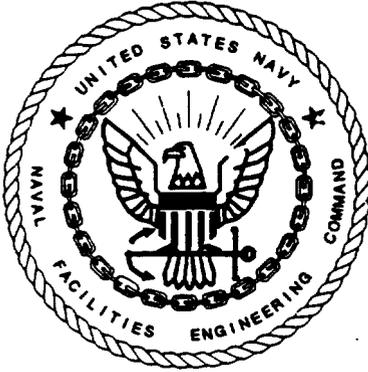


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**COMPREHENSIVE LONG-TERM**

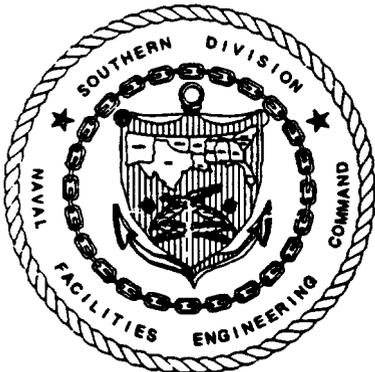
**ENVIRONMENTAL ACTION PLAN FOR**  
**FIN. SAMPLING ANALYSIS FOR**  
**SITE 4 (ARMY AMMUNITION AREA)**  
**SITE 5 (FORTREDOUBT AREA)**  
**SITE 7 (FIREFIGHTING SCHOOL)**  
**SITE 8 (RIFLE RANGE DISPOSAL AREA)**  
**SITE 16 (BRUSH DISPOSAL)**  
**SITE 22 (REPAIR SHOP)**  
**NAVAL AIR STATION**  
**PENSACOLA, FLORIDA**



**SOUTHNAVFACENGC  
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**Prepared for:**

**COMPREHENSIVE LONG-TERM  
ENVIRONMENTAL ACTION NAVY (CLEAN)  
NAVAL SUPPORT ACTIVITY  
NAVAL AIR STATION  
PENSACOLA, FLORIDA**



**Prepared by:**

**EnSafe/Allen & Hoshall  
5720 Summer Trees Drive, Suite 8  
Memphis, Tennessee 38134  
(904) 383-9115**

**November 10, 1995**

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19. Abstract

This Sampling and Analysis Plan is for Site 4 (Army Rubble Disposal Area), Site 6 (Fort Redoubt Disposal Area), Site 7 (Firefighting School), Site 8 (Rifle Range Disposal Area), Site 16 (Brush Disposal Area), and Site 22 (Refueler Repair Shop). The purpose of these investigations will be to delineate to the greatest degree possible the nature, magnitude, and extent of contaminated soil and groundwater. Physical surveys to be conducted during the site investigation include a well inventory, a contaminant source survey, a geