplan
Naval Air Station Whiting Field
Milton, Florida

Monitoring Well Designation	RI Phase of Well Completion	Well Size (inches)	Land Surface Elevation (feet msl)	TOC Elevation (feet msl)	Total Well Depth (feet BTOC)	Approximate Screen Interval (feet BTOC)	Surface Casing Length (feet bls)
Industrial Area							
Site 5, Battery Acid Seepage Pit							
WHF-5-OW-1	I	4	182.48	185.80	177.81	172 to 177	0 to 125
WHF-5-OW-2	I	4	182.78	186.02	116.40	111 to 116	NA
WHF-5-3	VS	4	(1)	(1)	150.81	NA	NA
WHF-5-8D	IIA	2	174.81	177.86	174.18	164 to 174	NA
WHF-5-8S	IIA	2	174.75	177.44	128.15	113 to 128	NA
WHF-5-9D	IIA	2	176.34	175.97	180.12	170 to 180	0 to 107
WHF-5-9S	IIA	2	175.85	175.55	128.74	118 to 128	0 to 108
WHF-5-10D	IIA	2	181.56	184.32	183.32	173 to 183	0 to 117
WHF-5-10S	IIA	2	181.06	184.11	144.71	134 to 144	0 to 119
WHF-5-PZ1	I	1	(1)	186.00	136.78	135 to 136	0 to 125
WHF-5-PZ2	I	1	(1)	185.90	151.94	150 to 151	0 to 125
Site 6, South Transformer Oil Disposal Area							
WHF-6-1D	IIA	2	177.77	177.55	180.47	175 to 180	0 to 112
WHF-6-1S	IIA	2	177.79	177.63	134.33	124 to 134	0 to 112
WHF-6-3	IIA	2	176.11	175.72	123.45	108 to 123	NA
Site 33, Midfield Maintenance Hangar Area							
WHF-33-1	IIA	2	180.78	180.58	127.44	112 to 127	NA
WHF-33-2	IIA	2	181.69	181.48	128.40	113 to 128	NA
WHF-33-3	IIA	2	182.01	181.79	128.44	113 to 128	NA
WHF-33-4	IIA	2	180.56	180.36	127.94	112 to 127	NA
WHF-33-5	IIA	2	178.51	178.39	125.90	110 to 125	NA
Site 7, South AVGAS Tank Sludge Disposal Area							
WHF-7-1	VS	4	185.06	187.75	143.38	133 to 143	NA
Site 8, AVGAS Fuel Spill Area							
WHF-8-1	VS	4	172.31	173.14	180.70	170 to 180	NA
Site 29, Auto Hobby Shop							
WHF-29-1	IIA	2	193.92	193.53	139.48	124 to 139	NA
WHF-29-2	IIA	2	191.85	191.52	136.90	121 to 136	NA
WHF-29-3	IIA	2	194.36	194.02	139.64	124 to 139	NA
WHF-29-4	IIA	2	196.17	195.78	139.10	124 to 139	NA
WHF-29-5	IIA	2	193.78	193.47	132.14	117 to 132	NA

See notes at end of table.

Table 5-2 (Continued)
Summary of Remedial Investigation and Feasibility Study
Monitoring Well Construction Details

Remedial Investigation and Feasibility Study
Technical Memorandum No. 7, Phase IIB Workplan
Naval Air Station Whiting Field
Milton, Florida

Monitoring Well Designation	RI Phase of Well Completion	Well Size (inches)	Land Surface Elevation (feet msl)	TOC Elevation (feet msl)	Total Well Depth (feet BTOC)	Approximate Screen Interval (feet BTOC)	Surface Casing Length (feet bls)
Site 30, South Field Maintenance Hangar Area							
WHF-30-3	IIA	2	179.29	179.11	134.60	119 to 134	NA
WHF-30-4	IIA	2	181.88	181.49	135.44	120 to 135	NA
WHF-30-5	IIA	2	182.16	181.89	157.53	147 to 157	NA
Site 3, Underground Waste Solvent Storage Area							
WHF-3-1	VS	4	173.43	174.92	153.17	143 to 153	NA
WHF-3-1D	IIA	2	173.22	172.97	180.29	170 to 180	0 to 104
WHF-3-1S	IIA	2	173.24	172.97	123.22	113 to 123	0 to 105
WHF-3-2	VS	4	173.32	175.37	153.20	143 to 153	NA
WHF-3-2D	IIA	2	173.41	173.14	176.17	171 to 176	NA
WHF-3-2S	IIA	2	(1)	172.78	114.12	99 to 114	NA
WHF-3-3D	IIA	2	175.90	175.69	180.57	170 to 180	0 to 112
WHF-3-3	I	4	175.72	178.18	154.22	149 to 154	0 to 120
WHF-3-3S	IIA	2	175.46	175.23	110.80	100 to 110	NA
WHF-3-4	IIA	2	174.43	174.38	121.45	111 to 121	0 to 102
WHF-3-7D	IIA	2	173.45	173.29	180.54	175 to 180	0 to 109
WHF-3-7I	IIA	2	173.46	173.25	139.92	134 to 139	0 to 109
WHF-3-7S	IIA	2	173.47	173.27	123.80	113 to 123	0 to 109
Site 4, North AVGAS Tank Sludge Disposal Area							
WHF-4-1	VS	4	170.42	172.45	153.07	143 to 153	NA
Site 32, North Field Maintenance Hangar Area							
WHF-32-1	IIA	2	172.13	171.88	110.34	95 to 110	NA
WHF-32-2	IIA	2	172.62	172.27	110.54	95 to 110	NA
WHF-32-3	IIA	2	172.58	(2)	110.02	95 to 110	NA
WHF-32-4	IIA	2	172.07	(2)	110.25	95 to 110	NA
WHF-32-5	IIA	2	172.28	172.15	109.61	94 to 109	NA
UST Monitoring Wells (Site 7)							
WHF-1466-1	NA	4	178.10	177.79	135	120 to 135	NA
WHF-1466-1D	NA	4	191.60	191.24	158	153 to 158	0 to 135
WHF-1466-2	NA	4	181.00	180.72	120	105 to 120	NA
WHF-1466-2D	NA	4	190.40	190.03	144	139 to 144	0 to 133
WHF-1466-3	NA	4	197.70	197.42	145	130 to 145	NA
WHF-1466-3D	NA	4	180.10	179.75	149	144 to 149	0 to 126
WHF-1466-4	NA	4	190.60	190.37	151	132 to 147	NA

See notes at end of table.

Table 5-2 (Continued)
Summary of Remedial Investigation and Feasibility Study
Monitoring Well Construction Details

Remedial Investigation and Feasibility Study
Technical Memorandum No. 7, Phase IIB Workplan
Naval Air Station Whiting Field
Milton, Florida

Monitoring Well Designation	RI Phase of Well Completion	Well Size (inches)	Land Surface Elevation (feet msl)	TOC Elevation (feet msl)	Total Well Depth (feet BTOC)	Approximate Screen Interval (feet BTOC)	Surface Casing Length (feet bls)
UST Monitoring Wells (Site 30) (continued)							
WHF-1466-5R	NA	4	175.60	175.18	132	117 to 132	NA
WHF-1466-6	NA	4	173.40	173.09	131	115 to 130	NA
WHF-1466-7	NA	4	172.50	172.26	131	115 to 130	NA
WHF-1466-8	NA	4	172.50	172.24	131	116 to 131	NA
WHF-1466-9	NA	4	173.40	173.20	116	100 to 115	NA
WHF-1466-10	NA	4	172.50	172.08	122	107 to 122	NA
WHF-1466-11	NA	4	176.30	175.87	104	89 to 104	NA
WHF-1466-12	NA	4	190.20	189.92	147	125 to 147	NA
WHF-1466-13 (WHF-30-2)	NA	4	177.50	177.31	130	115 to 130	NA
WHF-1466-14	NA	4	181.00	181.05	135	120 to 135	NA
WHF-1466-15	NA	4	178.14	177.81	135	119 to 134	NA
WHF-1466-16	NA	4	176.74	176.49	135	120 to 135	NA
WHF-1466-17	NA	4	178.20	177.91	134	119 to 134	NA
WHF-1466-18	NA	4	185.80	185.58	135	120 to 135	NA
WHF-1466-19	NA	4	189.20	188.81	145	130 to 145	NA
WHF-1466-20	NA	4	188.00	187.76	140	125 to 140	NA
UST Monitoring Wells (Site 4)							
WHF-1467-1	NA	4	168.80	168.51	97	82 to 97	NA
WHF-1467-2	NA	4	157.70	157.44	85	70 to 85	NA
WHF-1467-2D	NA	4	(1)	(1)	123	NA	NA
WHF-1467-3	NA	4	157.40	157.25	95	80 to 95	NA
WHF-1467-4	NA	4	175.00	174.64	103	88 to 103	NA
WHF-1467-5	NA	4	173.50	173.27	100	85 to 100	NA
WHF-1467-5D	NA	4	NA	171.77	140	NA	NA
WHF-1467-6	NA	4	176.80	176.54	103	88 to 103	NA
WHF-1467-6D	NA	4	166.40	166.23	102	97 to 102	0 to 88
WHF-1467-7	NA	4	157.70	157.48	85	70 to 85	NA
WHF-1467-7D	NA	4	158.50	158.18	129	124 to 129	0 to 97
WHF-1467-8	NA	4	173.50	173.24	107	92 to 107	NA
WHF-1467-8D	NA	4	169.20	168.85	127	112 to 127	0 to 107
WHF-1467-9	NA	4	163.30	162.99	100	85 to 100	NA
WHF-1467-11	NA	4	156.90	156.49	90	75 to 90	NA
WHF-1467-13R		4	164.90	164.57	90	75 to 90	NA
WHF-1467-14	NA	4	174.70	174.47	110	95 to 110	NA

See notes at end of table.

Table 5-2 (Continued)
Summary of Remedial Investigation and Feasibility Study
Monitoring Well Construction Details

Remedial Investigation and Feasibility Study
Technical Memorandum No. 7, Phase IIB Workplan
Naval Air Station Whiting Field
Milton, Florida

Monitoring Well Designation	RI Phase of Well Completion	Well Size (inches)	Land Surface Elevation (feet msl)	TOC Elevation (feet msl)	Total Well Depth (feet BTOC)	Approximate Screen Interval (feet BTOC)	Surface Casing Length (feet bls)
WHF-1467-16	NA	4	177.60	177.05	115	100 to 115	NA
WHF-1467-17	NA	4	([1])	115.00	106	91 to 106	NA
WHF-1467-18	NA	4	175.40	175.12	115	100 to 115	NA
WHF-1467-19	NA	4	169.80	169.33	105	90 to 105	NA
WHF-1467-20	NA	4	172.50	172.26	110	95 to 110	NA
WHF-1467-21	NA	4	174.30	173.93	111	96 to 111	NA
WHF-1467-22R	NA	4	172.70	172.38	103	88 to 98	NA
WHF-1467-23	NA	4	172.86	172.57	101	91 to 101	NA
WHF-1467-24	NA	4	170.10	169.77	100	85 to 95	NA
WHF-1467-25	NA	4	160.90	160.85	91	75 to 90	NA
WHF-1467-26	NA	4	166.50	166.28	90	73 to 83	NA
WHF-1467-27	NA	4	174.10	173.74	116	100 to 115	NA
WHF-1467-28	NA	4	173.30	173.03	106	90 to 105	NA
WHF-1467-29	NA	4	169.10	168.96	100	80 to 95	NA
WHF-1467-30	NA	4	174.40	174.23	102.5	87 to 102	NA
WHF-1467-31	NA	4	171.60	171.21	125	99 to 114	NA
WHF-1467-32	NA	4	162.80	162.31	100	82 to 97	NA
WHF-1467-33	NA	4	170.10	169.86	84	69 to 74	NA

[1] Land surface or top of casing elevation not available.
[2] Top of casing damaged after survey.

Notes: RI = Remedial Investigation.
msl = mean sea level.
TOC = top of casing.
BTOC = below top of casing.
bls = below land surface.
NA = not applicable.
IIA = Remedial Investigation Phase IIA.
VS = Verification Study.
I = Remedial Investigation Phase I.
AVGAS = aviation gasoline.
UST = underground storage tank.

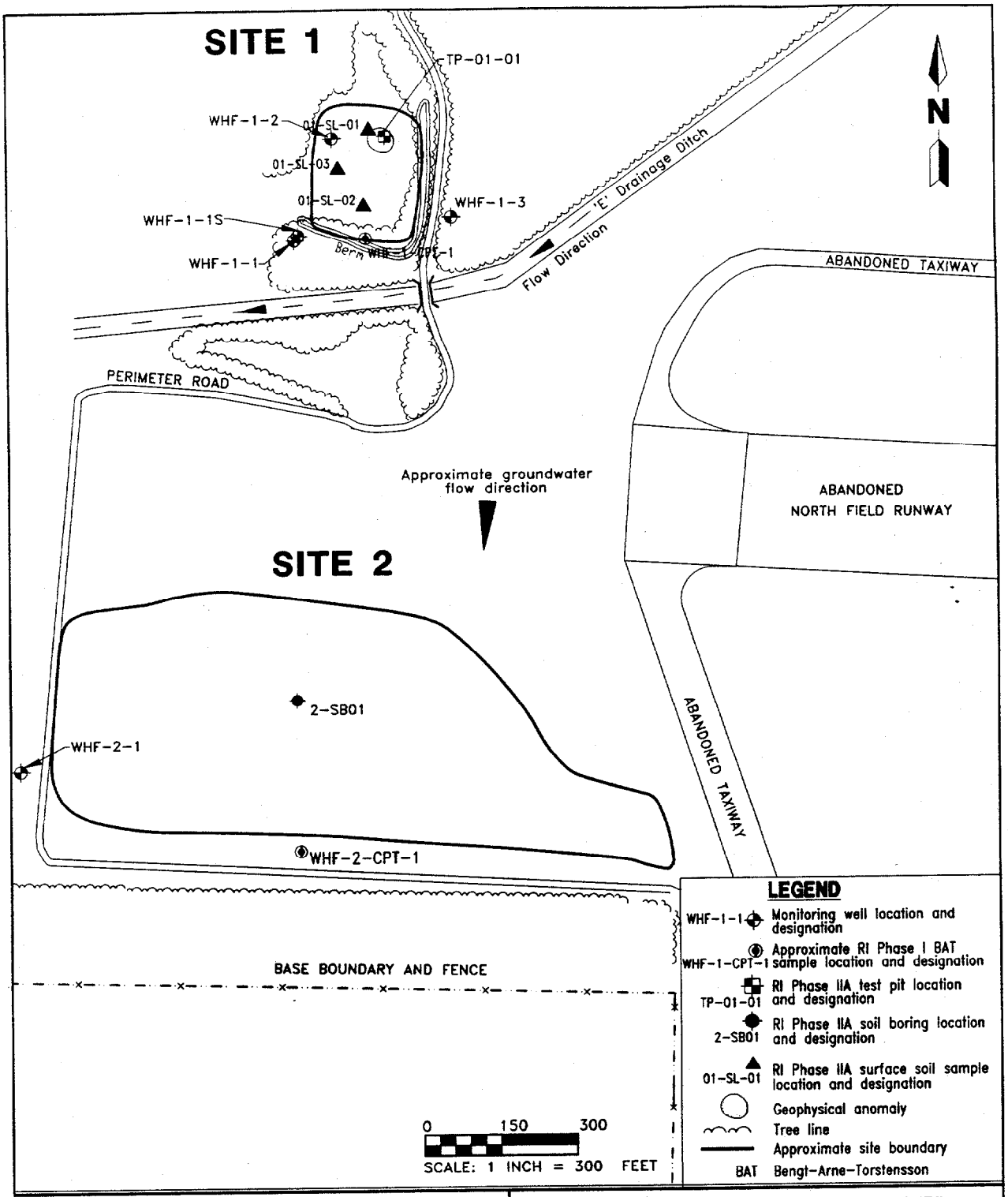

FIGURE 5-1
SITES 1 AND 2,
LOCATIONS OF SURFACE SOIL SAMPLES, TEST PITS, SOIL BORINGS, BAT SAMPLES, GEOPHYSICAL ANOMALY, AND MONITORING WELLS

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downgradient to the site (Figure 5-1) (ABB-ES, 1995b). The groundwater sample was analyzed for USEPA priority pollutants, which includes VOCs, acid and neutral extractable organic compounds, pesticides (including endrin, lindane, kepone, toxaphene, chlorodane, and malathion), herbicides (2,4-D and 2,4,5-TP Silvex), PCBs and metals. No organic compounds were detected; however, one inorganic analyte was detected. Lead was detected at concentrations below Florida's primary drinking-water regulations (Chapter 17-22.104, FAC) in 1986.

RI Phase I Investigation. The RI Phase I investigation (ABB-ES, 1992f) at Site 1 consisted of collecting a groundwater sample using a piezocone penetrometer (PCPT) and BAT sampler (Figure 5-1). The groundwater sample was collected from 130 feet bls and analyzed for VOCs and TAL inorganic analytes at an offsite laboratory. Acetone and carbon disulfide were detected in the sample, but were interpreted to be artifacts resulting from decontamination procedures. Seven inorganic analytes were also detected. Detailed results are summarized in the RI Phase I Technical Memorandum No. 5.

RI Phase IIA Investigation. The Phase IIA investigation included completion of a geophysical survey, collection of three surface soil samples and one subsurface soil sample from a test pit, installation of three monitoring wells (Figure 5-1), and collection of four groundwater samples. The samples were analyzed for TCL VOCs, semivolatile organic compounds (SVOCs), pesticides, and PCBs and TAL inorganic analytes.

The geophysical survey (ABB-ES, 1995c) identified one isolated anomaly, which was later determined during test pit excavation to be a concrete reinforcement rod present on the surface. No materials were disposed of below the land surface within the exploration depth of the test pit.

One pesticide and four inorganic analytes were detected in the surface soil samples at concentrations exceeding background screening criteria (ABB-ES, 1995c). One inorganic analyte was detected in the test pit soil sample at a concentration exceeding background screening criteria (ABB-ES, 1995c). Background screening criteria were established by collecting background samples across the installation from each U.S. Department of Agriculture (USDA) soil type identified at NAS Whiting. The arithmetic mean of analytes detected in the background soil samples was calculated by summing up individual analyte concentrations and then dividing the sum by the number of samples from which the analytes were detected. Samples were then compared to twice the arithmetic mean of analyte concentrations detected in background surface soil samples associated with the same USDA soil type. Detailed results are summarized in the RI Phase IIA Technical Memorandum No. 3 (ABB-ES, 1995c).

Comparison of groundwater elevation data for the area indicates that one monitoring well is located hydraulically upgradient (WHF-1-2), one monitoring well is located hydraulically crossgradient (WHF-1-3), and two monitoring wells (WHF-1-1 and WHF-1-1S) are located hydraulically downgradient (Figure 5-1 and Appendix A) (ABB-ES, 1995b).

One organic compound was detected and 19 inorganic analytes were detected in groundwater samples (ABB-ES, 1994c). Aluminum, beryllium, chromium, iron, lead, manganese, and nickel exceed Federal and State maximum containment levels (MCLs). A detailed discussion of the analytical results are provided in the RI Phase IIA Technical Memorandum No. 5 (ABB-ES, 1995c).

5.2.2 Site 2, Northwest Open Disposal Area

Site Description and Background. Background information was gathered from the IAS (Envirodyne Engineers, Inc., 1985). Site 2, an old borrow pit, is located south of Site 1 along the northwestern facility boundary near the North Air Field abandoned runway and taxiway. The site is approximately 12 acres in size (Figure 1-2). The borrow pit is a depression and the current bottom elevation is approximately 20 feet below the surrounding land surface, at its lowest point.

Between 1976 and 1984, the site was used as an open disposal area primarily for construction and demolition debris. Wastes disposed of at the site include asphalt, wood, tires, furniture, and similar materials that were not suitable for landfill disposal. Crushed paint cans and scrap metal parts have been scattered throughout the site. The wastes disposed of at this site are uncovered.

Due to the steep side slopes of the borrow pit, all surface drainage at the site is internal. Surface drainage within the borrow pit is down the partially vegetated side slopes to low areas near the middle of the pit where infiltration into the soil occurs.

Site 2 was not recommended for additional investigation during the IAS and was subsequently not investigated during the verification study.

RI Phase I Investigation. The RI Phase I investigation (ABB-ES, 1992e) at Site 2 consisted of collection of a groundwater sample using a PCPT and BAT sampler (Figure 5-1). The groundwater sample was collected from 99 feet bls and analyzed for VOCs and TAL inorganic analytes at an offsite laboratory. Acetone and carbon disulfide were detected in the sample, but were interpreted to be artifacts resulting from decontamination procedures. Seven inorganic analytes also were detected. Detailed results are summarized in the RI Phase I Technical Memorandum No. 5 (ABB-ES, 1992f).

On November 13, 1992, an RPMs meeting was held with representatives from the USEPA, Navy, FDEP, National Oceanic and Atmospheric Administration (NOAA), and ABB-ES. The USEPA recommended that one hydraulically downgradient monitoring well and one soil boring be drilled within the borrow pit and that samples be collected for TCL organic and TAL inorganic analysis (Figure 5-1). A consensus was reached that if these explorations were conducted and no contamination was detected, an NFA decision document could be prepared.

RI Phase IIA Investigation. The Phase IIA investigation included the collection of one surface soil sample and six subsurface soil boring samples, installation of one monitoring well, and collection of one groundwater sample (Figure 5-1). All samples were analyzed for TCL VOCs, SVOCs, pesticides, and PCBs and TAL inorganic analytes. One semivolatile compound, 2 pesticides and 13 inorganic analytes were detected in the surface soil samples. Two semivolatile compounds, 2 pesticides, 1 PCB, and 17 inorganic analytes were detected in the subsurface soil samples from the soil boring. Detailed results are summarized in the RI Phase IIA Technical Memorandum No. 3 (ABB-ES, 1994b).

Comparison of the groundwater elevation data in the area surrounding the site indicated that monitoring well WHF-2-1 is located crossgradient of the site (Figure 5-1, ABB-ES, 1995b, and Appendix A). One SVOC and 15 inorganic analytes were detected in the groundwater sample. Bis(2-ethylhexyl)phthalate, aluminum,

chromium, iron, lead, and manganese exceeded Federal and State MCLs. A detailed discussion of the analytical results are provided in the RI Phase IIA Technical Memorandum No. 5 (ABB-ES, 1995c).

5.2.3 Site 17, Crash Crew Training Area

Site Description and Background. Background information was gathered from the IAS (Envirodyne Engineers, Inc., 1985). Site 17 is located along the northwestern facility boundary and near the North Air Field taxiway. The site is approximately 4 acres (Figure 1-2) in size and was in use between 1951 and 1991. Site 17 is composed of multiple shallow depressions where metallic objects were placed to simulate an aircraft after a crash. Crash crew training activities consisted of pouring approximately 100 gallons of AVGAS or jet fuel into the depressions and then igniting it. The fires were then extinguished using an aqueous film-forming foam (AFFF) as part of crash crew training exercises (Geraghty & Miller, 1986).

Verification Study. The verification study (Geraghty & Miller, 1986) at Site 17 included the installation of one monitoring well (WHF-17-1) and collection of a single groundwater sample (Figure 5-2). The monitoring well was installed to a depth of 152 feet bls along the western edge of the site and was determined to be located hydraulically crossgradient to the site (Figure 5-2, and ABB-ES, 1995b). The groundwater sample was analyzed for USEPA priority pollutants. Only one SVOC, bis(2-ethylhexyl)phthalate, was detected. It was determined that the AFFF may have contained phthalate esters and could have been a source of the compound. Two inorganic analytes were detected. Lead and mercury were detected at concentrations below Florida's primary drinking-water regulations in 1986.

RI Phase I Investigation. The RI Phase I investigation at Site 17 consisted of collection of a groundwater sample using a PCPT and BAT sampler (Figure 5-2). The groundwater sample was collected from 128 feet bls and analyzed for VOCs and TAL inorganic analytes at an offsite laboratory. Acetone was detected in the sample, but was interpreted to be an artifact resulting from decontamination procedures. Fourteen inorganic analytes were detected. Detailed results are summarized in the RI Phase I Technical Memorandum No. 5 (ABB-ES, 1992f).

RI Phase IIA Investigation. The Phase IIA investigation included the collection of 34 surface soil samples and 18 subsurface soil samples from soil borings, installation of 3 monitoring wells, and collection of 4 groundwater samples (Figure 5-2).

Surface soil samples were analyzed for TCL VOCs, SVOCs, pesticides and PCBs, TAL inorganic analytes, total recoverable petroleum hydrocarbons (TRPH), and toxicity characteristic leachate procedure (TCLP) for inorganic analytes. Two SVOCs and 13 TAL inorganic analytes were detected in the surface soil samples at concentrations exceeding background screening criteria. None of the detected analytes exceeded TCLP regulatory concentrations for these analytes. Detailed results are summarized in the RI Phase IIA Technical Memorandum No. 3 (ABB-ES, 1994b).

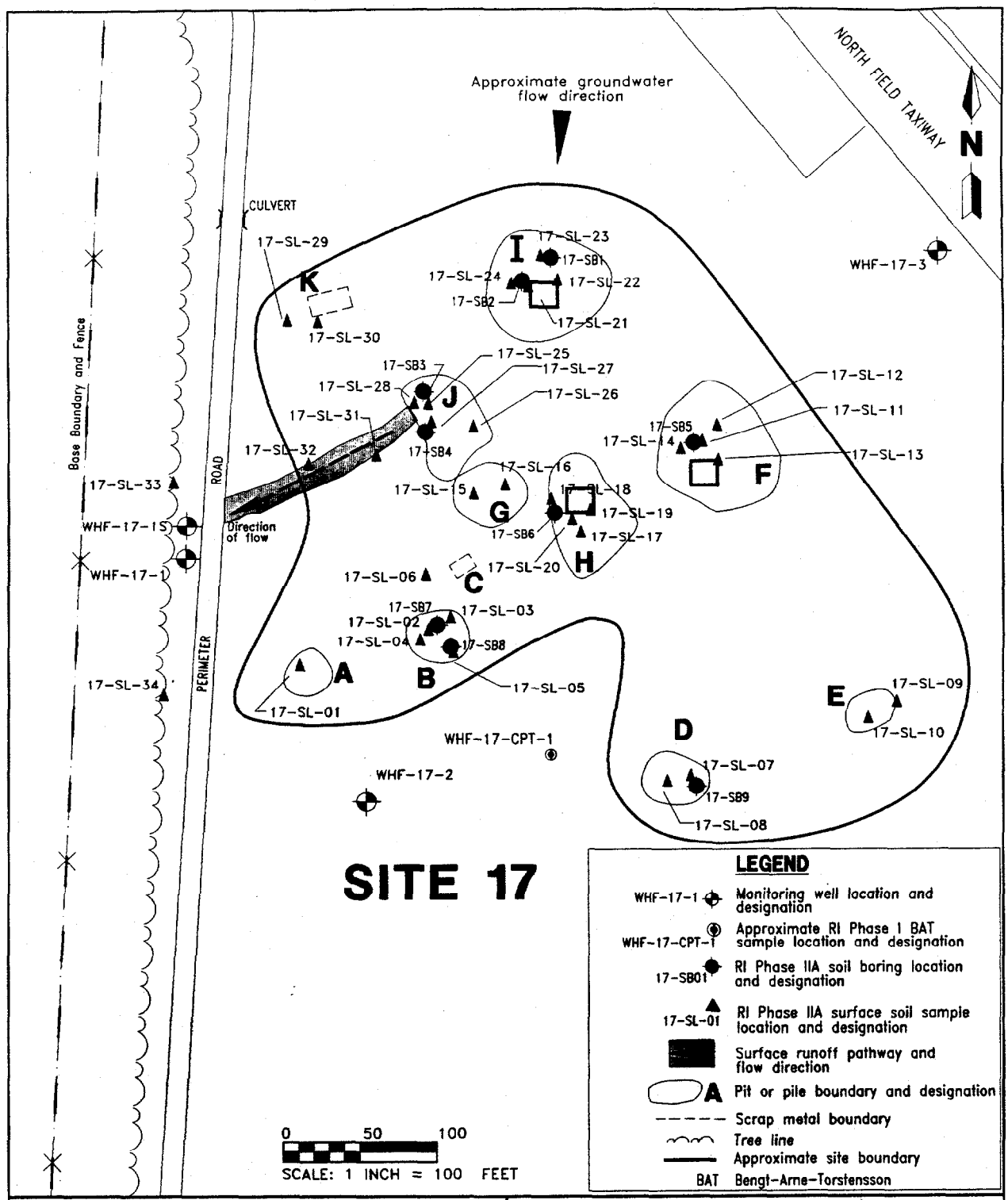

FIGURE 5-2
SITE 17, LOCATIONS OF SURFACE SOIL SAMPLES, SOIL BORINGS, SAMPLED PITS AND PILES, MONITORING WELLS, AND BAT SAMPLES

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Subsurface soil boring samples were analyzed for TCL VOCs, SVOCs, pesticides and PCBs, TAL inorganic analytes, and TRPH. Three VOCs, 2 SVOCs, 2 pesticides, TRPH, and 23 inorganic analytes were detected in subsurface soil samples. Detailed results are summarized in the RI Phase IIA Technical Memorandum No. 3 (ABB-ES, 1994b).

Two SVOCs, 1 pesticide, and 19 inorganic analytes were detected in groundwater samples. Bis(2-ethylhexyl)phthalate, aluminum, iron, and manganese exceeded Federal and State MCLs. A detailed discussion of the analytical results are provided in the RI Phase IIA Technical Memorandum No. 5 (ABB-ES, 1995c).

Comparison of groundwater elevation data indicated that the three newly installed monitoring wells consist of one well located hydraulically upgradient (WHF-17-3), one hydraulically crossgradient (WHF-17-1S), and one hydraulically downgradient of the site (WHF-17-2) (Figure 5-2 and Appendix A; ABB-ES, 1995b).

5.2.4 Site 18, Crash Crew Training Area

Site Description and Background. Background information was gathered from the IAS (Envirodyne Engineers, Inc., 1985). Site 18 is located along the western facility boundary and near the abandoned North Air Field taxiway. The site is approximately 5 acres in size and was in use between 1951 and 1991 (Figure 1-2). Site 18 is composed of multiple shallow depressions where metallic objects were placed to simulate an aircraft after a crash. Crash crew training activities consisted of pouring approximately 100 gallons of AVGAS or jet fuel into the depressions and then igniting it. The fires were then extinguished using an AFFF as part of crash crew training exercises (Geraghty & Miller, 1986).

Verification Study. The verification study (Geraghty & Miller, 1986) at site 18 included the installation of one monitoring well (WHF-18-1) and collection of a single groundwater sample (Figure 5-3). The monitoring well was installed to a depth of 122 feet bls along the western edge of the site. Comparison of groundwater elevation data in the area indicated that the well is located hydraulically crossgradient of the site (Figure 5-3 and ABB-ES, 1995b). The groundwater sample was analyzed for USEPA priority pollutants. Only one SVOC, bis(2-ethylhexyl)phthalate, was detected. It was determined that the AFFF may have contained phthalate esters and could have been a source of the compound. Only two inorganic analytes were detected. Lead and mercury were detected at concentrations below Florida's primary drinking-water regulations in 1986.

RI Phase I Investigation. The RI Phase I investigation at Site 18 consisted of collecting two groundwater samples using a PCPT and BAT sampler from a single location (Figure 5-3). The groundwater samples were collected at 95 and 183 feet bls and analyzed for VOCs and TAL inorganic analytes at an offsite laboratory. Acetone and carbon disulfide were detected in the samples, but were interpreted to be artifacts resulting from decontamination procedures. Fourteen inorganic analytes were detected. Detailed results are summarized in the RI Phase I Technical Memorandum No. 5 (ABB-ES, 1992f).

RI Phase IIA Investigation. The Phase IIA investigation included the collection of 47 surface soil samples, 24 subsurface soil samples from soil borings, installation of 2 monitoring wells, and collection of 3 groundwater samples (Figure 5-3).

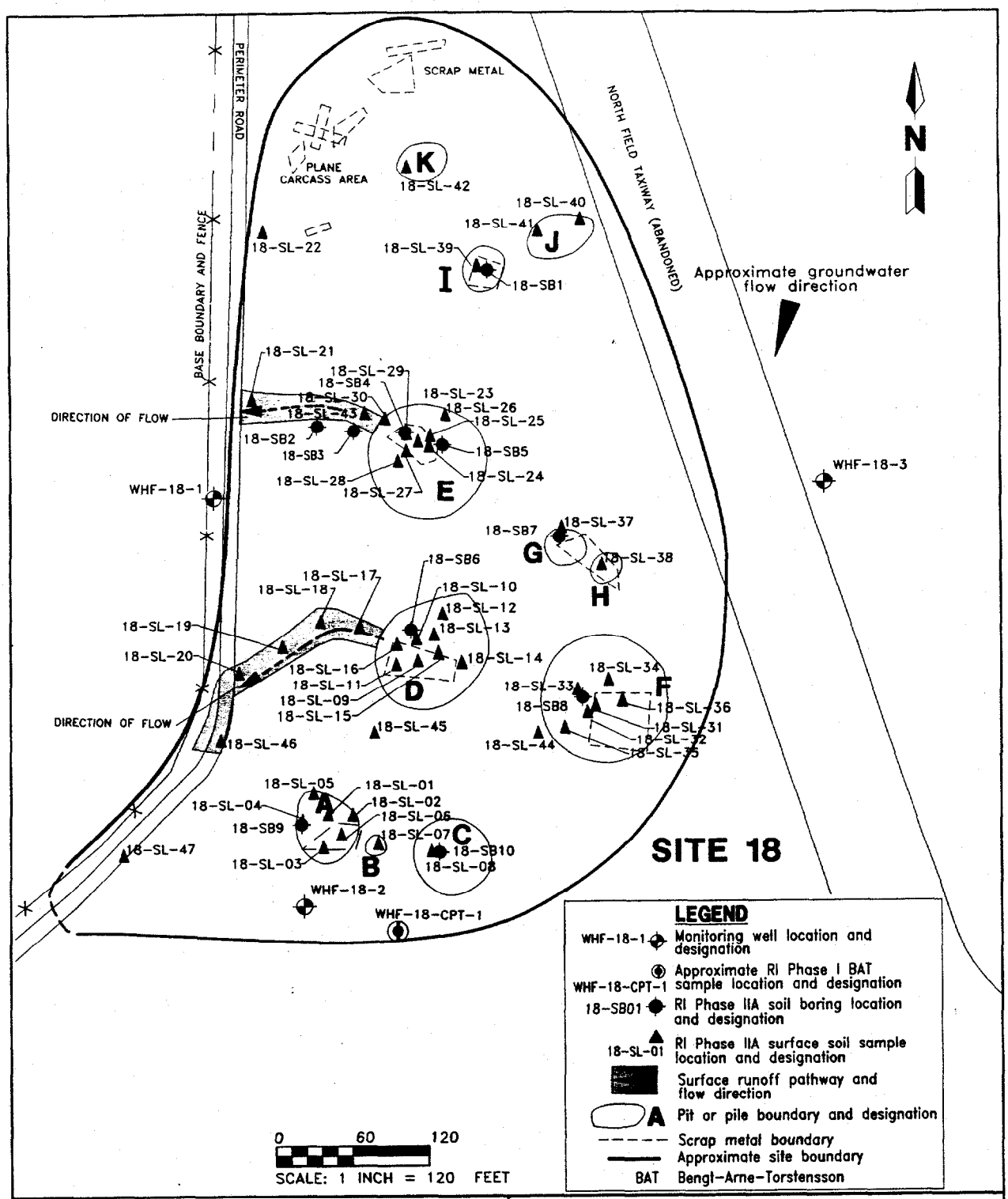

FIGURE 5-3
SITE 18, LOCATIONS OF SURFACE SOIL SAMPLES, SOIL BORINGS, SAMPLED PITS AND PILES, MONITORING WELLS, AND BAT SAMPLES

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Surface soil samples were analyzed for TCL VOCs, SVOCs, pesticides, and PCBs, TAL inorganic analytes, TRPH, and TCLP inorganic analytes. Nine SVOCs and 20 TAL inorganic analytes were detected in the surface soil samples at concentrations exceeding background screening criteria. One of eight TCLP surface soil samples exhibited the characteristics of toxicity for cadmium. Detailed results are summarized in the RI Phase IIA Technical Memorandum No. 3 (ABB-ES, 1994b).

Subsurface soil boring samples were analyzed for TCL VOCs, SVOCs, pesticides, and PCBs, TAL inorganic analytes, and TRPH. Four VOCs, 8 SVOCs, 3 pesticides, TRPH, and 31 inorganic analytes were detected in subsurface soil samples. Detailed results are summarized in the RI Phase IIA Technical Memorandum No. 3 (ABB-ES, 1994b).

One pesticide and 18 inorganic analytes were detected in groundwater samples. Aluminum, iron, and manganese exceeded Federal and State MCLs. A detailed discussion of the analytical results are provided in the RI Phase IIA Technical Memorandum No. 5 (ABB-ES, 1995c).

Comparison of groundwater elevation data indicated that the two newly installed monitoring wells consist of one well located hydraulically upgradient (WHF-18-3), and one hydraulically downgradient of the site (WHF-18-2) (Figure 5-3; ABB-ES, 1995b; and Appendix A).

5.3 OPERABLE UNIT 4. Operable Unit 4 consists of two sites located along the southwest perimeter of South Field. The sites are as follows:

Site 15, Southwest Landfill; and
Site 16, Open Disposal and Burning Area.

5.3.1 Site 15, Southwest Landfill

Site Description and Background. Background information was gathered from the IAS (Envirodyne Engineers, Inc., 1985). Site 15 is located southwest of the South Air Field, approximately 200 feet southeast of the wastewater treatment plant and 1,200 feet east of Clear Creek (Figure 1-2).

The site was a trench-and-fill landfill covering an area of approximately 15 acres. The land surface at the site is forested by pine trees and generally slopes downward from east to west at an average grade of 5 percent. Smaller areas within the site were previously bare of vegetation and, as a result, surface erosion was severe. As an engineering control, berms were constructed cross-gradient to reduce the severity of surface erosion.

This site was the primary disposal area from 1965 to 1979 (Envirodyne Engineers, 1985). Wastes associated with aircraft operation and maintenance were also included (paint, paint thinners, paint stripping wastewater, solvents, spent oils, and hydraulic fluids). Bagged asbestos was reportedly disposed of at the site, as well as potentially PCB-contaminated dielectric fluid. An estimated 3,000 to 4,000 tons of wastes per year were reportedly buried at the site.

Verification Study. The verification study (Geraghty & Miller, 1986) at Site 15 involved the installation of one monitoring well (WHF-15-1) and the collection of groundwater samples for offsite laboratory analyses. The well was installed

to a depth of 72 feet bls along the southeastern boundary of the site (Figure 5-4). Comparison of groundwater elevations in the area indicates the well was located hydraulically crossgradient to the site (Figure 5-4) (ABB-ES, 1995b). The groundwater sample was collected from approximately 27 feet bls and analyzed for USEPA priority pollutants. Herbicide compounds bis(2-ethylhexyl)phthalate, lead, and zinc were detected at concentrations below Florida's primary drinking-water regulations in 1986. No other analytes were detected.

RI Phase I. The RI Phase I investigation at Site 15 included the collection of five groundwater samples from four PCPT and BAT sampler locations and collection of three surface soil samples (Figure 5-4). The groundwater samples were collected at depths ranging between 33 to 72 feet bls and analyzed for VOCs and TAL inorganic analytes at an offsite laboratory. Benzene, toluene, and xylene were detected in groundwater samples collected from two of four locations. Thirteen inorganic analytes were detected. Detailed results are summarized in the RI Phase I Technical Memorandum No. 5 (ABB-ES, 1992f).

Three surface soil samples collected from Site 15 were analyzed for TCL compounds and TAL inorganic analytes. With the exception of acetone and bis(2-ethylhexyl)phthalate, no other organic compounds were detected in the soil samples from Site 15. The compounds were interpreted to be artifacts resulting from decontamination procedures. Twelve inorganic analytes were detected in the soil samples from Site 15 (ABB-ES, 1992d).

Acetone and bis(2-ethylhexyl)phthalate were also detected in the surface soil samples collected from old ditch "A", located between Sites 15 and 16. Both compounds were attributed to laboratory or field sources and were not considered to be site related (ABB-ES, 1992d). Fifteen inorganic analytes were detected in the surface soil samples from Site 15.

RI Phase IIA. The Phase IIA investigation included the completion of a geophysical survey, collection of 5 surface soil samples, excavation of 10 test pits, collection of 5 subsurface soil samples from test pits, installation of 10 monitoring wells, and collection of groundwater samples from 11 monitoring wells (Figure 5-4).

The geophysical survey identified seven anomalies at the site. The anomalies were interpreted to be two large landfill cells and a series of trenches in the central and western parts of the site (ABB-ES, 1994b).

Both surface and subsurface soil samples were analyzed for TCL VOCs, SVOCs, pesticides and PCBs, TAL inorganic analytes, and TRPH. Xylenes and bis(2-ethylhexyl)phthalate were the only organic compounds detected in surface soil samples. Two inorganic analytes were detected in the surface soil samples at concentrations exceeding background screening criteria. Three VOCs, seven SVOCs, one pesticide and one PCB were detected in the subsurface soil samples collected from test pits. Two inorganic analytes were detected in the test pit soil samples at concentrations exceeding background screening criteria. Detailed results are summarized in the RI Phase IIA Technical Memorandum No. 3 (ABB-ES, 1994b).

The 11 groundwater samples were analyzed for TCL VOCs, SVOCs, pesticides and PCBs, and TAL inorganic analytes. Five VOCs, 4 SVOCs, and 21 inorganic analytes were detected. Concentrations of bis(2-ethylhexyl)phthalate and four inorganic

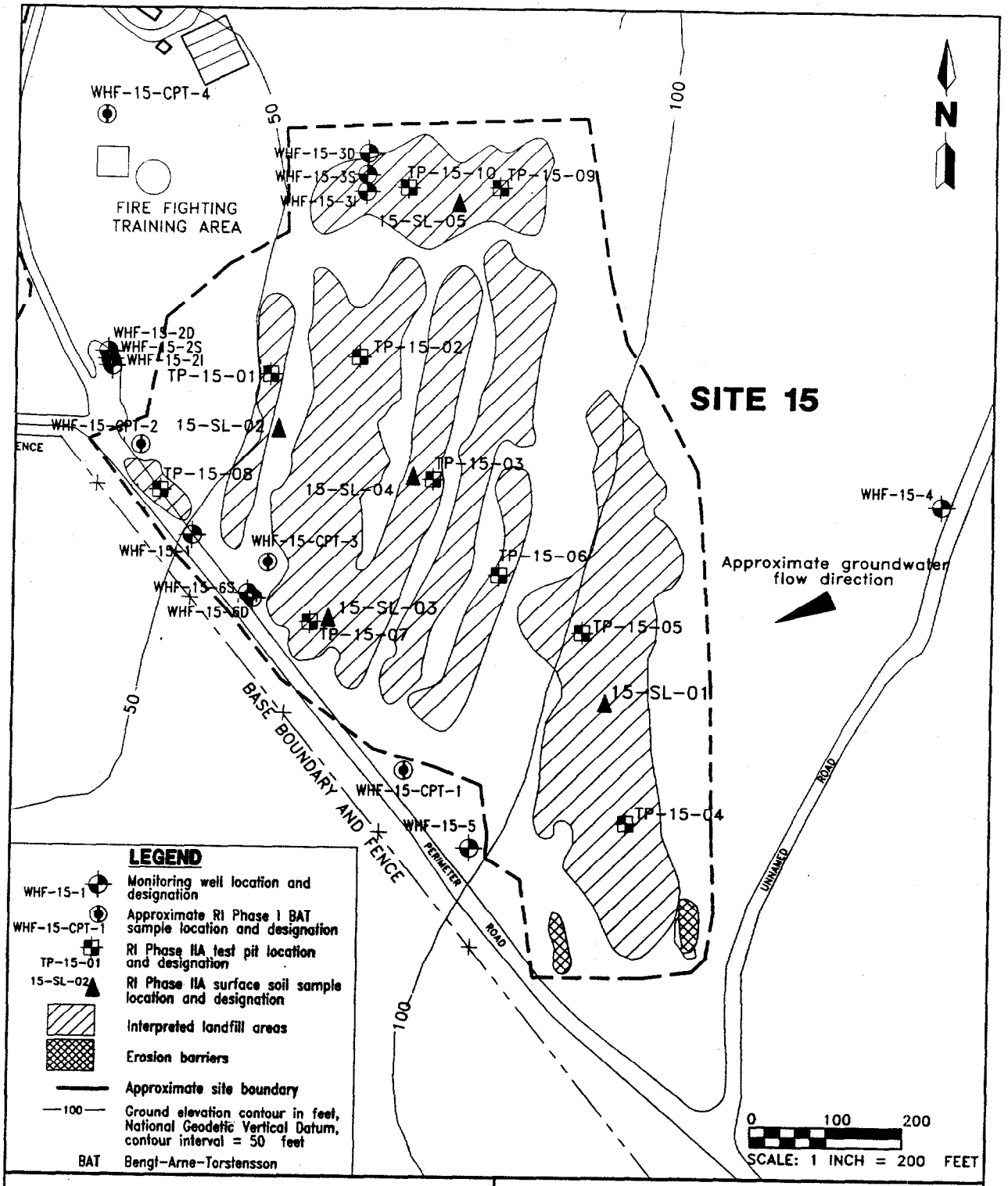

FIGURE 5-4
SITE 15,
LOCATIONS OF SURFACE SOIL SAMPLES, TEST PITS, MONITORING WELLS, AND BAT SAMPLES

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analytes (aluminum, cadmium, iron, and manganese) exceed Federal and State MCLs. Detailed results are summarized in the RI Phase IIA Technical Memorandum No. 5 (ABB-ES, 1995c).

Comparison of groundwater elevation data indicated that the monitoring wells consist of one well located hydraulically upgradient, four hydraulically cross-gradient, and six hydraulically downgradient of the site (Figure 5-4; ABB-ES, 1995b; and Appendix A).

5.3.2 Site 16, Open Disposal and Burning Area

Site Description and Background. Background information was gathered from the IAS (Envirodyne Engineers, Inc., 1985). Site 16 is located directly west of South Field, approximately 450 feet east of Clear Creek and 350 feet west of the Wastewater Treatment Plant (Figure 1-2).

The site consisted of two large pits approximately 12 acres in size. The land surface at the site is forested by pine trees and generally slopes downward from east to west at an average grade of 5 percent. Smaller areas within the site were previously bare of vegetation and, as a result, surface erosion was severe. Berms were not constructed to control erosion.

From 1943 to 1965, Site 16 was used as the primary waste disposal area at the facility. To reduce the volume, the bulk of the wastes were burnt with spent diesel fuel. Because the burning was reportedly not a controlled process, it is reasonable to assume that not all the wastes were completely destroyed. The waste consisted of general refuse plus waste generated from aircraft operation and maintenance including paints, paint-stripping wastewater, solvents, waste oil, and hydraulic fluid. PCB-contaminated transformer oil may also have been disposed of at the site. An estimated volume of 3,000 to 4,000 tons of waste was reportedly disposed of at the site annually (Geraghty and Miller, 1986).

Verification Study. The verification study (Geraghty & Miller, 1986) at Site 16 involved the installation of one monitoring well (WHF-16-1, Figure 5-5) and the collection of a groundwater sample for offsite laboratory analyses. The well was installed to a depth of 42 feet bls along the southeastern perimeter of the site (Figure 5-5). The comparison of groundwater elevation data in the area indicates the monitoring well is located hydraulically downgradient to the site (Figure 5-5 and ABB-ES, 1995b). The groundwater sample was analyzed for USEPA priority pollutants and herbicide compounds; bis(2-ethylhexyl)phthalate was detected, lead and zinc were detected at concentrations below Florida's primary drinking-water regulations in 1986. No other analytes were detected.

RI Phase I. The RI Phase I investigation at Site 16 included the collection of four groundwater samples from two PCPT and BAT sampler locations, collection of three surface soil samples, and installation of one monitoring well, WHF-16-2 (Figure 5-5). The groundwater samples were collected from the BAT sampling locations at depths ranging between 28 to 100 feet bls and analyzed for VOCs and TAL inorganic analytes at an offsite laboratory. Benzene, toluene, xylene, and 1,2-dichloroethane were detected in the groundwater samples from both locations. Ten inorganic analytes were detected in the groundwater samples.

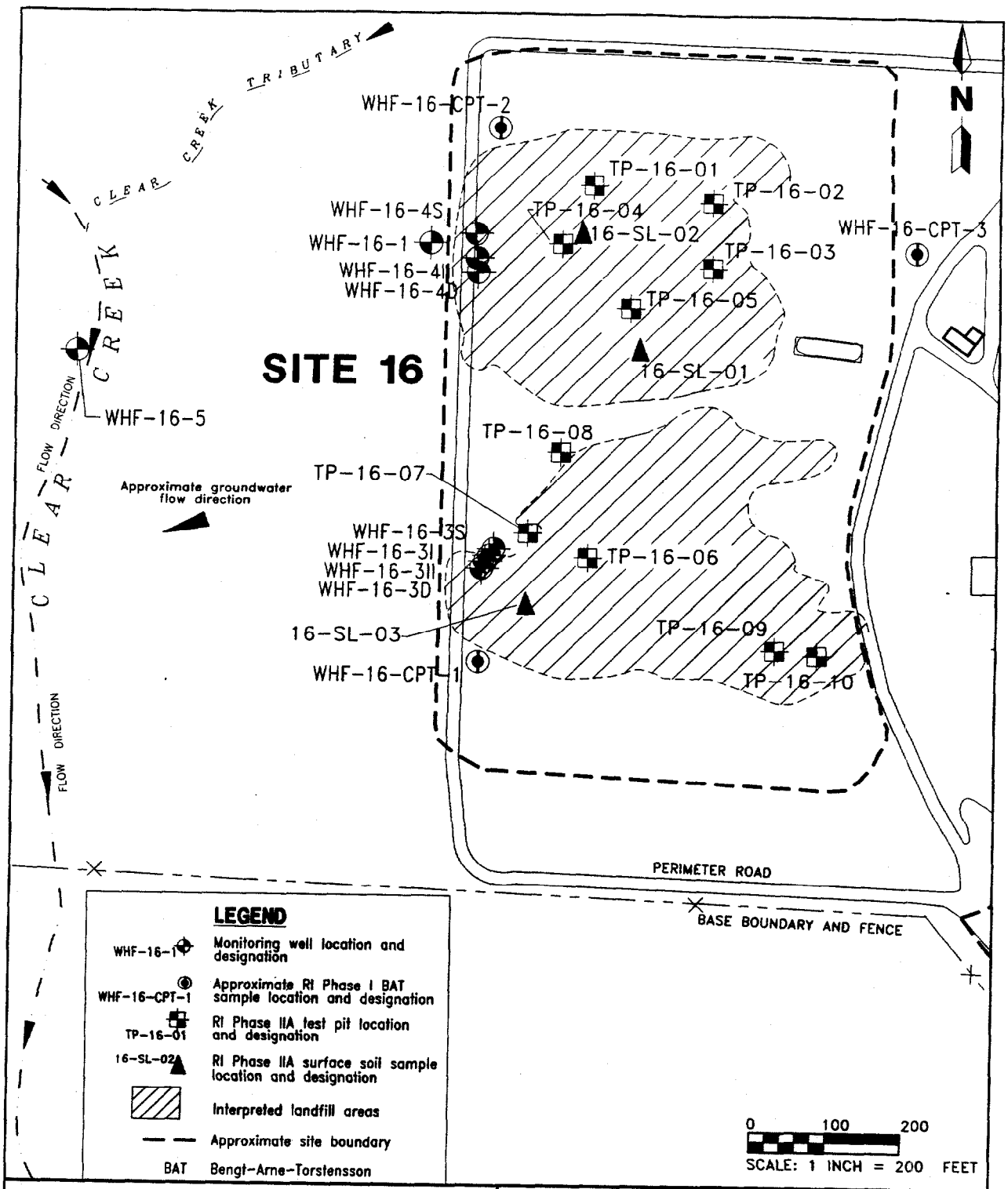

FIGURE 5-5
SITE 16,
LOCATIONS OF SURFACE SOIL SAMPLES, TEST PITS, GEOPHYSICAL GRID LINES, MONITORING WELLS, AND BAT SAMPLES

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Detailed results are summarized in the RI Phase I Technical Memorandum No. 5 (ABB-ES, 1992f). Monitoring well WHF-16-2 was not sampled at this time. Three surface soil samples collected from Site 16 were analyzed for TCL VOCs, SVOCs, pesticides and PCBs, and TAL inorganic analytes. With the exception of acetone and bis(2-ethylhexyl)phthalate, no organic compounds were detected in the soil samples from Site 16. Both compounds were attributed to laboratory or field sources and were not considered to be site related (ABB-ES, 1992d). Fifteen inorganic analytes were detected in the soil samples from Site 16 (ABB-ES, 1992d).

RI Phase IIA. The Phase IIA investigation included the completion of a geophysical survey, collection of 3 surface soil samples, excavation of 5 test pits, collection of 3 subsurface soil test pit samples, installation of 9 monitoring wells, and collection of groundwater samples from 11 monitoring wells (Figure 5-5).

The geophysical survey identified two anomalies, which were interpreted to be landfill areas (ABB-ES, 1994b).

Both surface and subsurface soil samples were analyzed for TCL VOCs, SVOCs, pesticides and PCBs, TAL inorganic analytes, and TRPH. Organic compounds xylene, bis(2-ethylhexyl)phthalate, 4,4' dichlorodiphenyldichloroethene (DDE), 4,4' dichlorodiphenyltrichloroethane (DDT), and dieldrin were detected in surface soil samples.

Seven inorganic analytes were detected in the surface soil samples at concentrations exceeding background screening criteria. Five VOCs, five SVOCs, and three pesticides were detected in the subsurface soil collected from test pits. Twelve inorganic analytes were detected in the test pit soil samples at concentrations exceeding background screening criteria. Detailed results are summarized in the RI Phase IIA Technical Memorandum No. 3 (ABB-ES, 1994b).

The 12 groundwater samples were analyzed for TCL VOCs, SVOCs, pesticides and PCBs, and TAL inorganic analytes. Six VOCs, 1 SVOC, and 19 inorganic analytes were detected. Bis(2-ethylhexyl)phthalate, 1,2-DCA, TCE, benzene, and seven inorganic analytes (aluminum, cadmium, calcium, chromium, iron, lead, and manganese) exceed Federal and State MCLs. Detailed results are summarized in the RI Phase IIA Technical Memorandum No. 5 (ABB-ES, 1995c).

Comparison of groundwater elevation data indicated that the monitoring wells consist of three wells located hydraulically upgradient and nine located hydraulically downgradient of the site (Figure 5-5; ABB-ES, 1995b; and Appendix A).

5.4 OPERABLE UNIT 5. Proposed OU 5 is composed of six sites located along the southeast perimeter of the facility. The sites are as follows:

Site 9, Waste Fuel Disposal Pit;
Site 10, Southeast Open Disposal Area (A);
Site 11, Southeast Open Disposal Area (B);
Site 12, Tetraethyl Lead Disposal Area;
Site 13, Sanitary Landfill; and
Site 14, Short-Term Sanitary Landfill.

Five of the sites, 9, 10, 11, 13, and 14, are similar in that they are open disposal areas or landfill sites. Site 12 is reported to be composed of tetraethyl sludge mounds.

5.4.1 Site 9, Waste Fuel Disposal Pit

Site Description and Background. Background information was gathered from the IAS (Envirodyne Engineers, Inc., 1985). Site 9 is located along the eastern facility boundary near the South Air Field and is approximately 2 acres in size (Figure 1-2). During the 1950s and 1960s, waste fuel containing tetraethyl lead was disposed of in the northern part of a borrow pit. The precise location of the borrow pit is unknown. Anecdotal evidence suggests a tank truck with a capacity of approximately 500 gallons was used to transport waste fuel to the disposal pit where it was drained. Approximately 200 to 300 gallons of fuel was disposed of at the site per trip. The total quantity of fuel disposed of at the site is unknown.

Verification Study. The verification study (Geraghty & Miller, 1986) at Site 9 included the collection of six surface and six subsurface soil samples and installation of one monitoring well (WHF-9-1) (Figure 5-6). One surface soil sample (0 to 1 foot bls) and one subsurface soil sample (1 to 2 feet bls) were collected at each location. The soil samples were analyzed offsite for total lead, extraction procedure (EP) toxicity for lead, and the VOCs benzene, toluene, and xylene (BTX). Concentrations of total lead ranged from 9 mg/kg to 14 mg/kg; however, the results of EP toxicity tests did not indicate the presence of lead above the detection limit of 0.01 mg/ℓ. BTX were not detected in the soil samples.

One monitoring well was installed to a depth of 117 feet bls along the eastern side of the site and a single groundwater sample was collected from the monitoring well. Comparison of groundwater elevations in the area indicates the well is located hydraulically crossgradient to the site (Figure 5-6 and ABB-ES, 1995b).

The groundwater sample was analyzed for BTX, ethylene dibromide (EDB), and total lead. Lead was detected at a concentration below Florida's primary drinking-water regulations in 1986. BTX and EDB compounds were not detected in the groundwater sample.

RI Phase I Investigation. The RI Phase I investigation at Site 9 included the collection of a groundwater sample using a PCPT and BAT sampler and installation of one monitoring well (WHF-9-2) (Figure 5-6). The groundwater sample was collected from 100 feet bls and analyzed for VOCs and TAL inorganic analytes at an offsite laboratory. Acetone and carbon disulfide were detected in the sample, but were interpreted to be artifacts resulting from decontamination procedures. Nine inorganic analytes also were detected. Detailed results are summarized in the RI Phase I Technical Memorandum No. 5 (ABB-ES, 1992f).

One monitoring well was installed hydraulically upgradient of the site to an intermediate depth of 120 feet bls (Figure 5-6 and ABB-ES, 1995b) (ABB-ES, 1992f). An *in situ* groundwater permeability test was conducted to assess hydraulic properties. No groundwater sample was collected for laboratory analysis.

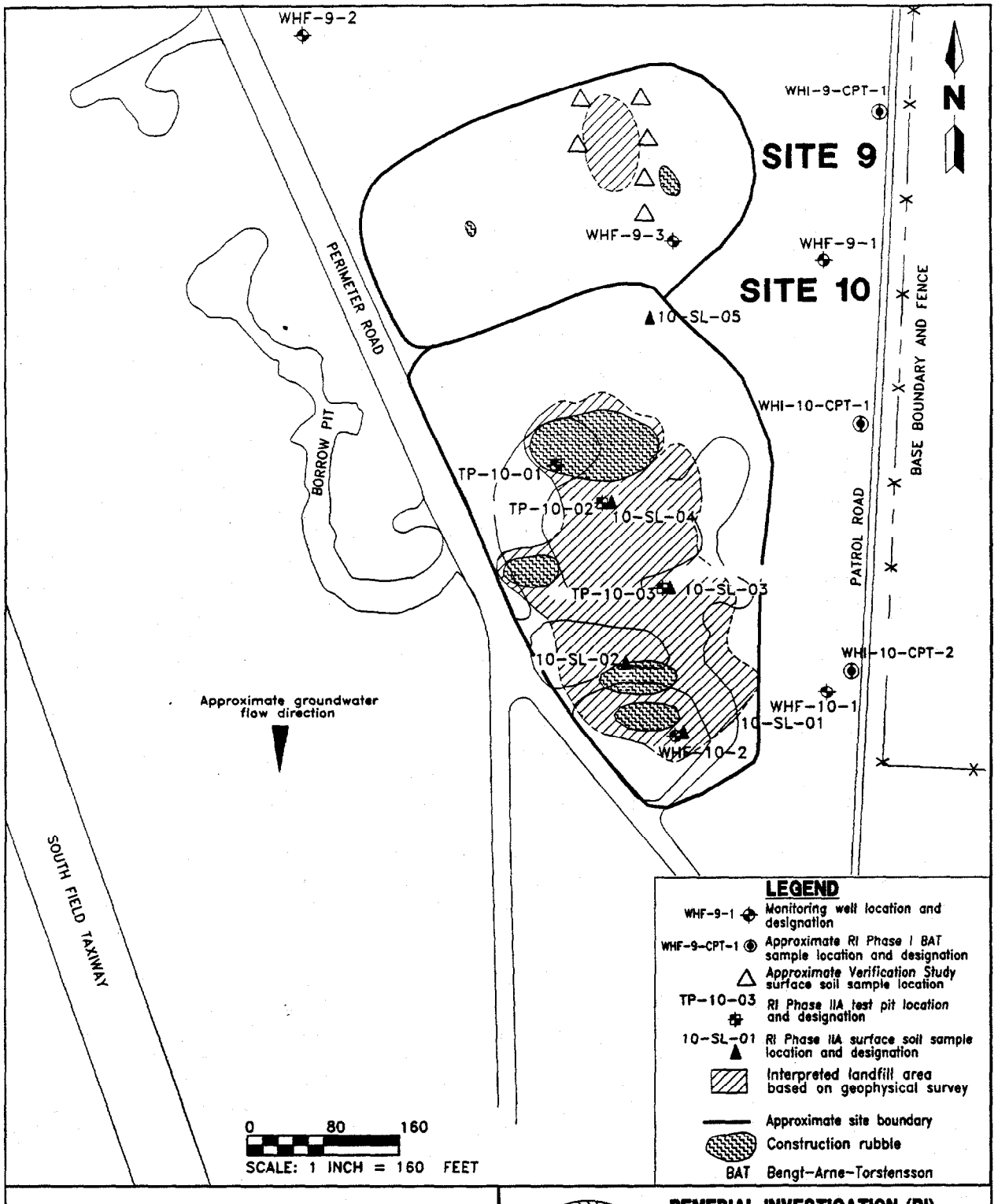

FIGURE 5-6
SITES 9 AND 10
LOCATION OF SURFACE SOIL SAMPLES, TEST PITS, MONITORING WELLS, AND BAT SAMPLES

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REMEDIAL INVESTIGATION (RI) PROGRAM PHASE IIA TECHNICAL MEMORANDUM No. 7, RI PHASE IIB WORKPLAN

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RI Phase IIA Investigation. One monitoring well was installed during the Phase IIA investigation. The newly installed and two existing monitoring wells at the site were sampled and analyzed for TCL VOCs, SVOCs, pesticides, and PCBs and TAL inorganic analytes (Figure 5-6). No TCL organic compounds were detected; however, fifteen inorganic analytes were detected. A detailed discussion of the analytical results are provided in the RI Phase IIA Technical Memorandum No. 5 (ABB-ES, 1995c).

Comparison on groundwater elevation data at the site suggests that WHF-9-2 is located hydraulically upgradient of the site; WHF-9-1 is hydraulically cross-gradient; and WHF-9-3 is hydraulically downgradient (Figure 5-6 and Appendix A) (ABB-ES, 1995b).

5.4.2 Site 10, Southeast Open Disposal Area (A)

Site Description and Background. Background information was gathered from the IAS (Envirodyne Engineers, Inc., 1985). Site 10 is contiguous to Site 9 and is located within the same borrow pit (Figure 1-2). From 1965 to 1973, this four-acre site was used for the disposal of inert wastes such as construction debris, trees, brush, metal cans, and similar materials not suitable for landfill disposal. Transformer oil and empty pesticide and herbicide containers were also reportedly disposed of at the site. Access to the site was uncontrolled and other potentially hazardous wastes may also have been disposed of at the site.

Verification Study. The verification study (Geraghty & Miller, 1986) at Site 10 included the installation of one monitoring well (WHF-10-1) and collection of a groundwater sample for offsite laboratory analyses (Figure 5-6). The well was installed to a depth of 117 feet bls along the eastern side of the site (Figure 5-6). Comparison of groundwater elevation data for the area indicates the monitoring well is located hydraulically crossgradient to the site (Figure 5-6) (ABB-ES, 1995b).

The groundwater sample was collected and analyzed for USEPA priority pollutants and additional herbicide compounds. Organic compounds were not detected in the sample; however, concentrations of the inorganic analytes lead, zinc, and silver were detected at levels below Florida's primary drinking-water regulations in 1986.

RI Phase I. The RI Phase I investigation at Site 10 consisted of the collection of three groundwater samples using a PCPT and BAT sampler. Samples were collected from two different locations (Figure 5-6). A single groundwater sample was collected from 102 feet bls at WHF-CPT-1. Samples were collected from 102 feet bls and 152 feet bls at WHF-CPT-2. The samples were analyzed for VOCs and TAL inorganic analytes at an offsite laboratory. Acetone was detected in two samples, but was interpreted to be an artifact resulting from decontamination procedures. Six inorganic analytes were also detected. Detailed results are summarized in the RI Phase I Technical Memorandum No. 5 (ABB-ES, 1992f).

RI Phase IIA. The RI Phase IIA investigation included the completion of a geophysical survey, collection of five surface soil samples and three subsurface soil samples from test pits, installation of one monitoring well, and collection of two groundwater samples (Figure 5-6).

The geophysical survey identified three anomalies at the site. One anomaly was interpreted to be a disposal area approximately 4 acres in size. The other two anomalies were small and low in amplitude and were identified as ferromagnetic inorganic analytes present at or near the land surface. (ABB-ES, 1994b)

Both surface and subsurface soil samples were analyzed for TCL VOCs, SVOCs, pesticides and PCBs, TAL inorganic analytes, and TRPH. Eight SVOCs, 1 pesticide, 2 PCBs, and 13 inorganic analytes were detected in surface soil samples at concentrations exceeding background screening criteria. Seven SVOCs, 3 pesticides, 2 PCBs, and 15 inorganic analytes were detected in the subsurface soil samples from test pits at concentrations exceeding the background screening criteria. Detailed results are summarized in the RI Phase II Technical Memorandum No. 3 (ABB-ES, 1994b).

During the Phase IIA investigation a second monitoring well (WHF-10-2) was installed and groundwater samples were collected from both monitoring wells WHF-10-1 and WHF-10-2 (Figure 5-6). Samples were analyzed for TCL VOCs, SVOCs, pesticides and PCBs, and TAL inorganic analytes. Organic compounds were not detected in groundwater samples; however, 12 inorganic analytes were detected. Detailed results are summarized in the RI Phase IIA Technical Memorandum No. 5 (ABB-ES, 1995c).

Comparison of groundwater elevation data in the southeast disposal area suggests that monitoring well WHF-10-1 is located hydraulically crossgradient to the site, and WHF-10-2 is located hydraulically downgradient (Figure 5-6 and Appendix A) (ABB-ES, 1995b).

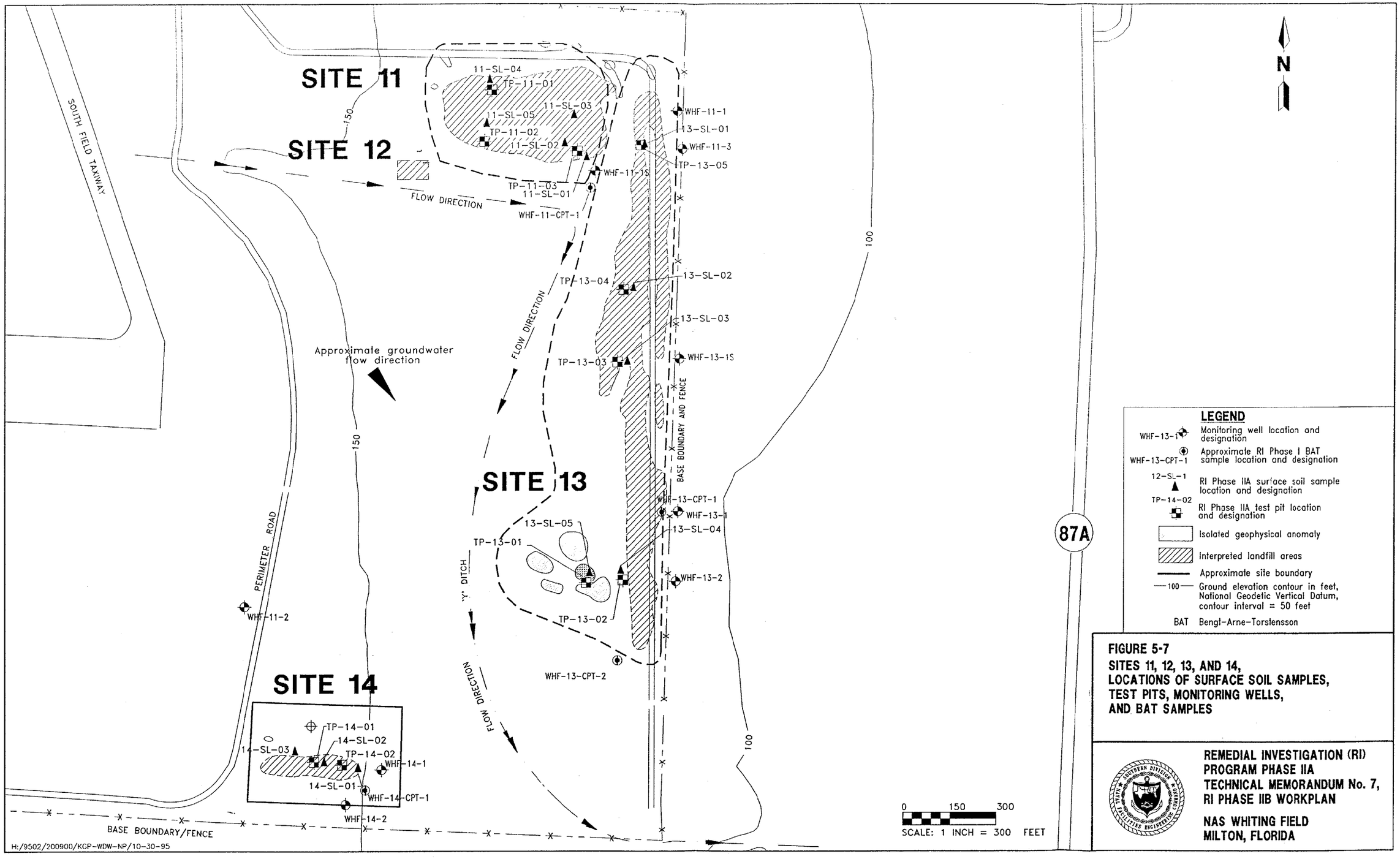
5.4.3 Site 11, Southeast Open Disposal Area (B)

Site Description and Background. Background information was gathered from the IAS (Envirodyne Engineers, Inc., 1985). Site 11 is located along the eastern facility property boundary near the South Air Field (Figure 1-2). This 3-acre site is an old borrow pit that was used as an open disposal area from 1943 until approximately 1970. The site had uncontrolled access and received a wide variety of wastes, including general refuse, construction debris, tree clippings, furniture, waste solvents, paint, transformer oils, hydraulic fluid, and various other oils.

When disposal operations were discontinued in 1970, a final covering was placed over the site and pine trees were planted (Geraghty & Miller, December 1986).

Verification Study. The verification study (Geraghty & Miller, 1986) at Site 11 included the installation of one monitoring well (WHF-11-1) and collection of a groundwater sample for offsite laboratory analyses. The well was installed to a depth of 127 feet bls along the eastern side of the site (Figure 5-7).

Comparison of groundwater elevation data for the southeast disposal area indicates the monitoring well is located hydraulically crossgradient to the site (Figure 5-7) and (ABB-ES, 1995b). The groundwater sample was collected and analyzed for USEPA priority pollutants and additional herbicide compounds. Bis(2-ethylhexyl)phthalate was detected at 23 $\mu g/\ell$, and mercury and zinc were detected at concentrations below State and Federal MCLs.



LEGEND

- WHF-13-1 — Monitoring well location and designation
- WHF-13-CPT-1 — Approximate RI Phase I BAT sample location and designation
- 12-SL-1 — RI Phase IIA surface soil sample location and designation
- TP-14-02 — RI Phase IIA test pit location and designation
- Isolated geophysical anomaly
- Interpreted landfill areas
- Approximate site boundary
- 100 — Ground elevation contour in feet, National Geodetic Vertical Datum, contour interval = 50 feet
- BAT — Bengt-Arne-Torstensson

FIGURE 5-7
SITES 11, 12, 13, AND 14,
LOCATIONS OF SURFACE SOIL SAMPLES,
TEST PITS, MONITORING WELLS,
AND BAT SAMPLES

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MILTON, FLORIDA

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RI Phase I. The RI Phase I investigation at Site 11 consisted of collecting two groundwater samples using a PCPT and BAT sampler and installing one monitoring well (Figure 5-7). The PCPT and BAT groundwater samples were collected at 92 and 132 feet bls and analyzed for VOCs and TAL inorganic analytes at an offsite laboratory. Acetone and carbon disulfide were detected in the samples, but were interpreted to be artifacts resulting from decontamination procedures. Ten inorganic analytes were detected. Detailed results are summarized in the RI Phase I Technical Memorandum No. 5 (ABB-ES, 1992f).

One monitoring well (WHF-11-2) was installed hydraulically crossgradient to the site and to an intermediate depth of 125 feet bls (Figure 5-7) (ABB-ES, 1992f; ABB-ES, 1995b). An *in situ* permeability test (slug test) was conducted to assess hydraulic properties. No groundwater sample was collected for laboratory analysis.

RI Phase IIA. The Phase IIA investigation included the completion of a geophysical survey, collection of five surface soil samples and three test pit (subsurface soil) samples, installation of two monitoring wells, and collection of four groundwater samples (Figure 5-7).

The geophysical survey identified four anomalies at the site. One large anomaly was interpreted to be a 7-acre disposal area. The three isolated anomalies were identified and interpreted to be ferromagnetic inorganic analytes present at or near the land surface (ABB-ES, 1994b).

Both surface and subsurface soil samples were analyzed for TCL VOCs, SVOCs, pesticides and PCBs, TAL inorganic analytes, and TRPH. Twelve SVOCs were detected in a single surface soil sample at concentrations exceeding background screening criteria. Eleven inorganic analytes were detected in surface soil samples at concentrations exceeding background screening criteria. Five pesticides, 2 PCBs, and 11 inorganic analytes were detected for subsurface soil samples from the test pits at concentrations exceeding background screening criteria. Detailed results are summarized in the RI Phase II Technical Memorandum No. 3 (ABB-ES, 1994b).

During the Phase IIA investigation, the four groundwater samples were analyzed for TCL VOCs, SVOCs, pesticides and PCBs, and TAL inorganic analytes. Two VOCs, 1 SVOC, and 17 inorganic analytes were detected. Only four inorganic analytes, aluminum, iron, lead, and manganese, exceed Federal and State MCLs. Detailed results are summarized in the RI Phase IIA Technical Memorandum No. 5 (ABB-ES, 1995c).

Comparison of groundwater elevation data from the southeast disposal area suggests that the newly installed monitoring wells are located hydraulically crossgradient (WHF-11-3) and hydraulically downgradient (WHF-11-1S) (Figure 5-7 and Appendix A) (ABB-ES, 1995b).

5.4.4 Site 12, Tetraethyl Lead Disposal Area

Site Description and Background. Background information was gathered from the IAS (Envirodyne Engineers, Inc., 1985). Site 12 is located in the southeastern part of the facility adjoining Site 11 and is less than 0.1 acre in size (Figure 1-2). The disposal area consists of six earth-covered sludge mounds within a fenced area of approximately 100 feet by 25 feet. The mounds range from approximately 3 to 5 feet in height and 5 to 10 feet in diameter. Each sludge

pile reportedly contained approximately 200 to 400 gallons of sludge. The piles are composed of tank bottom sludge generated from cleaning the north and south aqua system fuel storage tanks and fuel filters. The piles are reported to be contaminated with tetraethyl lead, a component of AVGAS. Disposal of the sludge reportedly occurred in May 1968.

Verification Study. The verification study (Geraghty & Miller, 1986) at Site 12 included the collection of two composite soil samples from within the piles, installation of a single monitoring well (WHF-12-1), and collection of one groundwater sample (Figure 5-7). The soil samples were analyzed for total lead and EP toxicity for lead. Analytical results for total lead were 4 and 11 mg/kg. The EP toxicity tests indicate that lead was not detected above the detection limit of 0.01 mg/ℓ.

One monitoring well (WHF-12-1) was installed to a depth of 112 feet bls, and a groundwater sample was collected and analyzed for BTX, naphthalene, EDB, and lead (Figure 5-8). Comparison of groundwater elevation data for the southeast disposal area indicates the monitoring well is located hydraulically crossgradient to the site (Figure 5-7) (ABB-ES, 1995b). Lead was detected in the groundwater sample at a concentration below Florida's primary drinking-water regulations in 1986. No organic compounds were detected in the groundwater sample.

RI Phase I. The RI Phase I investigation at Site 12 consisted of the collection of six soil samples from the center of the waste piles and collection of two PCPT and BAT groundwater samples (Figure 5-8). The soil samples were analyzed for total lead and for Resource Conservation and Recovery Act (RCRA) corrosivity, ignitability, and toxicity (ABB-ES, 1992c). No evidence of ignitability or corrosivity was present. Samples appeared to be fine- to medium-grained sand with no visible evidence of staining or odor. Soil pH ranged from 6.0 to 6.71, which is typical for soil in the area of NAS Whiting Field. None of the TCLP organic or inorganic analytes were detected in the extracts with the exception of barium (0.14 to 0.41 mg/ℓ). The RCRA regulatory limit for barium is 100 mg/ℓ. No lead was detected in the extract (detection limit of 0.1 mg/ℓ). Each soil sample did contain detectable concentrations of total lead. Concentrations detected ranged from 9.7 to 30 mg/kg, which was determined to be within background levels.

Two groundwater samples were collected using a PCPT and BAT sampler from a single location hydraulically crossgradient to the site. The groundwater samples were collected at 102 and 162 feet bls and analyzed for VOCs and TAL inorganic analytes at an offsite laboratory. Acetone and carbon disulfide were detected in the samples, but were interpreted to be artifacts resulting from decontamination procedures. Seven inorganic analytes were detected. Detailed results are summarized in the RI Phase I Technical Memorandum No. 5 (ABB-ES, 1992f).

RI Phase IIA. During Phase IIA eight soil samples were collected from the interface of the mounds and the land surface and one groundwater sample was collected from the previously existing monitoring well (Figure 5-8). The soil samples were analyzed for TAL inorganic analytes and cyanide. Twenty TAL inorganic analytes were detected. Detailed results are summarized in the RI Phase II Technical Memorandum No. 3 (ABB-ES, 1994b).

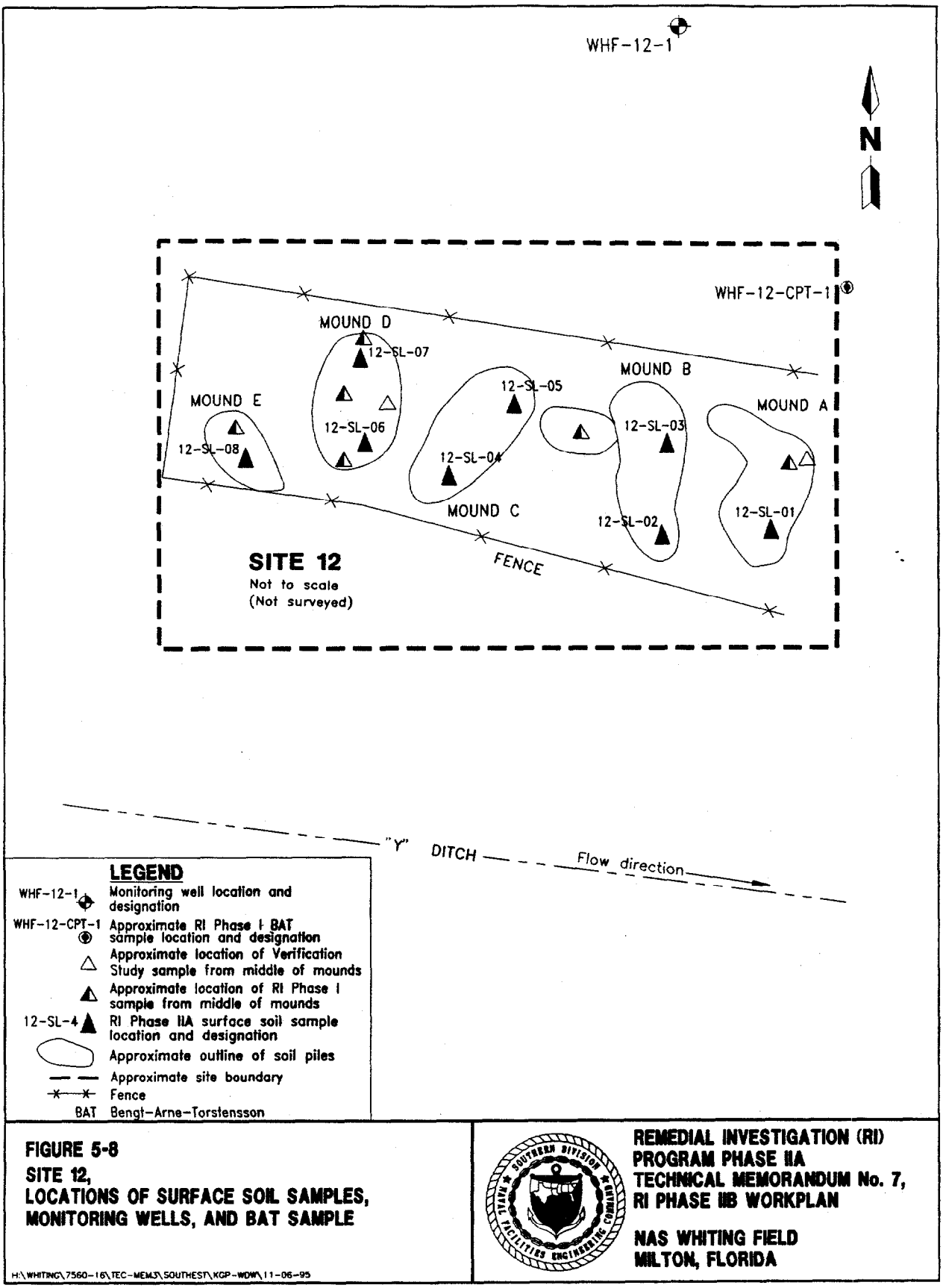

FIGURE 5-8
SITE 12,
LOCATIONS OF SURFACE SOIL SAMPLES, MONITORING WELLS, AND BAT SAMPLE

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During the Phase IIA investigation, one groundwater sample was analyzed for TCL VOCs, SVOCs, pesticides and PCBs, and TAL inorganic analytes. No organic compounds were detected in the sample. Eleven inorganic analytes were detected; cadmium and manganese exceeded State MCLs. Detailed results are summarized in the RI Phase IIA Technical Memorandum No. 5 (ABB-ES, 1995c).

5.4.5 Site 13, Sanitary Landfill

Site Description and Background. Background information was gathered from the IAS (Envirodyne Engineers, Inc., 1985). Site 13 is located long the eastern facility boundary near the South Air Field (Figure 1-2). The site is rectangular in shape, trending north to south, and covers approximately 7.5 acres. During 1979 waste solvents and residue from paint-stripping operations may have been disposed of at the site. After 1979, the landfill reportedly received only general refuse and nonhazardous waste.

Verification Study. The verification study (Geraghty & Miller, 1986) at Site 13 included the installation of one monitoring well (WHF-13-1) and collection of a groundwater sample for offsite laboratory analyses. The well was installed to a depth of 120 feet bls along the eastern side of the site (Figure 5-7). Comparison of groundwater elevation data for the southeast disposal area indicates the monitoring well is located hydraulically crossgradient to the site (Figure 5-7) (ABB-ES, 1995b). The groundwater sample was collected and analyzed for USEPA priority pollutants and additional herbicide compounds. No organic compounds were detected in the groundwater sample. Lead, mercury, nickel, and zinc were detected at concentrations below State MCLs. No other inorganic analytes were detected.

RI Phase I. The RI Phase I investigation at Site 13 consisted of collection of three groundwater samples from two locations using a PCPT and BAT sampler (Figure 5-7). A single sample was collected at 82 feet bls at location WHF-13-CPT-1. Samples were collected at 82 feet bls and 132 feet bls at location WHF-13-CPT-2. The samples were analyzed for VOCs and TAL inorganic analytes at an offsite laboratory. Acetone and carbon disulfide were detected in the samples, but were interpreted to be artifacts resulting from decontamination procedures. Seven inorganic analytes were detected. Detailed results are summarized in the RI Phase I Technical Memorandum No. 5 (ABB-ES, 1992f).

RI Phase IIA. The Phase IIA investigation included the completion of a geophysical survey, collection of five surface soil samples and three subsurface soil samples from test pits, installation of two monitoring wells, and collection of three groundwater samples (Figure 5-7).

The geophysical survey identified four anomalies at the site. One landfill area (approximately 8 acres) was interpreted from the results. The remaining isolated anomalies were interpreted to be associated with large amounts of buried ferromagnetic metals (ABB-ES, 1994b).

Both surface and subsurface soil samples were analyzed for TCL VOCs, SVOCs, pesticides and PCBs, TAL inorganic analytes, and TRPH. Two SVOCs and seven inorganic analytes were detected in surface soil samples at concentrations exceeding background screening criteria. One SVOC and eight inorganic analytes were detected in subsurface soil samples (test pit samples) at concentrations exceeding background screening criteria. Detailed results are summarized in the RI Phase II Technical Memorandum No. 3 (ABB-ES, 1994b).

During the Phase IIA investigation, three groundwater samples were collected and analyzed for TCL VOCs, SVOCs, pesticides and PCBs, and TAL inorganic analytes. One VOC, 1 SVOC, and 15 inorganic analytes were detected. Bis(2-ethylhexyl)-phthalate, aluminum, cadmium, iron, and manganese exceeded State MCLs. Detailed results are summarized in the RI Phase IIA Technical Memorandum No. 5 (ABB-ES, 1995f).

Comparison of groundwater elevation data suggests that the two newly installed monitoring wells are located hydraulically crossgradient to the site (Figure 5-7 and Appendix A) (ABB-ES, 1995b).

5.4.6 Site 14, Short-Term Sanitary Landfill

Site Description and Background. Background information was gathered from the IAS (Envirodyne Engineers, Inc., 1985). Site 14 is located south of Site 13 and is located along the eastern facility boundary (Figure 1-2). The site is approximately 3 acres in size and was used as a sanitary landfill for 6 to 9 months starting in 1978. The landfill was abandoned because of excessive clay content in the soil, which caused water to pond throughout the site. Surface drainage from the area is in an easterly direction toward the unlined and vegetated "Y" ditch, which borders the site on the east. The ditch drains east toward the Big Coldwater Creek located 1.8 miles east of the site. Following closure of Site 14, facility disposal activities were transferred to Site 13. The wastes disposed of at Site 14 would have presumably included general refuse, although waste solvents and residue from paint-stripping operations may have been disposed of in the past.

Verification Study. The Verification Study (Geraghty & Miller, 1986) at Site 14 included the installation of one monitoring well (WHF-14-1) and collection of a groundwater sample for offsite laboratory analyses. The well was installed to a depth of 152 feet bls along the eastern boundary of the site (Figure 5-7). Comparison of groundwater elevation data for the area indicates the monitoring well is located hydraulically crossgradient to the site (Figure 5-7) (ABB-ES, 1995b). The groundwater sample was collected and analyzed for USEPA priority pollutants and additional herbicide compounds. No organic compounds were detected in the groundwater sample; lead and zinc were detected at concentrations below State MCLs.

RI Phase I. The RI Phase I investigation at Site 14 consisted of collecting two groundwater samples using a PCPT and BAT sampler (Figure 5-7). Samples were collected from 107 feet bls and 160 feet bls at a single location. The samples were analyzed for VOCs and TAL inorganic analytes at an offsite laboratory. Acetone and carbon disulfide were detected in one sample, but were interpreted to be artifacts resulting from decontamination procedures. Seven inorganic analytes were detected. Detailed results are summarized in the RI Phase I Technical Memorandum No. 5 (ABB-ES, 1992f).

RI Phase IIA. The Phase IIA investigation included the completion of a geophysical survey, collection of three surface soil samples and two subsurface soil samples from test pits, installation of one monitoring well, and collection of two groundwater samples (Figure 5-7).

The geophysical survey identified a single anomaly at the site. One landfill area (approximately 3 acres) was interpreted from the results. Additionally, one isolated low amplitude anomaly was identified at the site (ABB-ES, 1994b).

Both surface and subsurface soil samples were analyzed for TCL VOCs, SVOCs, pesticides and PCBs, TAL inorganic analytes, and TRPH. One SVOC and five inorganic analytes were detected in surface soil samples at concentrations exceeding background screening criteria. One SVOC and six inorganic analytes were detected for subsurface soil samples from test pits at concentrations exceeding background screening criteria. Detailed results are summarized in the RI Phase II Technical Memorandum No. 3 (ABB-ES, 1994b).

During the Phase IIA investigation, the two groundwater samples were analyzed for TCL VOCs, SVOCs, pesticides and PCBs, and TAL inorganic analytes. Two SVOCs and 13 inorganic analytes were detected. Bis(2-ethylhexyl)phthalate, aluminum, iron, and manganese exceeded State MCLs. Detailed results are summarized in the RI Phase IIA Technical Memorandum No. 5 (ABB-ES, 1995c).

Comparison of groundwater elevation data for the southeast disposal area suggests the newly installed monitoring well is located hydraulically downgradient of the site (Figure 5-7 and Appendix A) (ABB-ES, 1995b).

5.5 OPERABLE UNIT 6. OU 6 is composed of six locations where sludge drying bed materials from the facility wastewater treatment plant were disposed of (Figure 1-2). The locations are identified as Site 31A through Site 31F.

5.5.1 Site 31, Sludge Drying Beds

Site Description and Background. Site 31, Sludge Drying Beds, is one of five sites identified during the RI Phase I and subsequently added to the Phase IIA RI program for investigation. Site 31 is composed of six locations used for sludge disposal from the facility wastewater treatment plant. Table 5-3 summarizes the site designations and their location.

From the 1940s until the 1990s sludge from beds at the wastewater treatment plants was collected and then spread on the ground at the sites located along the perimeter road (Sites B through F).

RI Phase IIA. The Phase IIA investigation included collecting 24 surface soil samples at the 6 sites (Figures 5-9 through 5-11). Surface soil samples were analyzed for TCL VOCs, SVOCs, pesticides and PCBs, and TAL inorganic analytes.

The following describes the analytical results of the surface soil samples collected at each of the sites.

Five pesticides and three inorganic analytes were detected in Site 31A surface soil samples at concentrations exceeding background screening criteria.

Three inorganic analytes were detected in Site 31B surface soil samples at concentrations exceeding background screening criteria.

Table 5-3
Site 31 Sludge Drying Beds Location Summary

Remedial Investigation and Feasibility Study
Technical Memorandum No. 7, Phase IIB Workplan
Naval Air Station Whiting Field
Milton, Florida

Site Designation	Size (Acres)	Approximate Location
31A	1	Sludge Drying Bed feature at the Wastewater Treatment Plant (Figure 1-2)
31B	2.5	East of Site 14, west-northwest of Runway 4, and south of the perimeter road in the South Air Field (Figure 1-2).
31C	2.8	Southeast of site 15, directly southwest of Runway 4, and south of the perimeter road in the south Air Field.
31D	1.0	Southeast of Site 15, south-southeast of Runway 4, and northeast of the perimeter road in the South Air Field (Figure 1-2).
31E	6.3	Northwest of Site 9 and south of the South Perimeter Road in the South Air Field (Figure 1-2).
31F	5.2	Northwest of Site 9 and north of the South Perimeter Road in the South Air Field (Figure 1-2).

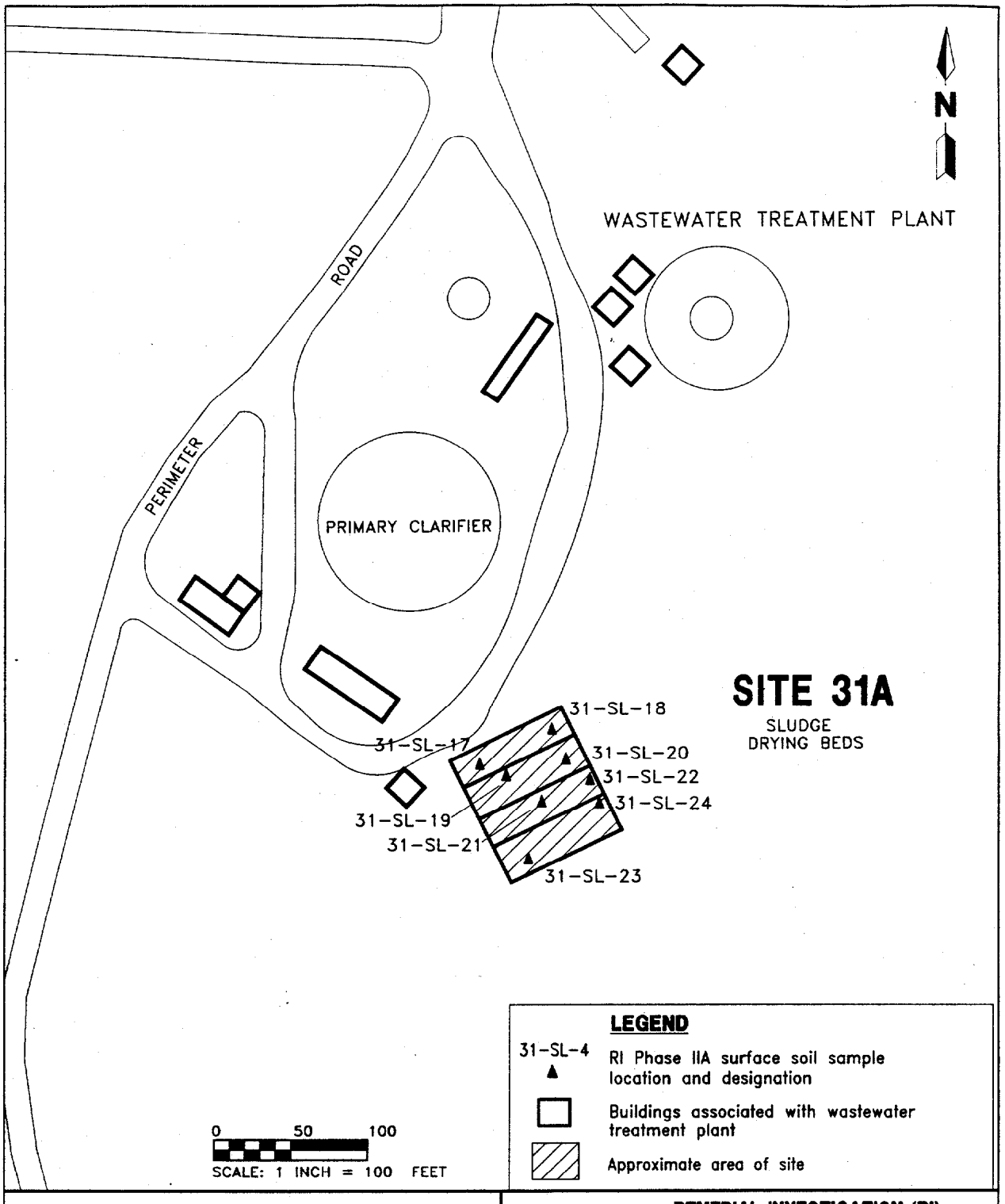

FIGURE 5-9
SITE 31A,
LOCATIONS OF SURFACE SOIL SAMPLES

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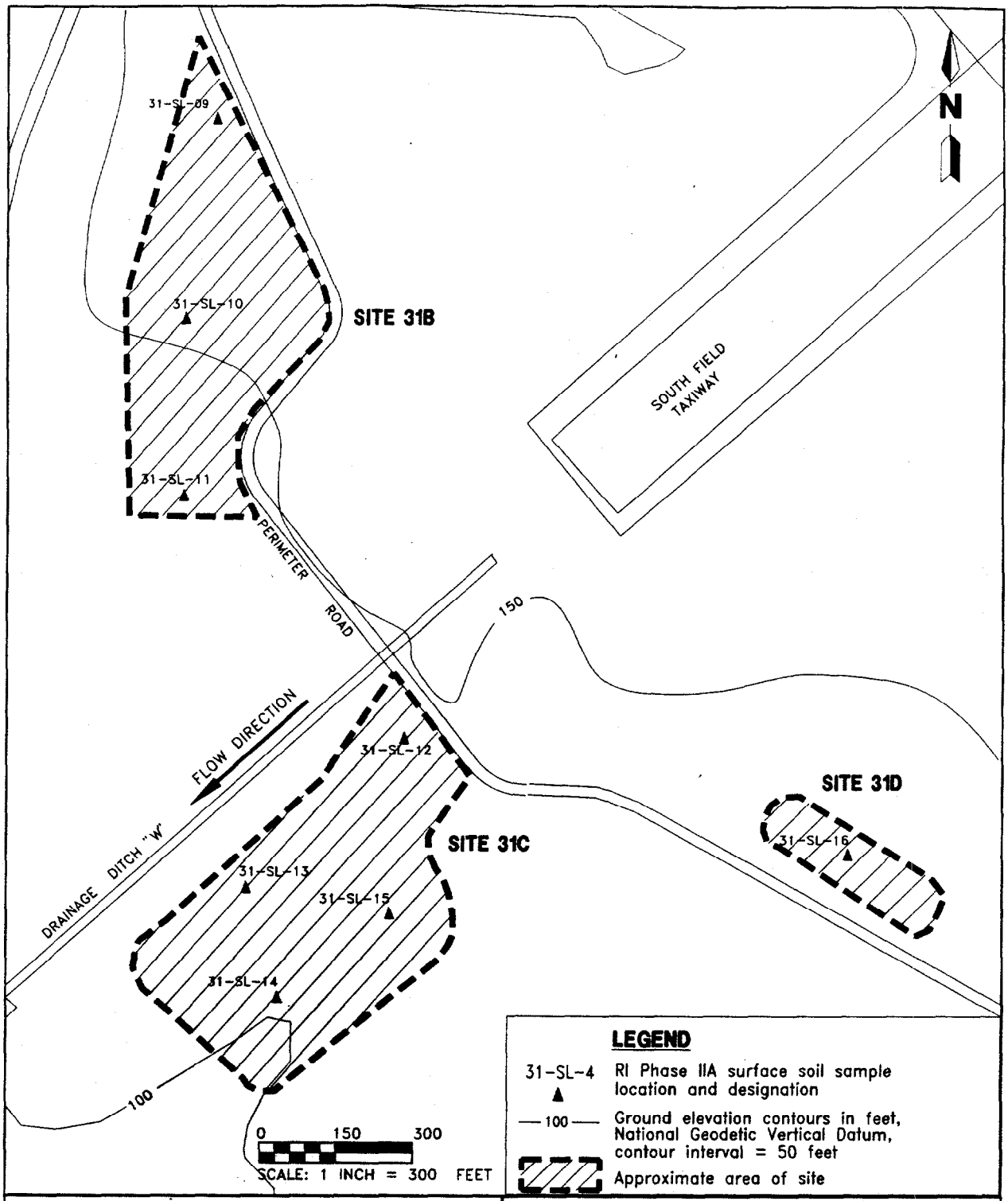

FIGURE 5-10
SITES 31B, 31C, AND 31D,
LOCATIONS OF SURFACE SOIL SAMPLES

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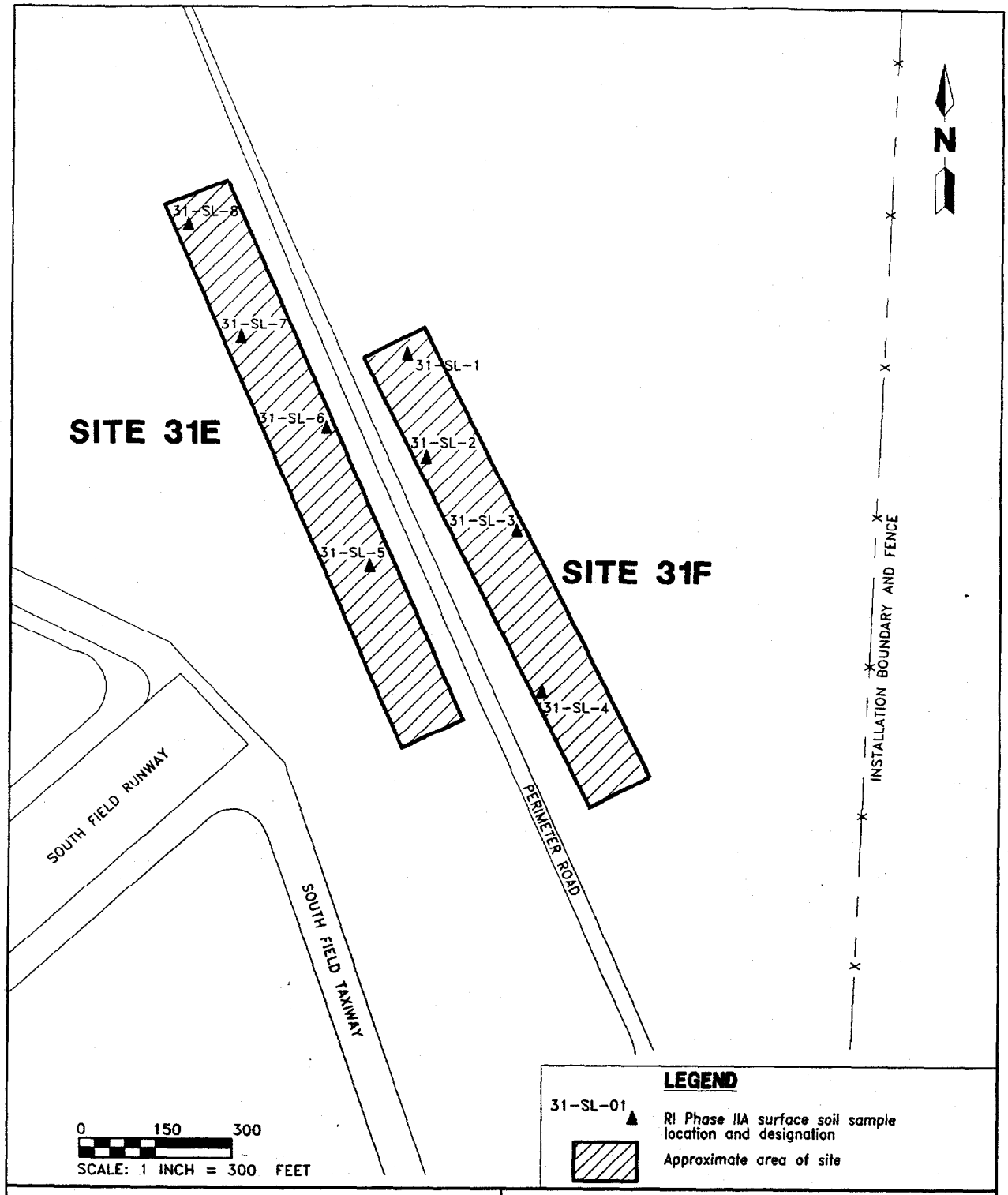

FIGURE 5-11
SITES 31E AND 31F,
LOCATIONS OF SURFACE SOIL SAMPLES

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Two SVOCs, 4 pesticides, 1 PCB, and 14 inorganic analytes were detected in Site 31C surface soil samples at concentrations exceeding background screening criteria.

No compounds or analytes were detected in the 31D surface soil samples at concentrations exceeding background screening criteria. Four inorganic analytes were detected in samples collected at 31E at concentrations exceeding background screening criteria.

Six inorganic analytes were detected in samples collected at 31F at concentrations exceeding background screening criteria. Detailed results are summarized in the RI Phase II Technical Memorandum No. 3 (ABB-ES, 1994b).

6.0 IDENTIFIED SITE MEDIA REQUIRING FURTHER INVESTIGATION

The following is a discussion of data gaps identified at proposed OUs 3, 4, 5, and 6. A summary of site media that have been identified for additional field investigations and corresponding goals for the NAS Whiting Field RI is provided in Table 6-1. These would provide data to assess the nature and extent of contamination, support a base line risk assessment, and complete an FS.

6.1 OPERABLE UNIT 3. Review of the analytical data from previous investigations conducted at OU 3 RI/FS sites resulted in identification of site media that require additional investigation. Additional investigation is warranted based on incomplete characterization of the soil and groundwater contamination at each site. Additional site media information is required to support a baseline risk assessment, develop remedial response objectives, and complete a feasibility study.

Soil Gas. One site medium not addressed in previous investigations is the generation of methane or other organic compounds emanating as soil gas from landfill and disposal areas. This activity is warranted to assess and characterize the nature of soil gas generation at each landfill or disposal site. The data will be used to complete the RI characterization and to support future feasibility studies for the OU.

Surface Soil. Characterization of surface soil (land surface to 1.0 foot bls) is required to support the ecological assessment (exposures for terrestrial wildlife) and human health risk assessment (exposure of transient persons to site soil). Previous sample locations were biased based on visual and geophysical anomalies. Samples from other random locations are warranted to confirm the presence or absence of contamination and to characterize the nature and extent of contamination. The information obtained will also be used to evaluate remedial alternatives in the FS.

Subsurface Soil. Interpretation of analytical results from subsurface soil samples suggest that the vertical extent of contamination at proposed OU 3 has not been defined. The physical characteristics of subsurface soil have not been addressed in the previous investigations. Additional subsurface soil sampling is required to adequately define the vertical extent of contamination and characterize the physical parameters of subsurface soil.

Groundwater. The installation of hydraulically downgradient monitoring wells and collection of groundwater samples is required at proposed OU 3 to further assess potential groundwater contamination. During previous field events, groundwater samples were collected as unfiltered samples. Analytes detected in unfiltered samples collected to date may be attributed to dissolved and colloidal fractions for inorganics and leaching of inorganics from sediment in the sample when preserved. The inorganics may have leached from sediment in the sample when the sample was preserved (acidified with nitric acid) at a pH of 2.0 standard units (SU). Therefore, analytical results for inorganic analytes are likely biased high and may provide false values. Resampling of monitoring wells using a modified method will allow the collection of unfiltered groundwater samples with little sediment (< 5 NTU) and will aid in defining the nature and extent of contamination.

Table 6-1
Site Media Requiring Further Investigation and Remedial Investigation Goals at Proposed Operable Units 3, 4, 5, and 6

Technical Memorandum No. 7, Phase IIB Workplan
Naval Air Station Whiting Field
Milton, Florida

Operable Unit	Site Media Requiring Further Investigation	Investigation Method and Location	Remedial Investigation Goals
OU 3	1. Soil gas 2. Surface soil 3. Subsurface soil 4. Groundwater	1. Collect soil gas samples at Site 1. 2. Collect surface soil samples at Site 1. 3. Collect subsurface soil samples at Sites 17 and 18; analyze for physical parameters and TRPH at Site 18 in subsurface soil samples below previous investigations. 4. Collect groundwater samples at all sites.	1. Assess soil gas for presence of methane or other volatile compounds. 2. Assess contamination of surface soil and support a baseline risk assessment. 3. Assess subsurface soils to delineate vertical contamination and evaluate physical characteristics for potential remedial alternatives. 4.a Assess groundwater quality at source areas for Sites 17 and 18. Assess downgradient groundwater quality at Site 2. 4.b Verify previous groundwater analytical results and compile a groundwater data base.
OU 4	1. Soil gas 2. Surface soil 3.Groundwater	1. Collect soil gas samples at Sites 15 and 16. 2. Collect surface soil samples at Sites 15 and 16. 3.a Collect *in situ* groundwater sample at all sites. 3.b Install additional monitoring wells as needed and sample all new and previously installed monitoring wells at all sites.	1. Assess soil gas for presence of methane or other volatile compounds. 2. Assess contamination of surface soil and support a baseline risk assessment. 3.a Assess groundwater quality upgradient and downgradient of sites. 3.b Verify *in situ* groundwater results and previous groundwater analytical results and compile a groundwater data base.
OU 5	1. Soil gas 2. Surface soil 3. Subsurface soil 4. Groundwater	1. Collect soil gas samples at Sites 9, 10, 11, 13, and 14. 2. Collect surface soil samples at Sites 9, 10, 11, 12, 13, and 14. 3. Collect subsurface soils at Site 12. 4.a Collect *in situ* groundwater sample at Sites 11 and 13. 4.b Install additional monitoring wells as needed and samples all new and previously installed monitoring wells at all sites.	1. Assess soil gas for presence of methane or other volatile compounds. 2. Assess contamination of surface soil and support a baseline risk assessment. 3. Collect subsurface samples below mounds at Site 12. 4.a Assess groundwater quality downgradient of sites. 4.b Verify *in situ* groundwater results and previous groundwater analytical results and compile a groundwater data base.
OU 6	1. Surface soil 2. Subsurface soil 3. Groundwater	1. Collect surface soil samples at all sites. 2. Collect subsurface soil samples at Site 31C. 3. Collect groundwater samples at Site 31C.	1. Assess contamination of surface soils and support a baseline risk assessment. 2. Assess subsurface soils to delineate vertical potential contamination Site 31C. 3. Assess the groundwater quality upgradient and downgradient of Site 31C.

6.2 OPERABLE UNIT 4. Review of the analytical data from previous investigations conducted at proposed OU 4 has resulted in identification of site media that require additional investigation. Additional investigation is warranted based on incomplete characterization of the soil and groundwater contamination at each site. Additional site media information is required to support a baseline risk assessment, develop remedial response objectives, and complete an FS.

Soil Gas. One site medium not addressed in previous investigations is the generation of methane or other organic compounds emanating as soil gas from landfill and disposal areas. This activity is warranted to assess and characterize the nature of soil gas generation at each landfill or disposal site. The data will be used to complete the RI characterization and to support future feasibility studies for the proposed OU.

Surface Soil. Characterization of surface soil (land surface to 1.0 foot bls) is required to support the ecological assessment (exposures for terrestrial wildlife) and human health risk assessment (exposure of transient persons to site soil). Previous sample locations were biased based on visual and geophysical anomalies. Samples from other random locations are warranted to confirm the presence or absence of contamination, and characterize the nature and extent of contamination. The information obtained will also be used to evaluate remedial alternatives in the FS.

Groundwater. Previous investigations have identified groundwater quality upgradient and downgradient of Sites 15 and 16. Organic compounds have been detected in samples from monitoring wells hydraulically upgradient and downgradient of Site 16. The lateral and vertical extent of contamination has not been determined.

During previous field events, groundwater samples were collected as unfiltered samples. Analytes detected in unfiltered samples collected to date may be attributed to dissolved and colloidal fractions for inorganics and leaching of inorganics from sediment in the sample when preserved. The inorganics may have leached from sediment in the sample when the sample was preserved (acidified with nitric acid) at a pH of 2.0 SU. Therefore, analytical results for inorganic analytes are likely biased high and may provide false values. Resampling of monitoring wells using a modified method will allow the collection of unfiltered groundwater samples with little sediment (< 5 NTU) and will aid in defining the nature and extent of contamination.

These data gaps and the associated RI goals are summarized in Table 6-1 for proposed OU 4.

6.3 OPERABLE UNIT 5. Review of the analytical data from previous investigations conducted at proposed OU 5 has resulted in identification of site media that require additional investigation. Additional investigation is warranted based on incomplete characterization of the soil and groundwater contamination at each site. Additional site media information is required to support a baseline risk assessment, develop remedial response objectives, and complete an FS.

Soil Gas. One site medium not addressed in previous investigations is the generation of methane or other organic compounds emanating as soil gas from landfill and disposal areas. This activity is warranted to assess and

characterize the nature of soil gas generation at each landfill or disposal site. The data will be used to complete the RI characterization and to support future feasibility studies for the proposed OU.

Surface Soil. Characterization of surface soil (land surface to 1.0 foot bls) is required to support the ecological assessment (exposures for terrestrial wildlife) and human health risk assessment (exposure of transient persons to site soil). Previous sample locations were biased based on visual and geophysical anomalies. Samples from other random locations are warranted to confirm the presence or absence of contamination, and characterize the nature and extent of contamination. The information obtained will also be used in the FS to evaluate remedial alternatives.

Subsurface Soil. One site medium not addressed in previous investigations is subsurface soil below the mounds at Site 12. Additional sampling is warranted to characterize subsurface soil at the site. The data will be used to complete characterization of the nature and extent of contamination and to support future feasibility studies for the proposed OU.

Groundwater. Based on the analytical results of previous investigations, characterization of groundwater quality downgradient of Sites 11, 12, and 13 are needed.

During previous field events, groundwater samples were collected as unfiltered samples. Analytes detected in unfiltered samples collected to date may be attributed to dissolved and colloidal fractions for inorganics and leaching of inorganics from sediment in the sample when preserved. The inorganics may have leached from sediment in the sample when the sample was preserved (acidified with nitric acid) at a pH of 2.0 SU. Therefore, analytical results for inorganic analytes are likely biased high and may provide false values. Resampling of monitoring wells using a modified method will allow the collection of unfiltered groundwater samples with little sediment (< 5 NTU) and will aid in defining the nature and extent of contamination.

Table 6-1 summarizes the site media that have been identified for further investigation and goals for the RI that should be attained to support the risk assessments and evaluation of potential remedial response actions at proposed OU 5.

6.4 OPERABLE UNIT 6. Review of the analytical data from previous investigations conducted at proposed OU 6 has resulted in identification of site media that require additional investigation. Additional investigation is warranted based on incomplete characterization of the soil and groundwater contamination at each site. Additional site media information is required to support a baseline risk assessment, develop remedial response objectives, and complete an FS.

Surface Soil. Characterization of surface soil (land surface to 1.0 foot bls) is required to support the ecological assessment (exposures for terrestrial wildlife) and human health risk assessment (exposure of transient persons to site soil). Previous sample locations were biased based on visual anomalies. Samples from other random locations are warranted to confirm the presence or absence of contamination, and characterize the nature and extent of contamination. The

information obtained will also be used to evaluate remedial alternatives in the FS.

Subsurface Soil. One site medium not addressed in previous investigations is subsurface soil at Site 31C. Additional sampling is warranted to characterize subsurface soil at the site. The data will be used to complete characterization of the nature and extent of contamination and to support future feasibility studies for the proposed OU.

Groundwater. One site medium not addressed at Site 31C in previous investigations is groundwater quality.

Installation of monitoring wells and sampling of groundwater at the site are required to assess the nature and extent of contamination, if present. Groundwater samples will be collected using the modified sampling method.

Data gaps and the associated RI goals are summarized in Table 6-1 for proposed OU 6.

7.0 PROPOSED ACTIVITIES

The following presents sampling and analytical activities that are proposed to supplement existing data for proposed OUs 3, 4, 5, and 6. Media requiring additional investigation have been identified, and sampling activities were selected to achieve RI goals (Table 6-1). The following sections summarize the approach to collect site-specific samples that are designed to complete the RI part of the field investigation at proposed OUs 3, 4, 5, and 6. Table 7-1 provides an overview of all previous and proposed investigation sampling programs by phase of investigation.

7.1 OPERABLE UNIT 3. A summary of the proposed activities to be conducted at OU 3 (RI/FS Sites 1, 2, 17, and 18) is outlined below.

7.1.1 Proposed Investigation at Site 1 The following provides a brief description of the proposed number and types of environmental samples and the analytical methodology for Site 1, Northwest Disposal Area.

Soil Gas Survey. Previous investigations have not addressed the generation of methane or other organic compounds emanating as soil gas from Site 1. A soil gas survey will be conducted to assess whether organic and/or methane gas is emanating from the landfill or disposal area. Samples will be collected and analyzed as described in Section 4.1, Soil Gas Survey.

Surface Soil Sampling. Eight surface soil samples will be collected at locations shown on Figure 7-1. Locations were determined using the systematic sampling method where a point is chosen at random along a transect, and then samples are collected at equidistant intervals thereafter (Gilbert, 1987; USEPA, 1989). This method will provide unbiased sampling locations to support the ecological and human health risk assessments. The surface soil samples will be analyzed for Contract Laboratory Program (CLP) (NEESA Level D) TCL VOCs, SVOCs, pesticides and PCBs, and TAL inorganic analytes.

Three of the eight surface soil samples will be analyzed to determine physical characteristics. The samples will be analyzed for the following physical parameters: dry bulk density, sieve analysis, hydrometer analysis, Atterberg limits, and permeability.

Groundwater Sampling. The four existing monitoring wells will be sampled to confirm the nature and extent of groundwater quality at Site 1 (Figure 7-1). The groundwater samples will be collected using the modified sampling procedure (see Section 4.3). The groundwater samples will be analyzed for CLP (NEESA Level D) TCL VOCs, SVOCs, pesticides and PCBs, and TAL inorganics. Samples for TAL inorganics will be unfiltered (total analysis) if turbidity is below 5 NTU. If turbidity is greater than 5 NTU, an additional groundwater sample will be collected and filtered (dissolved phase inorganics) using a 45-micron filter. The purpose of the additional groundwater sample is to support a baseline risk assessment and future FS work, if required.

Analyses will be conducted to assess secondary water quality parameters and to provide data for assessing remedial alternatives in the FS. The analyses will include alkalinity, chloride, sulfates, color, hardness, ammonia nitrates, total

Table 7-1
Summary of Investigation Sampling Programs at NAS Whiting Field

Remedial Investigation and Feasibility Study
Technical Memorandum No. 7, Phase IIB Workplan
Naval Air Station Whiting Field
Milton, Florida

Site Identification	Landfill Gas Survey	Surface Soil Samples	New Soil Borings	Subsurface Soil Boring Samples	Subsurface Test Pit Samples	BAT Groundwater Samples location/no. samples	New Monitoring Wells	Monitoring Well Samples	Aquifer (Slug) Test	Surface Water/ Sediment Samples
Operable Unit 3										
Site 1										
Verification Study								1		
RI Phase I						1				
RI Phase IIA		3			1			4		
RI Phase IIB	X	8						4		
Site 2										
Verification Study										
RI Phase I						1				
RI Phase IIA		1		6				1		
RI Phase IIB							2	3	1	
Site 17										
Verification Study								1		
RI Phase I										
RI Phase IIA		34		18		1		4		
RI Phase IIB			3	6			1	5	1	
Site 18										
Verification Study								1		1
RI Phase I						2				
RI Phase IIA		47		24				3		
RI Phase IIB			3	12			2	5	1	
Operable Unit 4										
Site 15										
Verification Study								1		
RI Phase I		3				4/5				3
RI Phase IIA		5			5			11		
RI Phase IIB	X	25				4/16	12	23	5	

Table 7-1 (Continued)
Summary of Investigation Sampling Programs
at NAS Whiting Field

Remedial Investigation and Feasibility Study
Technical Memorandum No. 7, Phase IIB Workplan
Naval Air Station Whiting Field
Milton, Florida

Site Identification	Landfill Gas Survey	Surface Soil Samples	New Soil Borings	Subsurface Soil Boring Samples	Subsurface Test Pit Samples	BAT Groundwater Samples location/no. samples	New Monitoring Wells	Monitoring Well Samples	Aquifer (Slug) Test	Surface Water/ Sediment Samples
Site 16										
Verification Study								1		
RI Phase I		3				2/4				
RI Phase IIA		3			3			12		
RI Phase IIB	X	17				4/16	12	24	5	
Operable Unit 5										
Site 9										
Verification Study		6						1		
RI Phase I						1				
RI Phase IIA								3		
RI Phase IIB	X	7						3		
Site 10										
Verification Study								1		
RI Phase I						2/3				
RI Phase IIA		5			3			2		
RI Phase IIB	X	5						2		
Site 11										
Verification Study								1		
RI Phase I						1/2				
RI Phase IIA		5			3			4		
RI Phase IIB	X	7				5/25	4	8	2	
Site 12										
Verification Study				2				1		
RI Phase I				6		2				
RI Phase IIA				8				1		
RI Phase IIB		6	1	5			1	2	1	

Table 7-1 (Continued)
Summary of Investigation Sampling Programs
at NAS Whiting Field

Remedial Investigation and Feasibility Study
Technical Memorandum No. 7, Phase IIB Workplan
Naval Air Station Whiting Field
Milton, Florida

Site Identification	Landfill Gas Survey	Surface Soil Samples	New Soil Borings	Subsurface Soil Boring Samples	Subsurface Test Pit Samples	BAT Groundwater Samples location/no. samples	New Monitoring Wells	Monitoring Well Samples	Aquifer (Slug) Test	Surface Water/ Sediment Samples
Site 13										
Verification Study								1		
RI Phase I						1/2				
RI Phase IIA		5			3			3		
RI Phase IIB	X	5				5/25	4	7	2	
Site 14										
Verification Study								1		
RI Phase I						1/2				
RI Phase IIA		5			2			2		
RI Phase IIB	X	3					1	3	1	
Operable Unit 6										
Site 31A										
RI Phase IIA		8								
RI Phase IIB		8								
Site 31B										
RI Phase IIA		3								
RI Phase IIB		3								
Site 31C										
RI Phase IIA		4								
RI Phase IIB		10	3	15			4	4	2	
Site 31D										
RI Phase IIA		1								
RI Phase IIB		1								
Site 31E										
RI Phase IIA		4								
RI Phase IIB		8								
Site 31F										
RI Phase IIA		4								
RI Phase IIB		6								

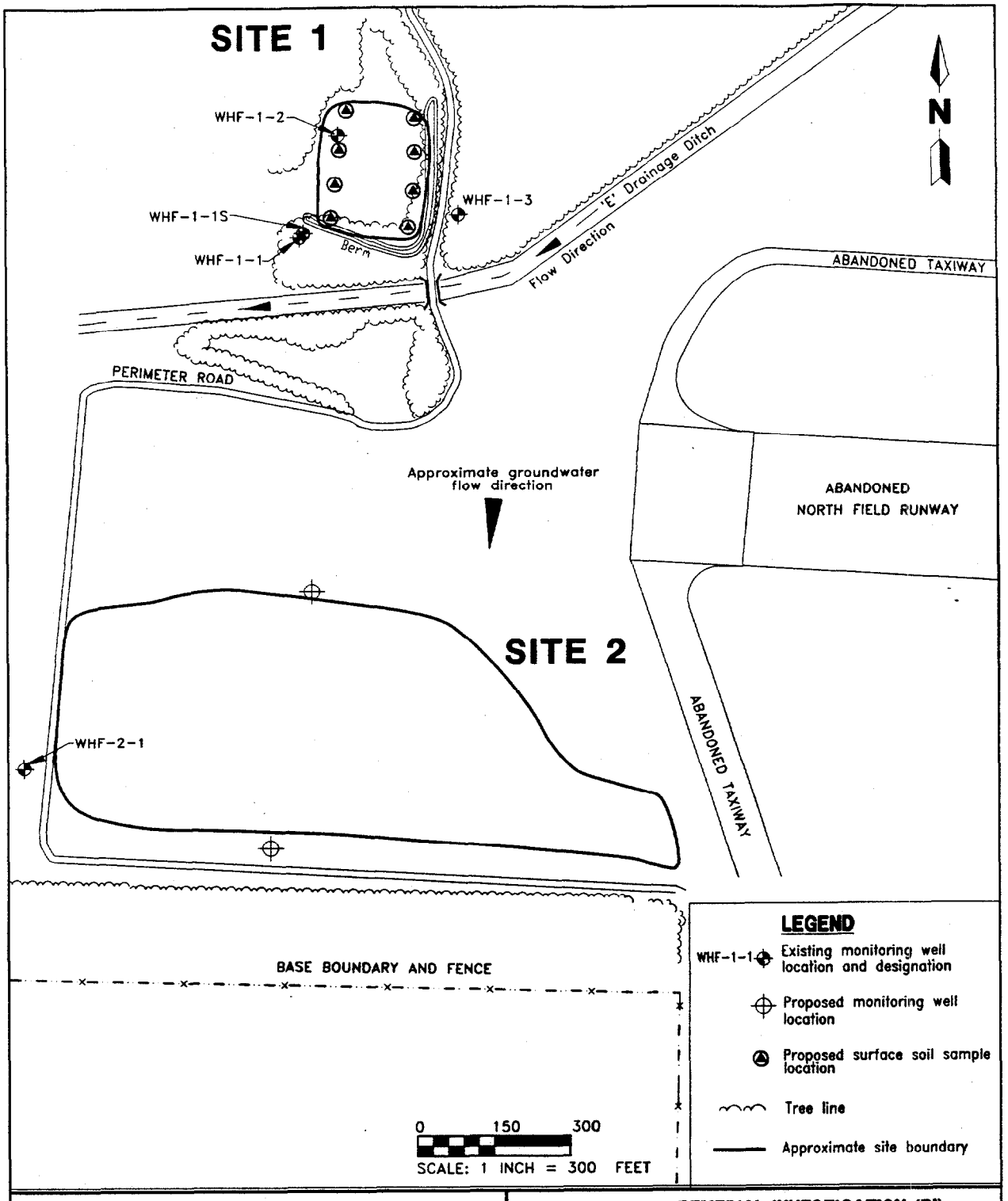

FIGURE 7-1
SITES 1 AND 2,
LOCATIONS OF PROPOSED SURFACE SOIL SAMPLES AND PROPOSED MONITORING WELLS

H:/9502/2001600/KGP-WDW-NP/10-31-95

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Kjeldahl nitrogen, nitrate and nitrite, pH, phosphorous, total dissolved solids, and sulfides.

7.1.2 Proposed Investigation at Site 2 The following provides a brief description of the proposed number and types of environmental samples and the analytical methodology for Site 2, Northwest Open Disposal Area.

On November 13, 1992, an RPMs meeting was held with representatives from the USEPA, Navy, FDEP, NOAA, and ABB-ES. The USEPA recommended that one hydraulically downgradient monitoring well and one soil boring be drilled within the borrow pit and that samples be collected for TCL organic and TAL inorganic analyses (Figure 5-1). A consensus was reached that, if these explorations were conducted and no contamination was detected, an NFA decision document could be prepared.

The soil samples were collected during Phase IIA, but the monitoring well was installed hydraulically crossgradient to the site. Additional monitoring wells will be installed to assess the groundwater quality at Site 2.

Monitoring Well Installation. Two monitoring wells will be installed at Site 2 to assess groundwater quality hydraulically upgradient and downgradient from the site (Figure 7-1). The monitoring wells will be completed to a depth of approximately 75 bls and will be screened across the water table with 5 feet of screen above and 10 feet below.

Groundwater Sampling. The one existing and two newly installed monitoring wells will be sampled to assess the nature and extent of groundwater quality at Site 2 (Figure 7-1). The groundwater samples will be collected using the modified sampling procedure (see Section 4.3, Modified Sampling Method). The groundwater samples will be analyzed for CLP (NEESA Level D) TCL VOCs, SVOCs, pesticides and PCBs, and TAL inorganics. Samples for TAL inorganics will be unfiltered (total analysis) if turbidity is below 5 NTU. If turbidity is greater than 5 NTU, an additional groundwater sample will be collected and filtered (dissolved phase inorganics) using a 45-micron filter. The purpose of the additional groundwater sample is to support a baseline risk assessment and future FS work, if required.

Analyses will be conducted to assess secondary water quality parameters and to provide data for assessing remedial alternatives in the FS. The analyses will include alkalinity, chloride, sulfates, color, hardness, ammonia nitrates, total Kjeldahl nitrogen, nitrate and nitrite, pH, phosphorous, total dissolved solids, and sulfides.

Aquifer Characteristics Testing. Hydraulic conductivity testing will be conducted on one newly installed monitoring well. Slug tests will be performed and the data will be collected using a transducer and digital data logger. Slug test data will be downloaded into the appropriate software program for manipulation and development of documentation for incorporation into the RI report.

7.1.3 Proposed Investigation at Site 17 The following provides a brief description of the proposed number and types of environmental samples and the analytical methodology for Site 17, Crash Crew Training Area.

Soil Boring. Three soil borings are planned at the three largest depressions at Site 17 (Figure 7-2). Subsurface soil samples will be collected using hollow stem augers (HSA) and a split-spoon sampler at intervals of 15 and 25 feet bls and

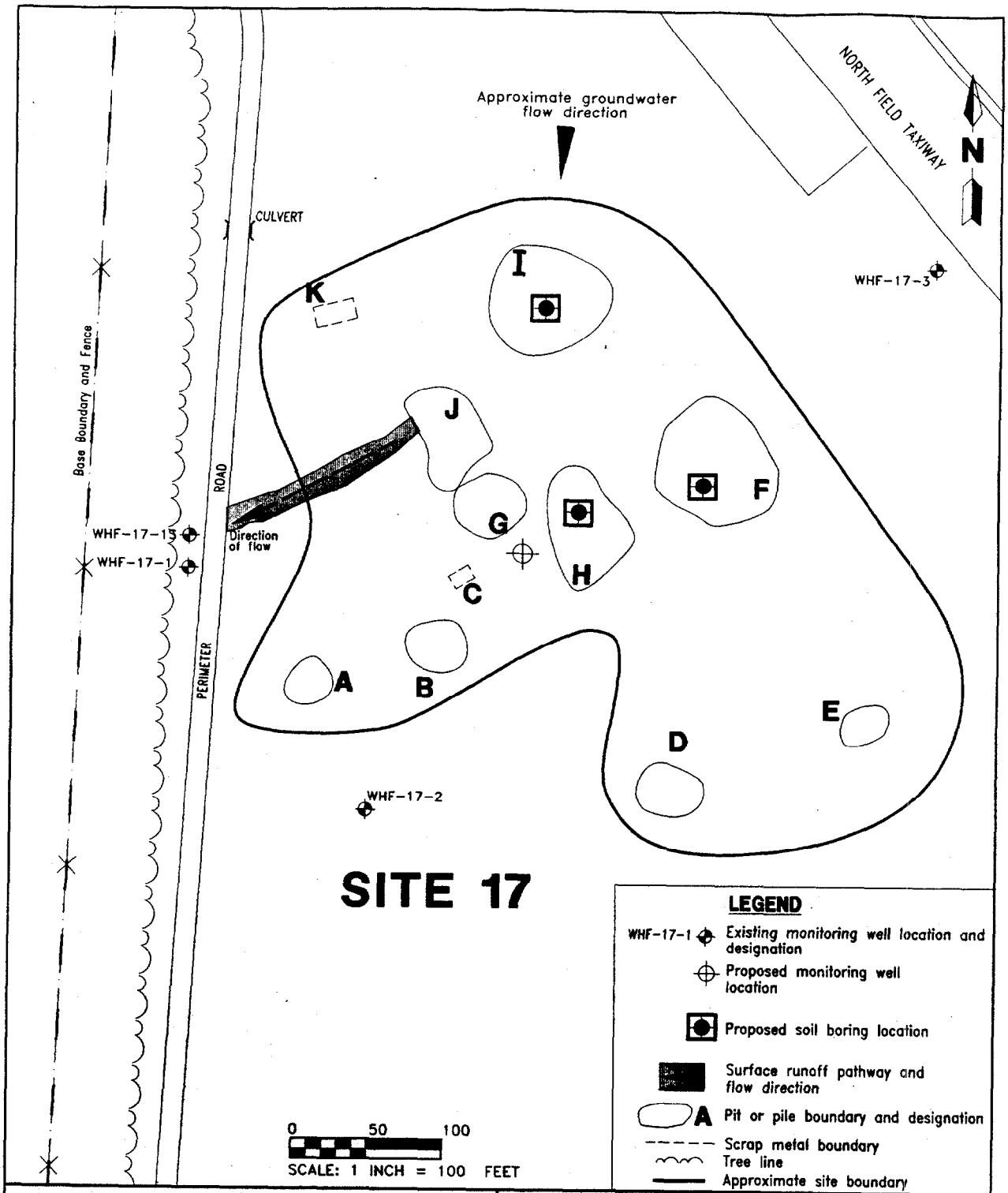

FIGURE 7-2
SITE 17, LOCATIONS OF PROPOSED SOIL BORINGS AND MONITORING WELL

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analyzed for the following physical parameters: dry bulk density, sieve analysis, hydrometer analysis, Atterberg limits, and permeability. The data will be used to support the RI/FS characterization and interim removal actions at the site.

Monitoring Well Installation. One monitoring well will be installed at Site 17 to assess the groundwater quality at the source of contamination (Figure 7-2). The monitoring well will be completed to a depth of approximately 125 feet bls and screened across the water table with 5 feet of screen above and 10 feet below.

Groundwater Sampling. The four existing and one newly installed monitoring well will be sampled to assess the nature and extent of groundwater quality at Site 17 (Figure 7-2). The groundwater samples will be collected using the modified sampling procedure (see Section 4.3, Modified Sampling Method). The groundwater samples will be analyzed for CLP (NEESA Level D) TCL VOCs, SVOCs, pesticides, and PCBs, and TAL inorganics. Samples for TAL inorganics will be unfiltered (total analysis) if turbidity is below 5 NTU. If turbidity is greater than 5 NTU, an additional groundwater sample will be collected and filtered (dissolved phase inorganics) using a 45-micron filter. The purpose of the additional groundwater sample is to support a baseline risk assessment and future FS work, if required.

Analyses will be conducted to assess secondary water quality parameters and to provide data for assessing remedial alternatives in the FS. The analyses will include alkalinity, chloride, sulfates, color, hardness, ammonia nitrates, total Kjeldahl nitrogen, nitrate and nitrite, pH, phosphorous, total dissolved solids, and sulfides.

Aquifer Characteristics Testing. Hydraulic conductivity testing will be conducted on one newly installed monitoring well. Slug tests will be performed and the data will be collected using a transducer and a digital data logger. Slug test data will be downloaded into the appropriate software program for manipulation and development of documentation for incorporation into the RI report.

7.1.4 Proposed Investigation at Site 18 The following provides a brief description of the proposed number and types of environmental samples and the analytical methodology for Site 18, Crash Crew Training Area.

Soil Boring. Three soil borings are planned for three of the major depressions at Site 18 (Figure 7-3). Subsurface soil samples will be collected at intervals of 15 and 25 feet bls using an HSA and a split-spoon sampler. The samples will be analyzed for the following physical parameters: dry bulk density, sieve analysis, hydrometer analysis, Atterberg limits, and permeability. The data will be used to support the RI/FS characterization and interim removal actions at the site.

One soil boring will be located at pit F. Analyses of previous subsurface samples suggest that the vertical extent has not been delineated. Therefore, split-spoon samples will be collected at this boring at 5-foot intervals starting at 15 feet bls down to 50 feet bls. The samples will be screened using an IR and Method 418.1 for TRPH analysis. Confirmatory samples will be sent to the laboratory.

Monitoring Well Installation. Two monitoring wells will be installed at Site 18 to assess the groundwater quality at the source of contamination (Figure 7-3). The monitoring wells will be completed to a depth of approximately 110 feet bls and screened across the water table with 5 feet above and 10 feet below.

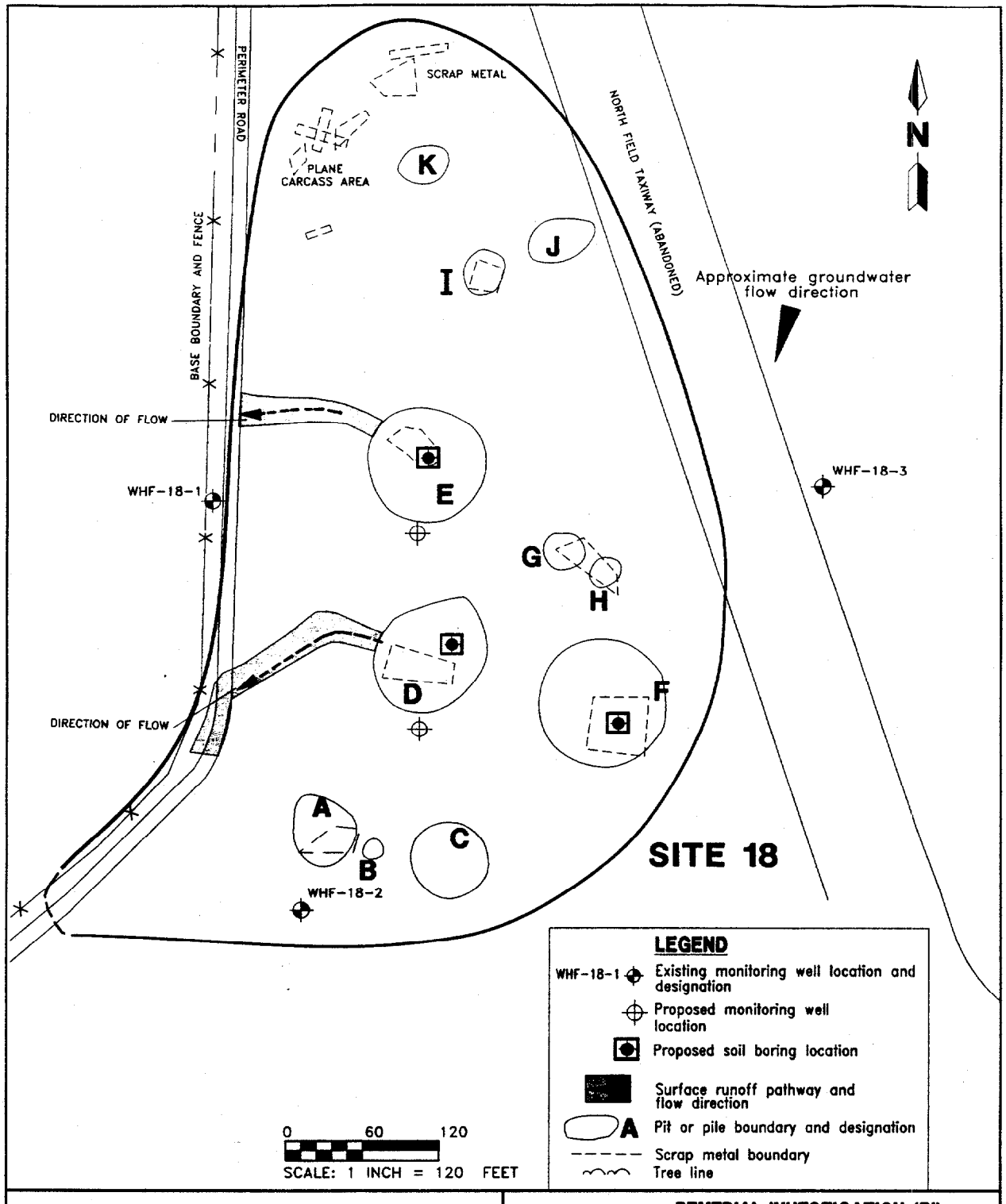

FIGURE 7-3
SITE 18, LOCATIONS OF PROPOSED SOIL BORINGS AND MONITORING WELLS

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Groundwater Sampling. The three existing and two newly installed monitoring wells will be sampled to assess the nature and extent of groundwater quality at Site 18 (Figure 7-3). The groundwater samples will be collected using the modified sampling procedure (see Section 4.3, Modified Sampling Method). The groundwater samples will be analyzed for CLP (NEESA Level D) TCL VOCs, SVOCs, pesticides and PCBs, and TAL inorganics. Samples for TAL inorganics will be unfiltered (total analysis) if turbidity is below 5 NTU. If turbidity is greater than 5 NTU, an additional groundwater sample will be collected and filtered (dissolved phase inorganics) using a 45-micron filter. The purpose of the additional groundwater sample is to support a baseline risk assessment and future FS work, if required.

Analyses will be conducted to assess secondary water quality parameters and to provide data for assessing remedial alternatives in the FS. The analyses will include alkalinity, chloride, sulfates, color, hardness, ammonia nitrates, total Kjeldahl nitrogen, nitrate and nitrite, pH, phosphorous, total dissolved solids, and sulfides.

Aquifer Characteristics Testing. Hydraulic conductivity testing will be conducted on one newly installed monitoring well. Slug tests will be performed and the data will be collected using a transducer and a digital data logger. Slug test data will be downloaded into the appropriate software program for manipulation and development of documentation for incorporation into the RI report.

7.2 OPERABLE UNIT 4. A summary of the proposed activities to be conducted at OU 4, Sites 15 and 16, is outlined below.

7.2.1 Proposed Investigation at Site 15 The following provides a brief description of the proposed number and types of environmental samples and the analytical methodology for Site 15, Southwest Landfill.

Soil Gas Survey. Previous investigations have not addressed the generation of methane or other organic compounds emanating as soil gas from Site 15. A soil gas survey will be conducted to assess whether organic and/or methane gas is emanating from the landfill or disposal area. Samples will be collected and analyzed as described in Section 4.1, Soil Gas Survey.

Surface Soil Sampling. Twenty-five surface soil samples will be collected at locations shown on Figure 7-4. The surface soil samples will be analyzed for CLP (NEESA Level D) TCL VOCs, SVOCs, pesticides and PCBs, and TAL inorganic analytes.

Locations will be determined using the systematic sampling method where a point will be chosen at random along a transect, and then samples will be collected at equidistant intervals thereafter (Gilbert, 1987; USEPA, 1989). This method will provide unbiased sample locations to support the ecological and human health risk assessments. The distance between sampling stations will be determined such that the known extent of the landfill (based on geophysical survey results) will be covered. Any sampling station that falls near a previous (RI Phase IIA) sampling location will be replaced by another sampling station that was not already included among the 25 sample stations.

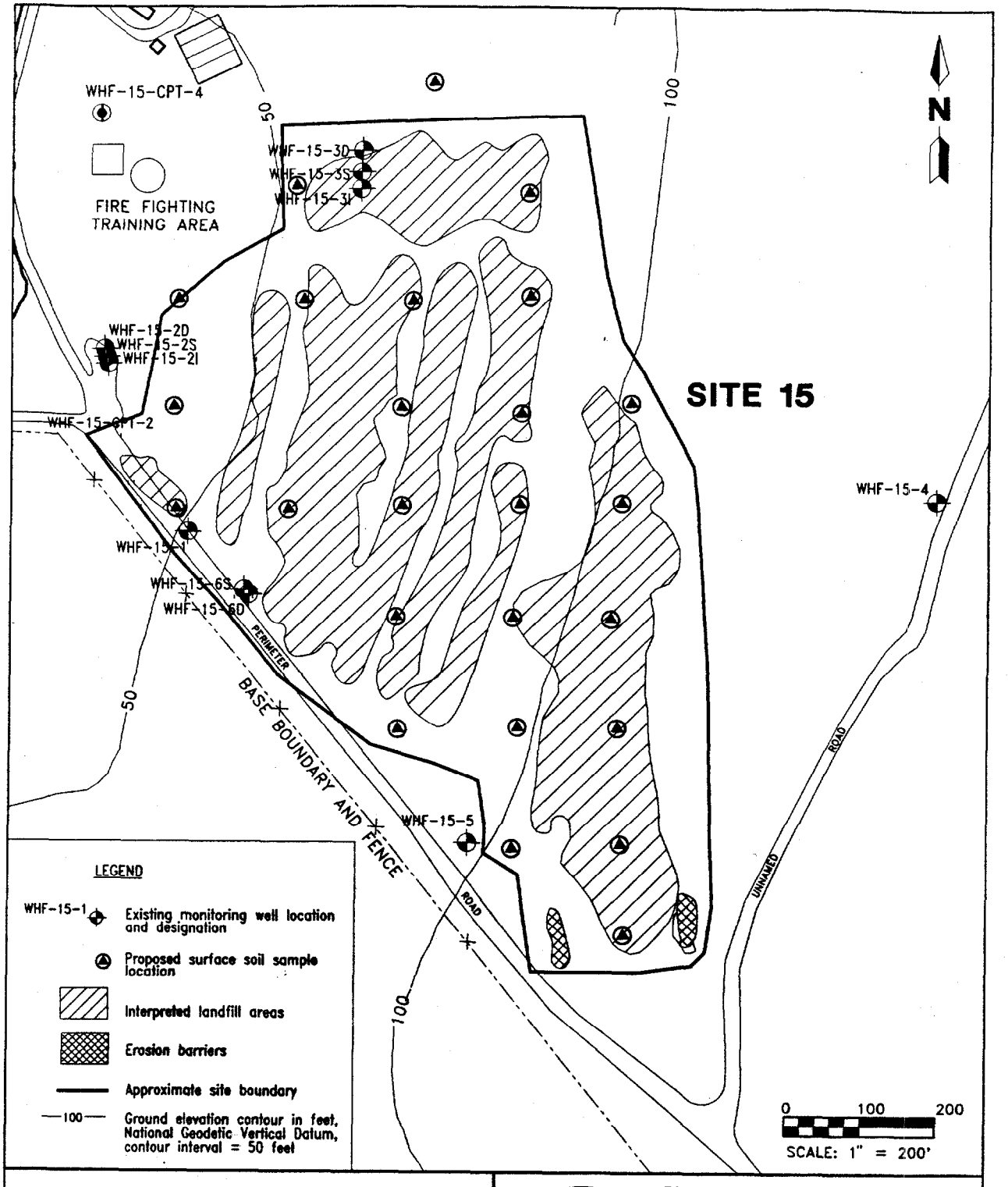

FIGURE 7-4
SITE 15,
LOCATIONS OF PROPOSED SURFACE SOIL SAMPLES

WHITING/7560-16/TEC-MEM3/SOUTHEST/KGP-WDW/03-24-95

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Three of the 25 surface soil samples will be analyzed to determined physical characteristics. The samples will be analyzed for the following physical parameters: dry bulk density, sieve analysis, hydrometer analysis, Atterberg limits, and permeability.

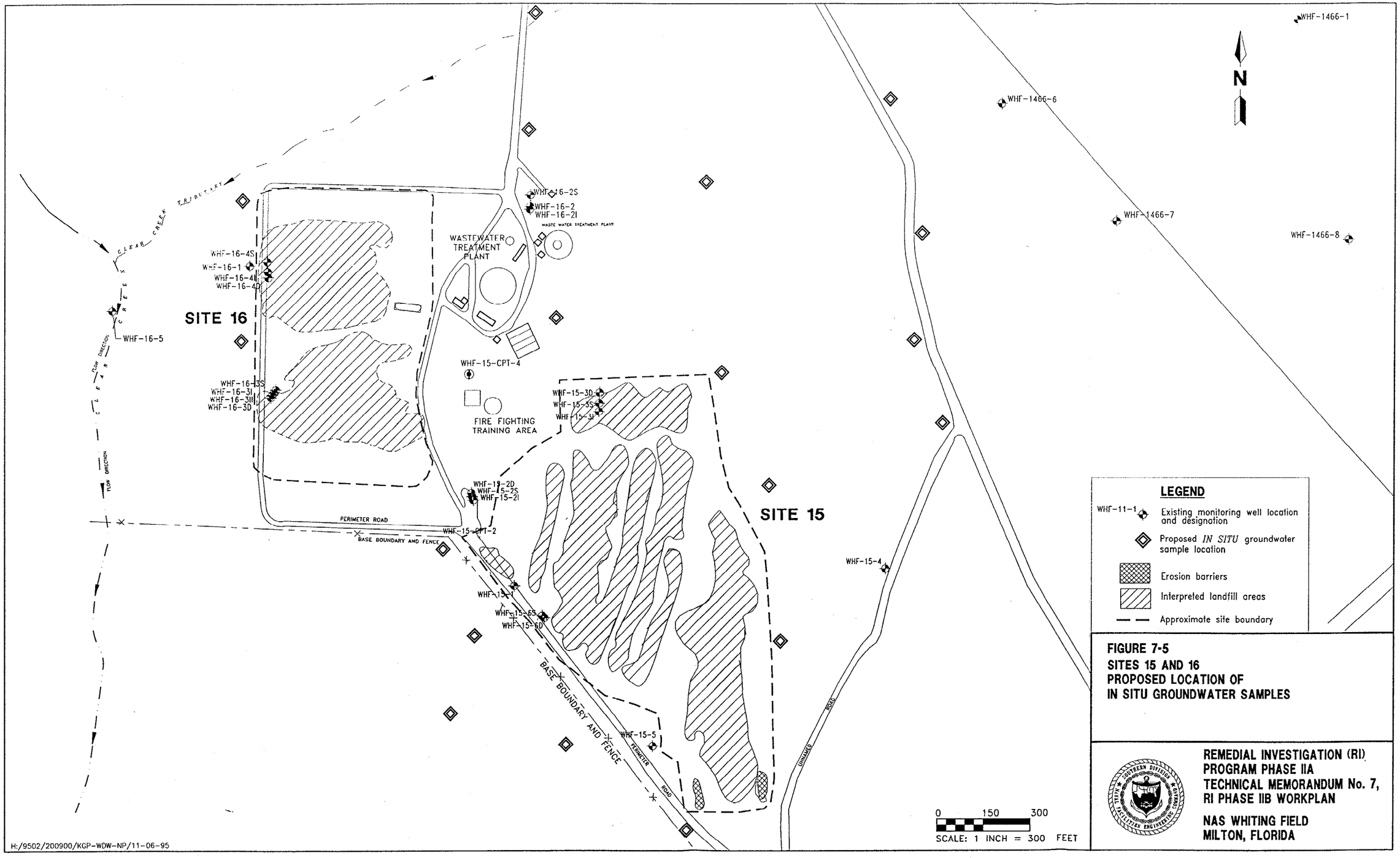
In Situ Groundwater Sampling. An *in situ* groundwater sampling method will be used to assess groundwater quality vertically and horizontally at locations hydraulically upgradient and downgradient of Site 15. Samples will be collected from four locations that are hydraulically downgradient of Site 15 (Figure 7-5). At each location, groundwater samples will be collected initially from the piezometric water level and at 20-foot intervals to an estimated maximum depth of 150 feet bls. The samples will be analyzed for BTEX and TCE using a field gas chromatograph using SW-846 Method 3810 (USEPA, 1986; ABB-ES, 1994c). Forty percent of the samples will be sent to the laboratory for confirmatory analyses.

Monitoring Well Installation. Twelve monitoring wells consisting of four well clusters consisting of shallow, intermediate, and deep monitoring well will be installed at Site 15. The purpose of the monitoring well cluster is to assess groundwater quality vertically at locations hydraulically upgradient and downgradient from Site 15. The locations of the monitoring well clusters will be based on the results of the *in situ* groundwater sampling. The location, rationale, and supporting data for the monitoring well clusters will be presented at an RPM meeting following the *in situ* groundwater sampling events.

The first well to be drilled at a monitoring well cluster will be the deep well. Deep wells will be installed with a 10-foot length screen in the zone between 80 and 110 feet below the water table. Intermediate depth wells will be installed with a 10-foot length screen in the zone between 35 and 60 feet below the water table. Shallow wells will be installed with 15-foot length screens with 10 feet below the water table and 5 feet above.

Groundwater Sampling. Twenty-three monitoring wells (11 existing and 12 newly installed monitoring wells) will be sampled to assess the nature and extent of groundwater quality at Site 15 (Figure 7-4). The groundwater samples will be collected using the modified sampling procedure (see Section 4.3). The groundwater samples will be analyzed for CLP (NEESA Level D) TCL VOCs, SVOCs, pesticides and PCBs, and TAL inorganics. Samples for TAL inorganics will be unfiltered (total analysis) if turbidity is below 5 NTU. If turbidity is greater than 5 NTU, an additional groundwater sample will be collected and filtered (dissolved phase inorganics) using a 45-micron filter. The purpose of the additional groundwater sample is to support a baseline risk assessment and future FS work, if required.

Analyses will be conducted to assess secondary water quality parameters and to provide data for assessing remedial alternatives in the FS. The analyses will include alkalinity, chloride, sulfates, color, hardness, ammonia nitrates, total Kjeldahl nitrogen, nitrate and nitrite, pH, phosphorous, total dissolved solids, and sulfides.



LEGEND

WHF-11-1 — Existing monitoring well location and designation

Proposed *IN SITU* groundwater sample location

Erosion barriers

Interpreted landfill areas

Approximate site boundary

FIGURE 7-5
SITES 15 AND 16
PROPOSED LOCATION OF
IN SITU GROUNDWATER SAMPLES

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Aquifer Characteristics Testing. Hydraulic conductivity testing will be conducted on five of the newly installed monitoring wells. Slug tests will be performed and the data will be collected using a transducer and a digital data logger. Slug test data will be downloaded into the appropriate software program for manipulation and development of documentation for incorporation into the RI report.

7.2.2 Proposed Investigation at Site 16 The following provides a brief description of the proposed number and types of environmental samples and the analytical methodology for Site 16, Open Disposal and Burning Area.

Soil Gas Survey. Previous investigations have not addressed the generation of methane or other organic compounds emanating as soil gas from Site 16. A soil gas survey will be conducted to assess whether organic and/or methane gas is emanating from the landfill or disposal area. Samples will be collected and analyzed as described in Section 4.1, Soil Gas Survey.

Surface Soil Sampling. Seventeen surface soil samples will be collected at locations shown on Figure 7-6. The surface soil samples will be analyzed for CLP (NEESA Level D) TCL VOCs, SVOCs, pesticides and PCBs, and TAL inorganic analytes.

Locations were determined using the systematic sampling method where a point is chosen at random along a transect, and then samples are collected at equidistant intervals thereafter (Gilbert, 1987; USEPA, 1989). This method will provide unbiased sample locations to support the ecological and human health risk assessments. The distance between sampling stations will be determined such that the known extent of the landfill (based on geophysical survey results) will be covered. Any sampling station that falls near a previous (RI Phase IIA) sampling location, will be replaced by another sampling station that was not already included among the 17 sample stations.

Three of the 17 surface soil samples will be analyzed to determine physical characteristics. The samples will be analyzed for the following physical parameters: dry bulk density, sieve analysis, hydrometer analysis, Atterberg limits, and permeability.

In Situ Groundwater Sampling. An *in situ* groundwater sampling method will be used to assess groundwater quality vertically and horizontally at locations hydraulically upgradient and downgradient of Site 16. Samples will be collected from four locations that are hydraulically downgradient of Site 16 (Figure 7-5). At each location, groundwater samples will be collected initially from the piezometric water level and at 20-foot intervals to an estimated maximum depth of 150 feet bls. The samples will be analyzed for BTEX and TCE using a field gas chromatograph using SW-846 Method 3810 (USEPA, 1986; ABB-ES, 1994c). Forty percent of the samples will be sent to the laboratory for confirmatory analyses.

Monitoring Well Installation. Twelve monitoring wells consisting of four well clusters consisting of shallow, intermediate, and deep monitoring wells will be installed at Site 16. The purpose of the monitoring well cluster is to assess groundwater quality at locations hydraulically upgradient and downgradient from Site 16. The

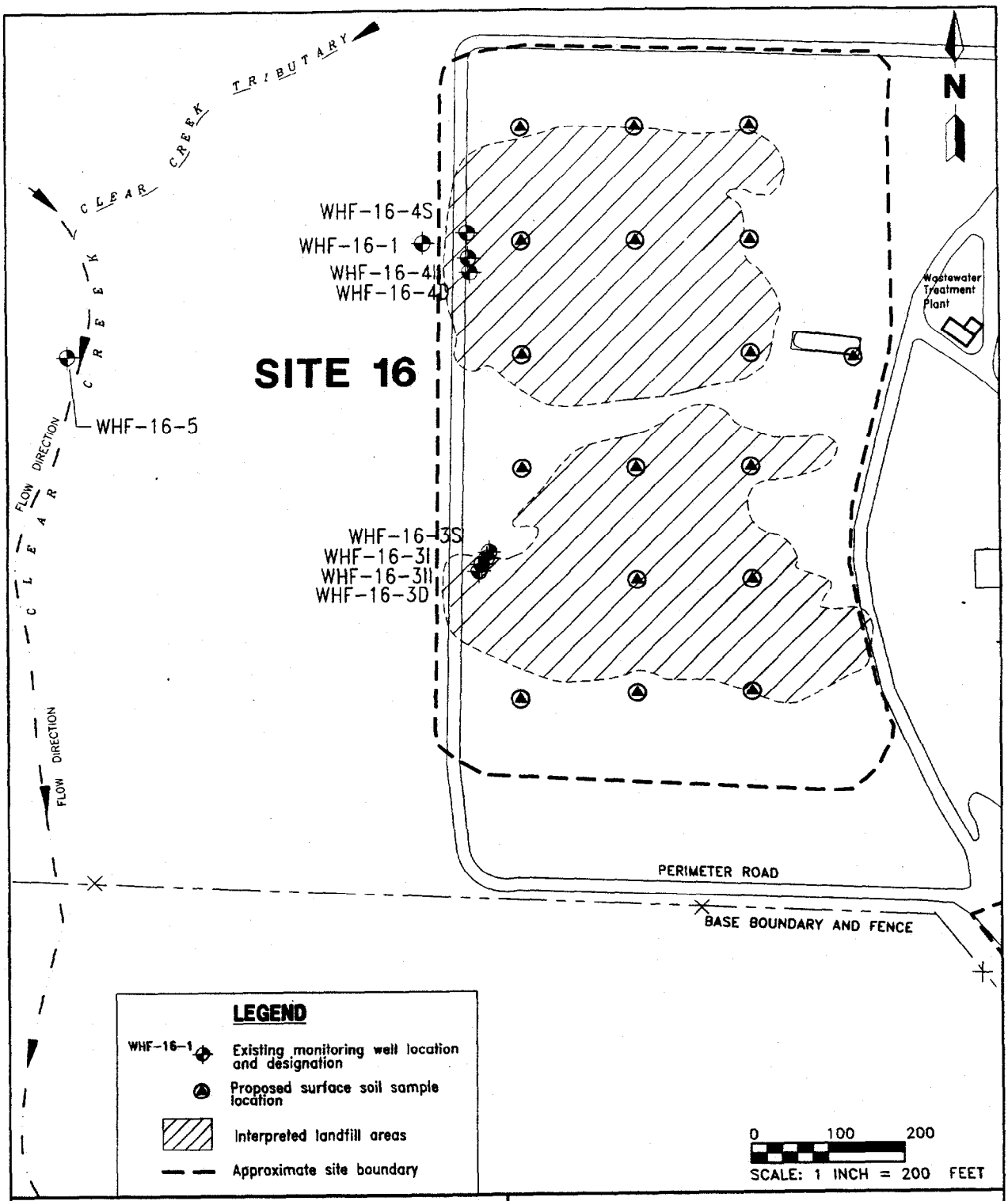

FIGURE 7-6
SITE 16,
PROPOSED LOCATIONS OF SURFACE SOIL SAMPLES

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locations of the monitoring well clusters will be based on the results of the *in situ* groundwater sampling. The location, rationale, and supporting data for the monitoring well clusters will be presented at an RPM meeting following the *in situ* groundwater sampling events.

The first well to be drilled at a monitoring well cluster will be the deep well. Deep wells will be installed with a 10-foot length screen in the zone between 80 and 110 feet below the water table. Intermediate depth wells will be installed with a 10-foot length screen in the zone between 35 and 60 feet below the water table. Shallow wells will be installed with 15-foot length screens with 10 feet below the water table and 5 feet above.

Groundwater Sampling. Twenty-four monitoring wells (12 existing and 12 newly installed monitoring wells) will be sampled to assess the nature and extent of groundwater quality at Site 16 (Figure 7-6). The groundwater samples will be collected using the modified sampling procedure (see Section 4.3). The groundwater samples will be analyzed for CLP (NEESA Level D) TCL VOCs, SVOCs, pesticides and PCBs, and TAL inorganics. Samples for TAL inorganics will be unfiltered (total analysis) if turbidity is below 5 NTU. If turbidity is greater than 5 NTU, an additional groundwater sample will be collected and filtered (dissolved phase inorganics) using a 45-micron filter. The purpose of the additional groundwater sample is to support a baseline risk assessment and future FS work, if required.

Analyses will be conducted to assess secondary water quality parameters and to provide data for assessing remedial alternatives in the FS. The analyses will include alkalinity, chloride, sulfates, color, hardness, ammonia nitrates, total Kjeldahl nitrogen, nitrate and nitrite, pH, phosphorous, total dissolved solids, and sulfides.

Aquifer Characteristics Testing. Hydraulic conductivity testing will be conducted on five of the newly installed monitoring wells. Slug tests will be performed and the data will be collected using a transducer and a digital data logger. Slug test data will be downloaded into the appropriate software program for manipulation and development of documentation for incorporation into the RI report.

7.3 OPERABLE UNIT 5. A summary of the proposed activities to be conducted at OU 5, Sites 9 through 14, is outlined below.

7.3.1 Proposed Investigation at Site 9 The following provides a brief description of the number of environmental samples and the analytical methodology for Site 9, Waste Fuel Disposal Pit.

Soil Gas Survey. Previous investigations have not addressed the generation of methane or other organic compounds emanating as soil gas from Site 9. A soil gas survey will be conducted to assess whether organic and/or methane gas is emanating from the landfill or disposal area. Samples will be collected and analyzed as described in Section 4.1, Soil Gas Survey.

Surface Soil Sampling. Seven surface soil samples will be collected for field screening analyses of TRPH (Figure 7-7). Soil samples collected for field screening will be analyzed qualitatively onsite using USEPA Method 418.1 with a Freon extraction for TRPH.

Locations will be determined using the systematic sampling method where a point will be chosen at random along a transect, and then samples will be collected at equidistant intervals thereafter (Gilbert, 1987; USEPA, 1989). This method will provide unbiased sample locations to support the ecological and human health risk assessments. The distance between sampling stations will be determined such that the known extent of the disposal area will be covered. Any sampling station that falls near a previous sampling location will be replaced by another sampling station that was not already included among the seven sample stations.

Based on the field screening results, four surface soil samples will be collected for laboratory confirmatory analyses. The surface soil samples will be analyzed for CLP (NEESA Level D) TCL VOCs, SVOCs, pesticides and PCBs, TAL inorganic analytes, and TRPH. Three of the four surface soil samples will be analyzed to determine physical characteristics. The samples will be analyzed for the following physical parameters: dry bulk density, sieve analysis, hydrometer analysis, Atterberg limits, and permeability.

Groundwater Sampling. The three existing monitoring wells will be sampled to confirm the nature and extent of groundwater quality at Site 9 (Figure 7-7). The groundwater samples will be collected using the modified sampling procedure (see Section 4.3, Modified Sampling Method). The groundwater samples will be analyzed for CLP (NEESA Level D) TCL VOCs, SVOCs, pesticides and PCBs, and TAL inorganics. Samples for TAL inorganics will be unfiltered (total analysis) if turbidity is below 5 NTU. If turbidity is greater than 5 NTU, an additional groundwater sample will be collected and filtered (dissolved phase inorganics) using a 45-micron filter. The purpose of the additional groundwater sample is to support a baseline risk assessment and future FS work, if required.

Analyses will be conducted to assess secondary water quality parameters and provide data for assessing remedial alternatives in the FS. The analyses will include alkalinity, chloride, sulfates, color, hardness, ammonia nitrates, total Kjeldahl nitrogen, nitrate and nitrite, pH, phosphorous, total dissolved solids, and sulfides.

7.3.2 Proposed Investigation at Site 10 The following provides a brief description of the number of environmental samples and the analytical methodology for Site 10, Southeast Open Disposal Area (A).

Soil Gas Survey. Previous investigations have not addressed the generation of methane or other organic compounds emanating as soil gas from Site 10. A soil gas survey will be conducted to assess whether organic and/or methane gas is emanating from the landfill or disposal area. Samples will be collected and analyzed as described in Section 4.1, Soil Gas Survey.

Surface Soil Sampling. Five surface soil samples will be collected for field screening analyses of TRPH (Figure 7-7). Soil samples collected for field screening will be analyzed qualitatively onsite using USEPA Method 418.1 with a Freon extraction for TRPH.

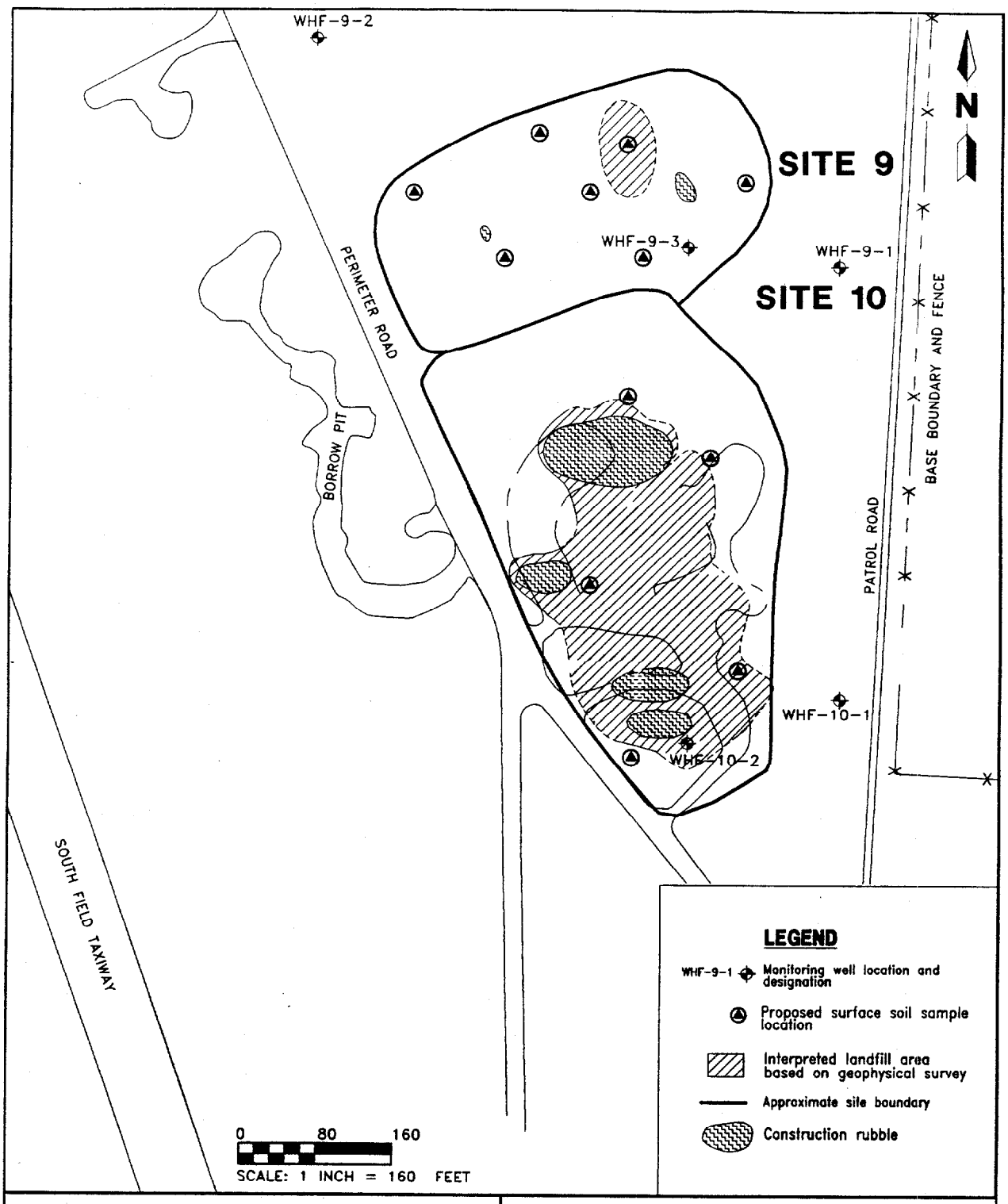

FIGURE 7-7
SITES 9 AND 10
PROPOSED LOCATION OF SURFACE SOIL SAMPLES

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Locations will be determined using the systematic sampling method where a point will be chosen at random along a transect, and then samples will be collected at equidistant intervals thereafter (Gilbert; 1987 & USEPA, 1989). This method will provide unbiased sample locations to support the ecological and human health risk assessments. The distance between sampling stations will be determined such that the known extent of the disposal area (based on the geophysical survey) will be covered. Any sampling station that falls near a previous sampling location will be replaced by another sampling station that was not already included among the five sample stations.

Based on the field screening results, five surface soil samples will be collected for laboratory confirmatory analyses. The surface soil samples will be analyzed for CLP (NEESA Level D) TCL VOCs, SVOCs, pesticides and PCBs, TAL inorganic analytes; and TRPH.

Three of the five surface soil samples will be analyzed to determine physical characteristics. The samples will be analyzed for the following physical parameters: dry bulk density, sieve analysis, hydrometer analysis, Atterberg limits, and permeability.

Groundwater Sampling. The two existing installed monitoring wells will be sampled to confirm the nature and extent of groundwater quality at Site 10 (Figure 7-7). The groundwater samples will be collected using the modified sampling procedure (see Section 4.3, Modified Sampling Method). The groundwater samples will be analyzed for CLP (NEESA Level D) TCL VOCs, SVOCs, pesticides and PCBs, and TAL inorganics. Samples for TAL inorganics will be unfiltered (total analysis) if turbidity is below 5 NTU. If turbidity is greater than 5 NTU, an additional groundwater sample will be collected and filtered (dissolved phase inorganics) using a 45-micron filter. The purpose of the additional groundwater sample is to support a baseline risk assessment and future FS work, if required.

Analyses will be conducted to assess secondary water quality parameters and provide data for assessing remedial alternatives in the FS. The analyses will include alkalinity, chloride, sulfates, color, hardness, ammonia nitrates, total Kjeldahl nitrogen, nitrate and nitrite, pH, phosphorous, total dissolved solids, and sulfides.

7.3.3 Proposed Investigation at Site 11 The following provides a brief description of the proposed number and types of environmental samples and the analytical methodology for Site 11, Southeast Open Disposal Area (B).

Soil Gas Survey. Previous investigations have not addressed the generation of methane or other organic compounds emanating as soil gas from Site 11. A soil gas survey will be conducted to assess whether organic and/or methane gas is emanating from the landfill or disposal area. Samples will be collected and analyzed as described in Section 4.1, Soil Gas Survey.

Surface Soil Sampling. Seven surface soil samples will be collected for field screening analyses of TRPH (Figure 7-8). Soil samples collected for field screening will be analyzed qualitatively onsite using USEPA Method 418.1 with a Freon extraction for TRPH.

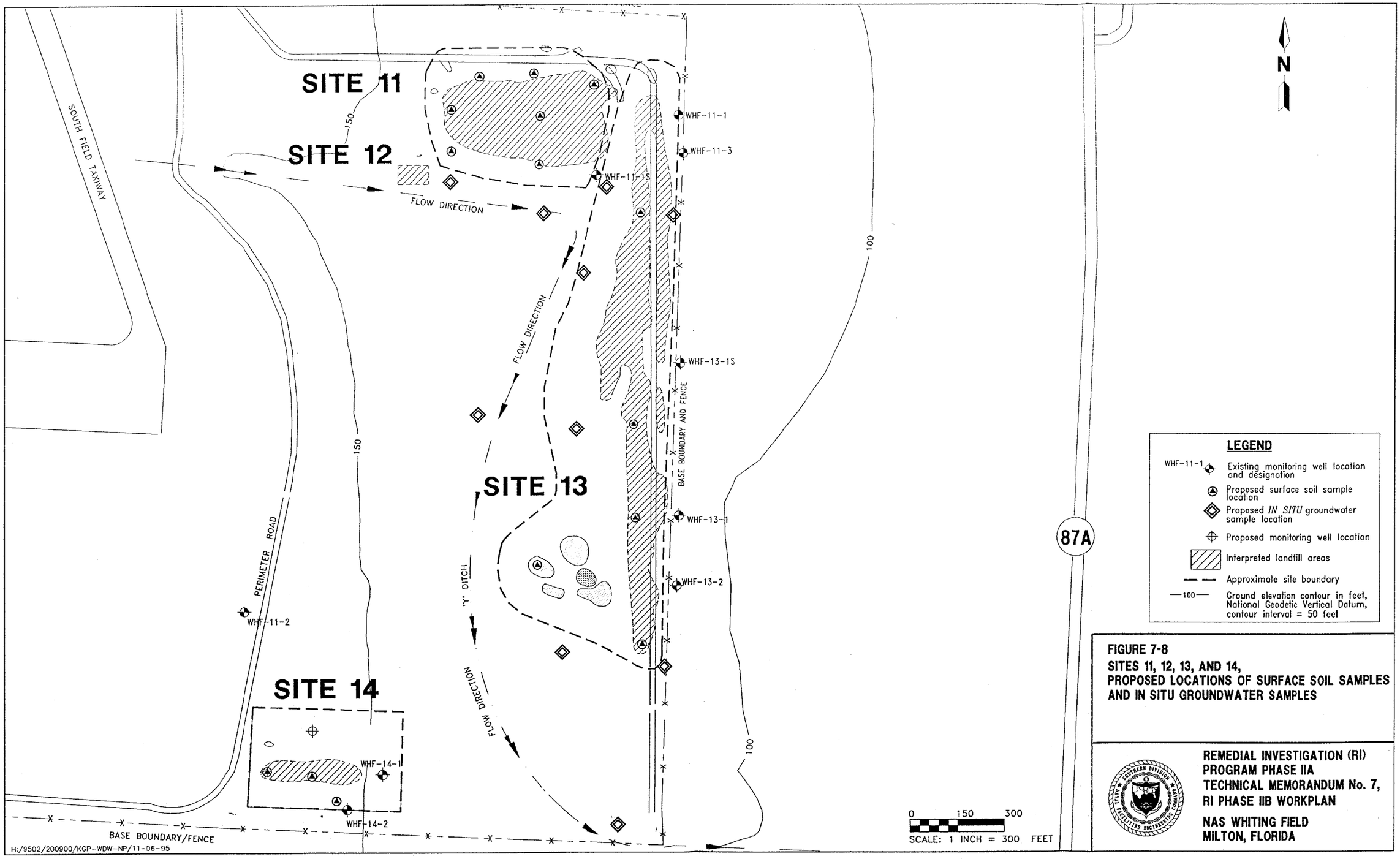

FIGURE 7-8
SITES 11, 12, 13, AND 14,
PROPOSED LOCATIONS OF SURFACE SOIL SAMPLES AND IN SITU GROUNDWATER SAMPLES

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Locations will be determined using the systematic sampling method. A point will be chosen at random along a transect, and then samples will be collected at equidistant intervals thereafter (Gilbert, 1987; USEPA, 1989). This method will provide unbiased sample locations to support the ecological and human health risk assessments. The distance between sampling stations will be determined such that the known extent of the disposal area (based on the geophysical survey) will be covered. Any sampling station that falls near a previous sampling location will be replaced by another sampling station that was not already included among the five sample stations.

Based on the field screening results seven surface soil samples will be collected for laboratory confirmation analysis. The surface soil samples will be analyzed for CLP (NEESA Level D) TCL VOCs, SVOCs, pesticides and PCBs, TAL inorganic analytes, and TRPH.

Three of the seven surface soil samples will be analyzed to determine physical characteristics. The samples will be analyzed for the following physical parameters: dry bulk density, sieve analysis, hydrometer analysis, Atterberg limits, and permeability.

In Situ Groundwater Sampling. An *in situ* groundwater sampling method will be used to assess groundwater quality vertically and horizontally at locations hydraulically downgradient of Site 11. Five locations will be completed hydraulically downgradient of Site 11 (Figure 7-8). At each location, groundwater samples will be collected initially from the piezometric water level and at 20-foot intervals to an estimated maximum depth of 180 feet bls. The samples will be analyzed for BTEX and TCE using a field gas chromatograph using SW-846 Method 3810 (USEPA, 1986; ABB-ES, 1994c). Forty percent of the samples will be sent to the laboratory for confirmatory analysis.

Monitoring Well Installation. Four monitoring wells consisting of two well clusters of a shallow and deep monitoring well will be installed at Site 11. The purpose of the monitoring well cluster is to assess groundwater quality at locations hydraulically downgradient from Site 11. The locations of the monitoring well clusters will be based on the results of the *in situ* groundwater sampling. The location, rationale, and supporting data for the monitoring well clusters will be presented at an RPM meeting following the *in situ* groundwater sampling events.

The first well to be drilled at a monitoring well cluster will be the deep well. Deep monitoring wells will be installed with a 10-foot length screen in a zone between 50 and 80 feet below the top of the water table. Shallow monitoring wells will be installed with 15-foot screens with 5 feet of screen above the water table and 10 feet below.

Groundwater Sampling. The four existing and four newly installed monitoring wells will be sampled to assess the nature and extent of groundwater quality at Site 11 (Figure 7-8). The groundwater samples will be collected using the modified sampling procedure (see Section 4.3, Modified Sampling Method). The groundwater samples will be analyzed for CLP (NEESA Level D) TCL VOCs, SVOCs, pesticides and PCBs, and TAL inorganics. Samples for TAL inorganics will be unfiltered (total analysis) if turbidity is below 5 NTU. If turbidity is greater than 5 NTU, an additional groundwater sample will be collected and filtered (dissolved phase inorganics) using a 45-micron filter. The purpose of the

additional groundwater sample is to support a baseline risk assessment and future FS work, if required.

Analyses will be conducted to assess secondary water quality parameters and provide data for assessing remedial alternatives in the FS. The analyses will include alkalinity, chloride, sulfates, color, hardness, ammonia nitrates, total Kjeldahl nitrogen, nitrate and nitrite, pH, phosphorous, total dissolved solids, and sulfides.

Aquifer Characteristics Testing. Hydraulic conductivity testing will be conducted on two of the newly installed monitoring wells. Slug tests will be performed and the data will be collected using a transducer and a digital data logger. Slug test data will be downloaded into the appropriate software program for manipulation and development of documentation for incorporation into the RI report.

7.3.4 Proposed Investigation at Site 12 The following provides a brief description of the proposed number and types of environmental samples and the analytical methodology for Site 12, Tetraethyl Lead Disposal Area.

Surface Soil Sampling. Previously soil samples were collected from the middle of the mounds and from the mound and land surface interface only. Proposed soil sampling locations will include the area surrounding the mounds to support the RI, the baseline risk assessments, and future FS work, if required.

Six surface soil samples will be collected at locations shown on Figure 7-9. The surface soil samples will be analyzed for CLP (NEESA Level D) TCL VOCs, SVOCs, pesticides and PCBs, TAL inorganic analytes, and TRPH.

Soil Boring. A single soil boring will be drilled on the southern side of Site 12 (Figure 7-9). Subsurface soil samples will be collected at intervals of 5, 10, 15, 25, and 50 feet below land surface. The samples will be collected and analyzed for TRPH.

Monitoring Well Installation. One monitoring well will be installed to assess groundwater quality hydraulically downgradient of Site 12 (Figure 7-9). The monitoring well will be screened across the water table with 5 feet of screen above and 10 feet below.

Groundwater Sampling. The one existing and one newly installed monitoring well will be sampled to confirm the nature and extent of groundwater quality at Site 12 (Figure 7-9). The groundwater samples will be collected using the modified sampling procedure (see Section 4.3, Modified Sampling Method). The groundwater samples will be analyzed for CLP (NEESA Level D) TCL VOCs, SVOCs, pesticides and PCBs, and TAL inorganics. Samples for TAL inorganics will be unfiltered (total analysis) if turbidity is below 5 NTU. If turbidity is greater than 5 NTU, an additional groundwater sample will be collected and filtered (dissolved phase inorganics) using a 45-micron filter. The purpose of the additional groundwater sample is to support a baseline risk assessment and future FS work, if required.

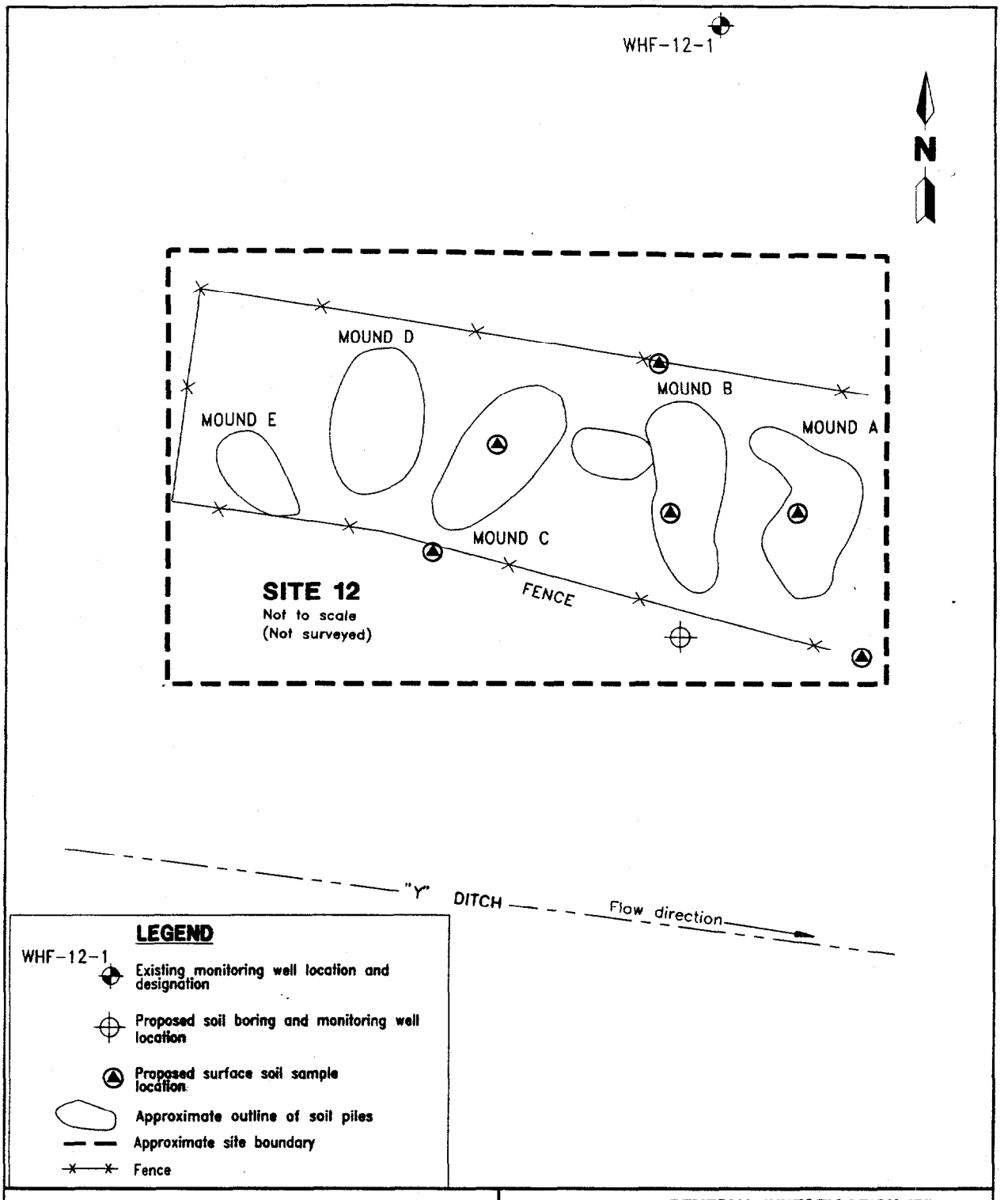

FIGURE 7-9
SITE 12,
PROPOSED LOCATIONS OF SURFACE SOIL SAMPLES, SOIL BORING AND MONITORING WELL

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Analyses will be conducted to assess secondary water quality parameters and provide data for assessing remedial alternatives in the FS. The analyses will include alkalinity, chloride, sulfates, color, hardness, ammonia nitrates, total Kjeldahl nitrogen, nitrate and nitrite, pH, phosphorous, total dissolved solids, and sulfides.

Aquifer Characteristics Testing. Hydraulic conductivity testing will be conducted on the newly installed monitoring well. Slug tests will be performed and the data will be collected using a transducer and a digital data logger. Slug test data will be downloaded into the appropriate software program for manipulation and development of documentation for incorporation into the RI report.

7.3.5 Proposed Investigation at Site 13 The following provides a brief description of the proposed number and types of environmental samples and the analytical methodology for Site 13, Sanitary Landfill.

Soil Gas Survey. Previous investigations have not addressed the generation of methane or other organic compounds emanating as soil gas from Site 13. A soil gas survey will be conducted to assess whether organic and/or methane gas is emanating from the landfill or disposal area. Samples will be collected and analyzed as described in Section 4.1 Soil Gas Survey.

Surface Soil Sampling. Five surface soil samples will be collected at locations shown on Figure 7-8. Locations will be determined using the systematic sampling method where a point will be chosen at random along a transect, and then samples will be collected at equidistant intervals thereafter (Gilbert, 1987; USEPA, 1989). This method will provide unbiased sample locations to support the ecological and human health risk assessments. The distance between sampling stations will be determined such that the known extent of the disposal area (based on the geophysical survey) will be covered. Any sampling station that falls near a previous sampling location will be replaced by another sampling station that was not already included among the five sample stations.

The surface soil samples will be analyzed for CLP (NEESA Level D) TCL VOCs, SVOCs, pesticides and PCBs, and TAL inorganic analytes.

Three of the five surface soil samples will be analyzed to determine physical characteristics. The samples will be analyzed for the following physical parameters: dry bulk density, sieve analysis, hydrometer analysis, Atterberg limits, and permeability.

In Situ Groundwater Sampling. An *in situ* groundwater sampling method will be used to assess groundwater quality vertically and horizontally at locations hydraulically upgradient and downgradient of Site 13. Five locations will be completed hydraulically downgradient of Site 13 (Figure 7-8). At each location, groundwater samples will be collected initially from the piezometric water level and at 20-foot intervals to an estimated maximum depth of 180 feet bls. The samples will be analyzed for BTEX and TCE using a field gas chromatograph using SW-846 Method 3810 (USEPA, 1986; ABB-ES, 1994c). Forty percent of the samples will be sent to the laboratory for confirmatory analyses.

Monitoring Well Installation. Four monitoring wells consisting of two well clusters consisting of shallow and deep monitoring well will be installed at Site 13. The purpose of the monitoring well cluster is to assess groundwater quality

at locations hydraulically downgradient from Site 13. The locations of the monitoring well clusters will be based on the results of the *in situ* groundwater sampling. The location, rationale, and supporting data for the monitoring well clusters will be presented at an RPM meeting following the *in situ* groundwater sampling events.

The first well to be drilled at a monitoring well cluster will be the deep well. Deep monitoring wells will be installed with a 10-foot length screen in a zone between 50 and 80 feet below the top of the water table. Shallow monitoring wells will be installed with 15-foot screens with 5 feet of screen above the water table and 10 feet below.

Groundwater Sampling. The three existing and four newly installed monitoring wells will be sampled to assess the nature and extent of groundwater quality at Site 13 (Figure 7-8). The groundwater samples will be collected using the modified sampling procedure (see Section 4.3, Modified Sampling Method). The groundwater samples will be analyzed for CLP (NEESA Level D) TCL VOCs, SVOCs, pesticides and PCBs, and TAL inorganics. Samples for TAL inorganics will be unfiltered (total analysis) if turbidity is below 5 NTU. If turbidity is greater than 5 NTU, an additional groundwater sample will be collected and filtered (dissolved phase inorganics) using a 45-micron filter. The purpose of the additional groundwater sample is to support a baseline risk assessment and future FS work, if required.

Analyses will be conducted to assess secondary water quality parameters and provide data for assessing remedial alternatives in the FS. The analyses will include alkalinity, chloride, sulfates, color, hardness, ammonia nitrates, total Kjeldahl nitrogen, nitrate and nitrite, pH, phosphorous, total dissolved solids, and sulfides.

Aquifer Characteristics Testing. Hydraulic conductivity testing will be conducted on two of the newly installed monitoring wells. Slug tests will be performed and the data will be collected using a transducer and a digital data logger. Slug test data will be downloaded into the appropriate software program for manipulation and development of documentation for incorporation into the RI report.

7.3.6 Proposed Investigation at Site 14 The following provides a brief description of the proposed number and types of environmental samples and the analytical methodology for Site 14, Short-term Sanitary Landfill.

Soil Gas Survey. Previous investigations have not addressed the generation of methane or other organic compounds emanating as soil gas from Site 14. A soil gas survey will be conducted to assess whether organic and/or methane gas is emanating from the landfill or disposal area. Samples will be collected and analyzed as described in Section 4.1 Soil Gas Survey.

Surface Soil Sampling. Three surface soil samples will be collected at locations shown on Figure 7-8. The samples will be collected from random unbiased locations to support the ecological and human health risk assessments. The surface soil samples will be analyzed for CLP (NEESA Level D) TCL VOCs, SVOCs, pesticides and PCBs, and TAL inorganic analytes.

Three surface soil samples will be analyzed to determine physical characteristics. The samples will be analyzed for the following physical parameters: dry bulk density, sieve analysis, hydrometer analysis, Atterberg limits, and permeability.

Monitoring Well Installation. One monitoring well will be installed hydraulically upgradient from Site 14 to assess groundwater quality (Figure 7-8). The monitoring well will be completed to a depth of approximately 90 feet bls and will be screened across the piezometric water level.

Groundwater Sampling. The two existing and one newly installed monitoring well will be sampled to assess the nature and extent of groundwater quality at Site 14 (Figure 7-8). The groundwater samples will be collected using the modified sampling procedure (see Section 4.3, Modified Sampling Method). The groundwater samples will be analyzed for CLP (NEESA Level D) TCL VOCs, SVOCs, pesticides and PCBs, and TAL inorganics. Samples for TAL inorganics will be unfiltered (total analysis) if turbidity is below 5 NTU. If turbidity is greater than 5 NTU, an additional groundwater sample will be collected and filtered (dissolved phase inorganics) using a 45-micron filter. The purpose of the additional groundwater sample is to support a baseline risk assessment and future FS work, if required.

Analyses will be conducted to assess secondary water quality parameters and provide data for assessing remedial alternatives in the FS. The analyses will include alkalinity, chloride, sulfates, color, hardness, ammonia nitrates, total Kjeldahl nitrogen, nitrate and nitrite, pH, phosphorous, total dissolved solids, and sulfides.

Aquifer Characteristics Testing. Hydraulic conductivity testing will be conducted on the newly installed monitoring well. Slug tests will be performed and the data will be collected using a transducer and a digital data logger. Slug test data will be downloaded into the appropriate software program for manipulation and development of documentation for incorporation into the RI report.

7.4 OPERABLE UNIT 6. A summary of the proposed activities to be conducted at OU 6, Site 31A through 31F is outlined below.

Proposed Investigation at Site 31. The following provides a brief description of the proposed number and types of environmental samples and the analytical methodology for:

- 31 A, Sludge Drying Beds;
- 31 B, Sludge Drying Beds Disposal Area;
- 31 C, Sludge Drying Beds Disposal Area;
- 31 D, Sludge Drying Beds Disposal Area;
- 31 E, Sludge Drying Beds Disposal Area; and
- 31 F, Sludge Drying Beds Disposal Area.

Surface Soil Sampling. Surface soil sampling will consist of collecting 36 samples (28 grab samples and 8 composite samples) for laboratory analyses (Figures 7-10 through 7-12). The surface soil samples will be analyzed for CLP (NEESA Level D) TCL VOCs, SVOCs, pesticides and PCBs, and TAL inorganics. Additionally three of the samples from Site 31C will be analyzed for TCLP analytes. Eight composite surface soil samples will be collected at 31A, the sludge drying beds.

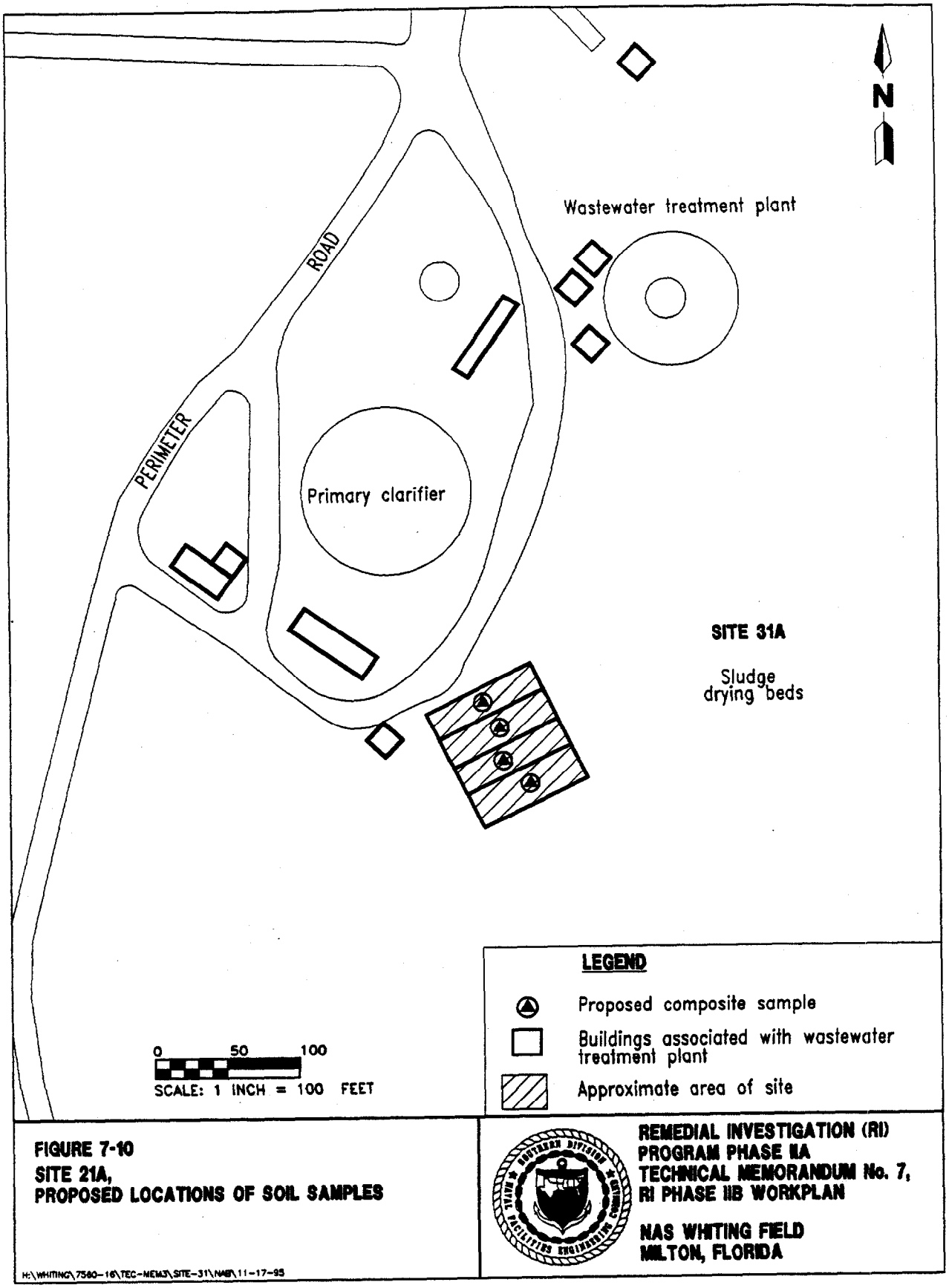

FIGURE 7-10
SITE 21A,
PROPOSED LOCATIONS OF SOIL SAMPLES

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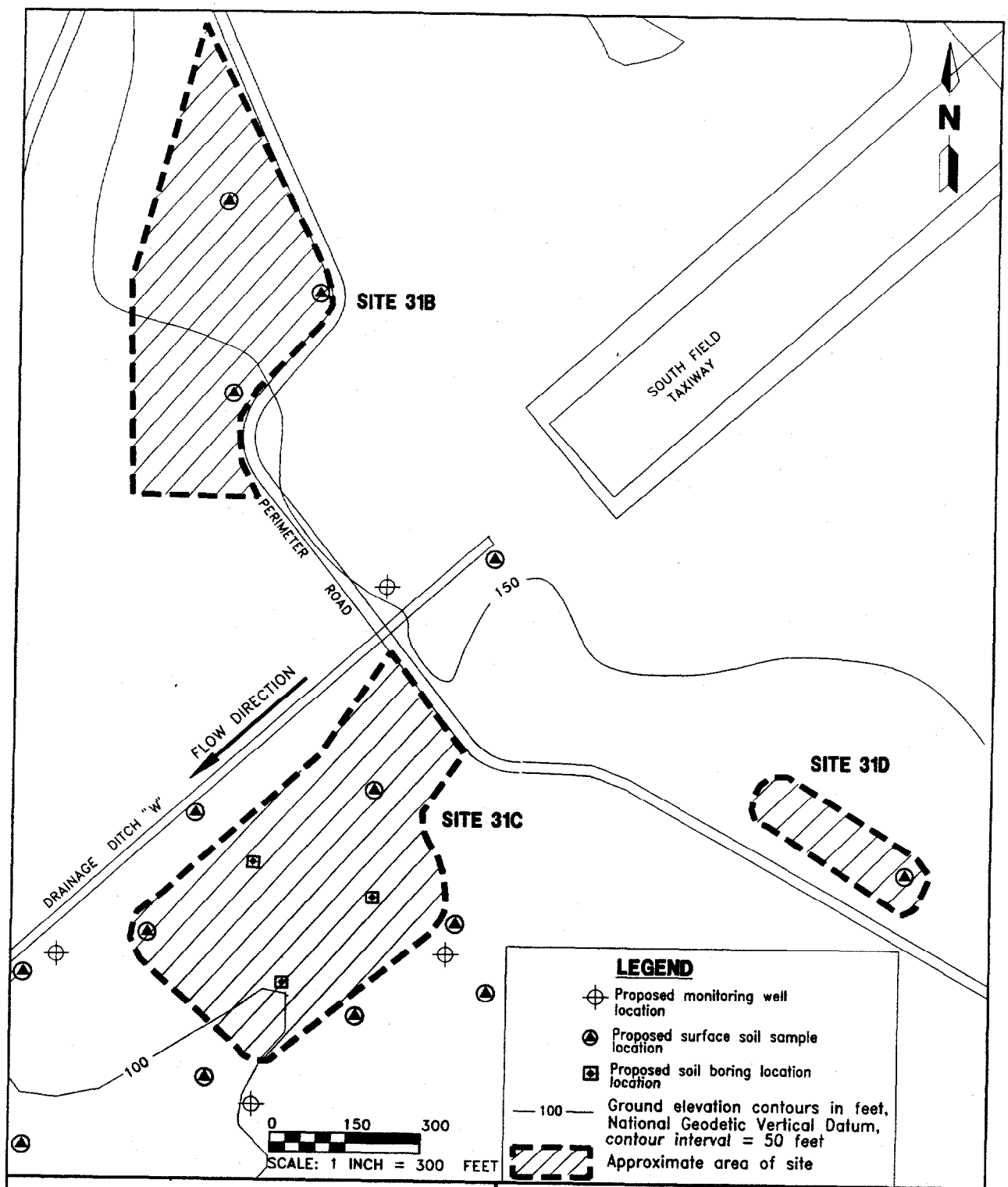

FIGURE 7-11
SITES 31B, 31C, AND 31D,
PROPOSED LOCATIONS OF SURFACE SOIL SAMPLES, SOIL BORINGS, AND MONITORING WELLS

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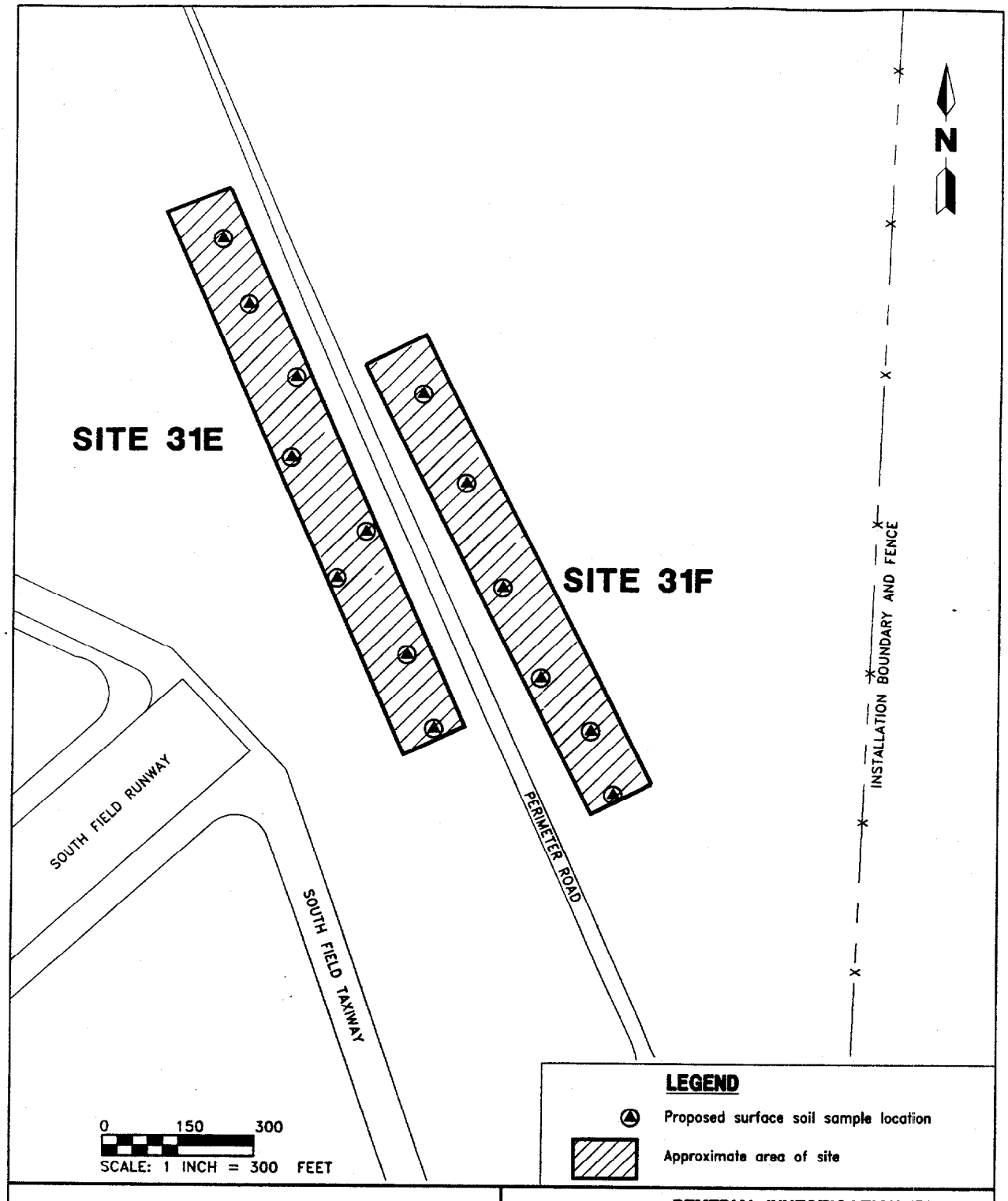

FIGURE 7-12
SITES 31E AND 31F,
PROPOSED LOCATIONS OF SURFACE SOIL SAMPLES

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The grab samples will be collected from sites 31B, 31C, 31D, 31E, and 31F. The following lists the number of surface soil grab samples for the disposal areas:

- three surface soil samples at Site 31B,
- ten surface soil samples at Site 31C,
- one surface soil sample at Site 31D,
- eight surface soil samples at Site 31E, and
- six surface soil samples at Site 31F.

Soil Boring. Three soil borings will be completed at Site 31C to conduct a vertical assessment of organic compounds and inorganic analytes previously detected in surface soil samples during the RI Phase IIA investigation (Figure 7-11). Subsurface soil samples will be collected at intervals of 5, 10, 15, 20, and 25 feet bls. The subsurface soil samples will be analyzed for CLP (NEESA Level D) TCL VOCs, SVOCs, pesticides and PCBs, and TAL inorganics.

Monitoring Well Installation. Three monitoring wells will be installed at Site 31C to assess groundwater quality hydraulically upgradient and downgradient of the site (Figure 7-11). Groundwater flow direction was evaluated from groundwater elevation data collected in the surrounding South Field industrial area and Operable Unit 5 (ABB-ES, 1995b). One monitoring well will be located northeast (upgradient) of Site 31C and three monitoring wells will be located southwest (downgradient). The monitoring wells will be completed to a depth of approximately 135 feet bls and will be screened across the piezometric water level.

Groundwater Sampling. The four newly installed monitoring wells will be sampled to assess the nature of groundwater contamination at Site 31C (Figure 7-11). The groundwater samples will be collected using the modified sampling procedure (see Section 4.3, Modified Sampling Method). The groundwater samples will be analyzed for CLP (NEESA Level D) TCL VOCs, SVOCs, pesticides and PCBs, and TAL inorganics. Samples for TAL inorganics will be unfiltered (total analysis) if turbidity is below 5 NTU. If turbidity is greater than 5 NTU, an additional groundwater sample will be collected and filtered (dissolved phase inorganics) using a 45-micron filter. The purpose of the additional groundwater sample is to support a baseline risk assessment and future FS work, if required.

Analyses will be conducted to assess secondary water quality parameters and provide data for assessing remedial alternatives in the FS. The analyses will include alkalinity, chloride, sulfates, color, hardness, ammonia nitrates, total Kjeldahl nitrogen, nitrate and nitrite, pH, phosphorous, total dissolved solids, and sulfides.

Aquifer Characteristics Testing. Hydraulic conductivity testing will be conducted on two of the newly installed monitoring wells. Slug tests will be performed and the data will be collected using a transducer and a digital data logger. Slug test data will be downloaded into the appropriate software program for manipulation and development of documentation for incorporation into the RI report.

8.0 PROFESSIONAL REVIEW CERTIFICATION

The groundwater assessment contained in this report was prepared using sound principles and judgment. This workplan is based on the geologic investigation and associated information detailed in the text and appended to this report. If conditions are determined to exist that differ from those described, the undersigned geologist should be notified to evaluate the effects of any additional information on the assessment described in this report. Technical Memorandum No. 7, RI Phase IIB workplan, was developed for NAS Whiting Field in Milton, Florida, and should not be construed to apply to any other site.

Gerald A. Walker

Gerald A. Walker
Professional Geologist
P.G. No. 1180

November 20, 1995

9.0 PROJECT ORGANIZATION

The overall organizational structure for the remedial investigation conducted for OUs 1 through 7 is presented on Figure 9-1. The ABB-ES task order manager will be responsible for project management, including coordination of QA/QC measures, field investigation, health and safety programs, data evaluation and reporting, risk assessment, feasibility studies, and technical coordination of project oversight for long range planning goals and objectives.

The ABB-ES task order manager is responsible for oversight of all project activities and will communicate with the engineer-in-charge regarding all project related activities. Figure 9-1 also presents organizational structure for field activities and coordination of subcontract field and laboratory support, risk assessment, feasibility studies and data evaluation, and report writing teams. Activities conducted by subcontractors will be supervised by ABB-ES personnel. Figure 9-2 presents the organizational structure for the Comprehensive Long-term Environmental Action, Navy program at ABB-ES.

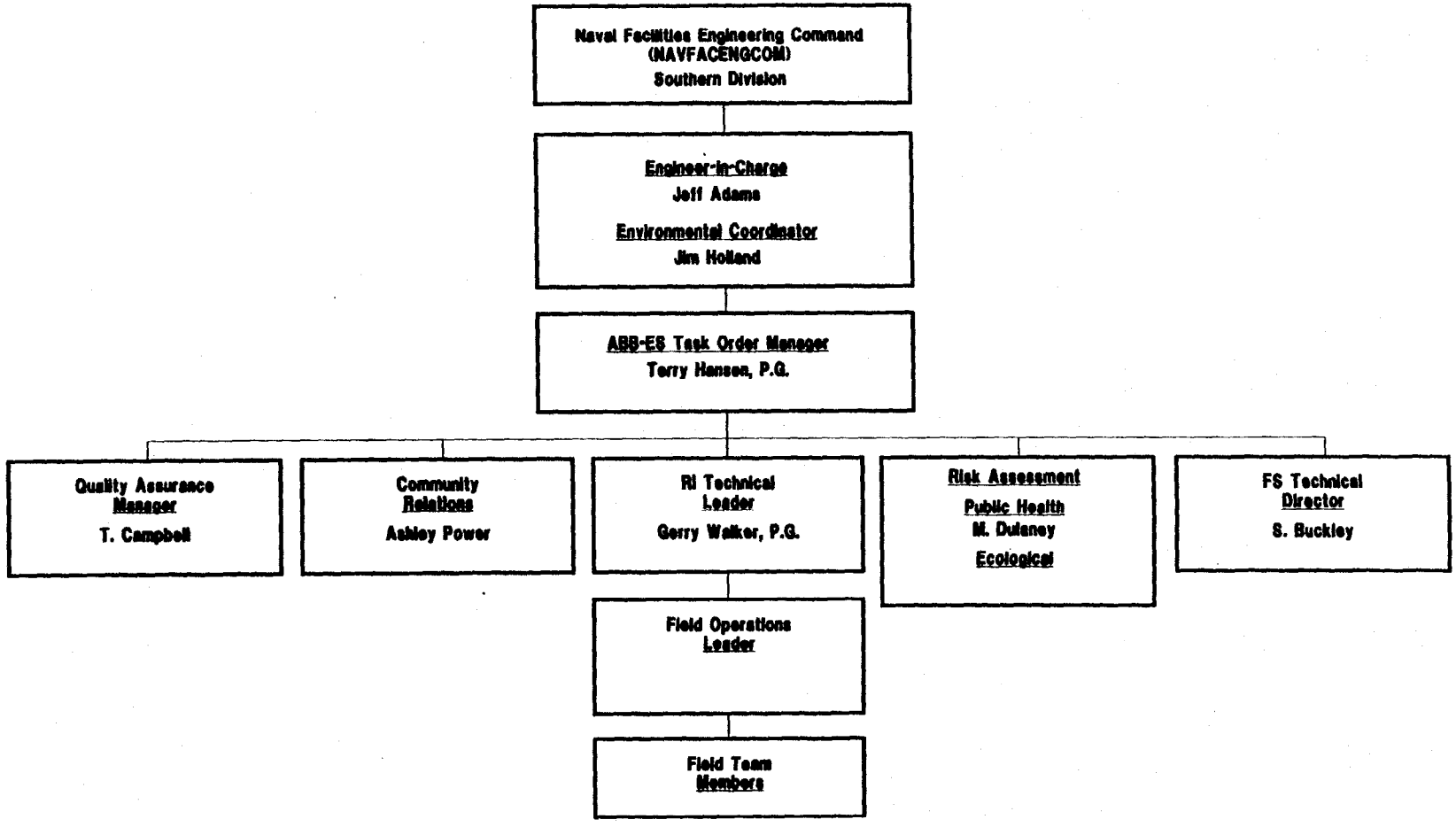

FIGURE 9-1
PROJECT ORGANIZATION

REMEDIAL INVESTIGATION (RI)
PROGRAM PHASE IIA
TECHNICAL MEMORANDUM No. 7,
RI PHASE IIB WORKPLAN

NAS WHITING FIELD
MILTON, FLORIDA

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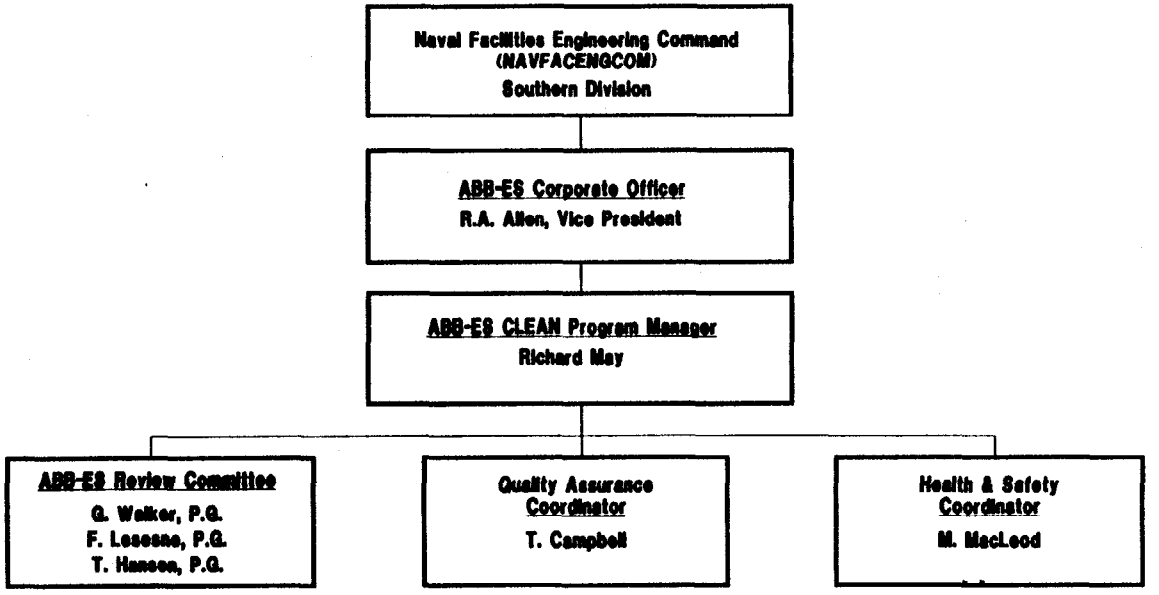

FIGURE 9-2
PROGRAM ORGANIZATION

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REMEDIAL INVESTIGATION (RI)
PROGRAM PHASE IIA
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APPENDIX A

GROUNDWATER CONTOUR MAPS

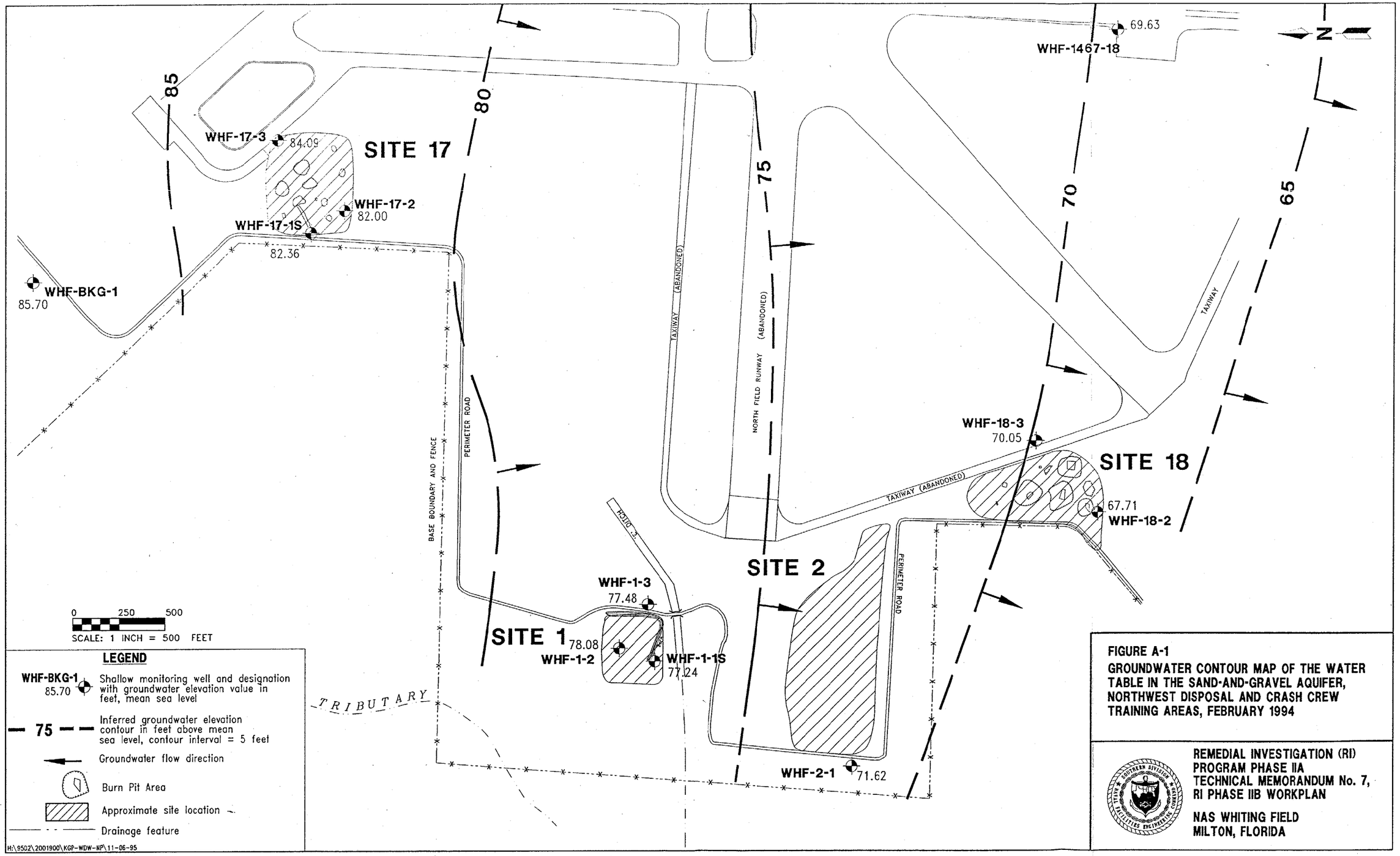

FIGURE A-1
GROUNDWATER CONTOUR MAP OF THE WATER TABLE IN THE SAND-AND-GRAVEL AQUIFER, NORTHWEST DISPOSAL AND CRASH CREW TRAINING AREAS, FEBRUARY 1994

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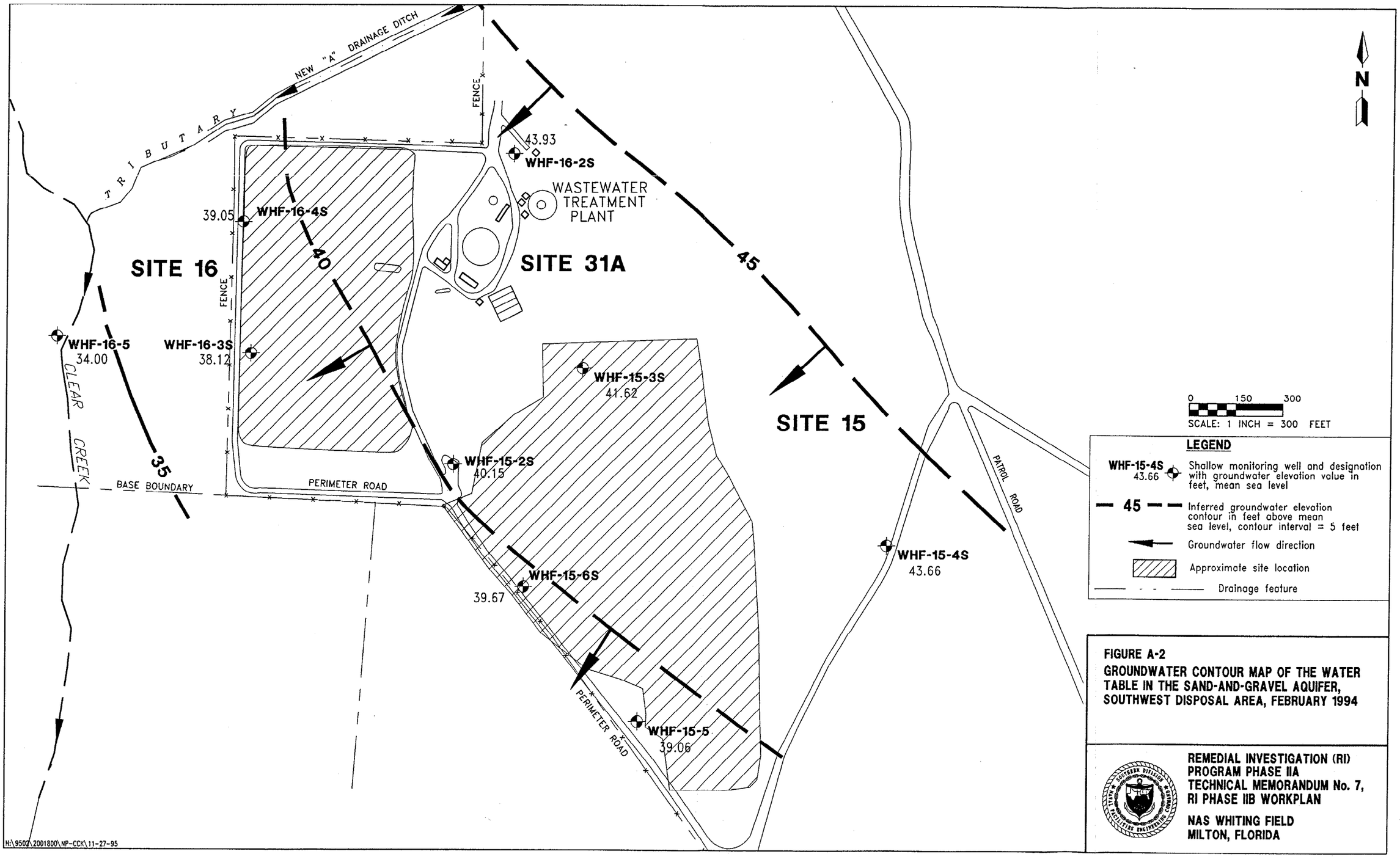

FIGURE A-2
GROUNDWATER CONTOUR MAP OF THE WATER TABLE IN THE SAND-AND-GRAVEL AQUIFER, SOUTHWEST DISPOSAL AREA, FEBRUARY 1994

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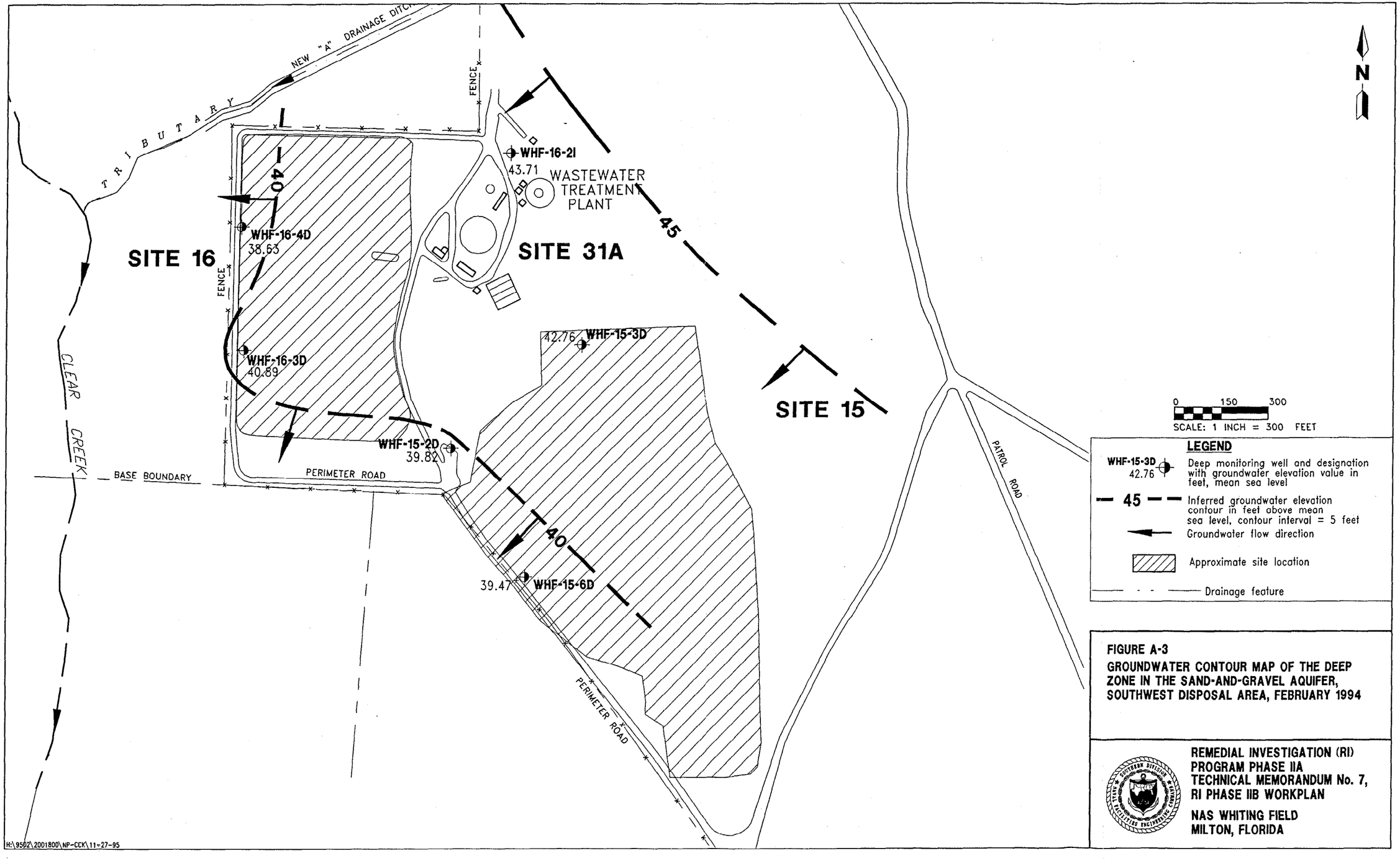

FIGURE A-3
GROUNDWATER CONTOUR MAP OF THE DEEP ZONE IN THE SAND-AND-GRAVEL AQUIFER, SOUTHWEST DISPOSAL AREA, FEBRUARY 1994

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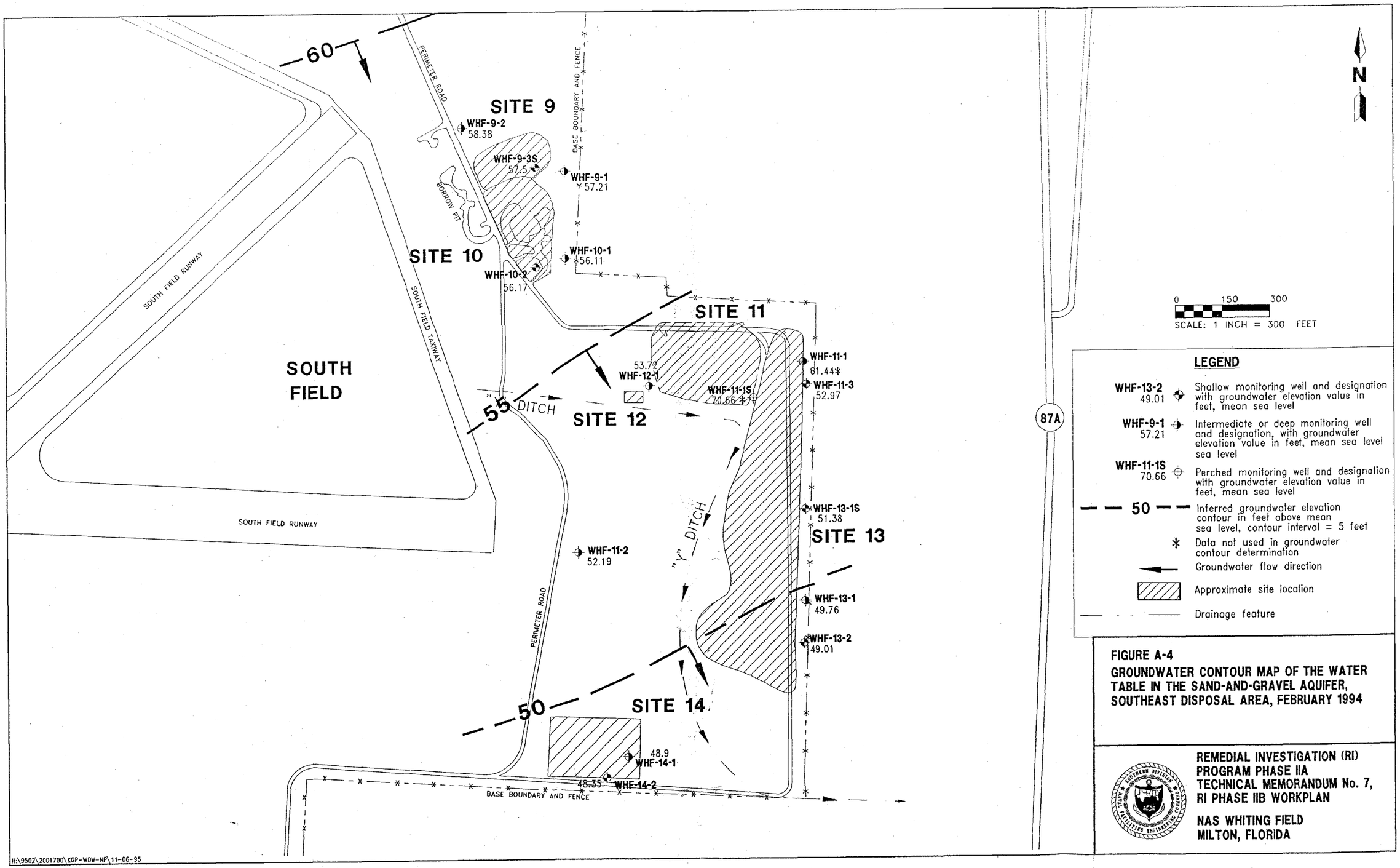

LEGEND

WHF-13-2 49.01	Shallow monitoring well and designation with groundwater elevation value in feet, mean sea level
WHF-9-1 57.21	Intermediate or deep monitoring well and designation, with groundwater elevation value in feet, mean sea level sea level
WHF-11-1S 70.66	Perched monitoring well and designation with groundwater elevation value in feet, mean sea level
50	Inferred groundwater elevation contour in feet above mean sea level, contour interval = 5 feet
*	Data not used in groundwater contour determination
	Groundwater flow direction
	Approximate site location
	Drainage feature

FIGURE A-4
GROUNDWATER CONTOUR MAP OF THE WATER TABLE IN THE SAND-AND-GRAVEL AQUIFER, SOUTHEAST DISPOSAL AREA, FEBRUARY 1994

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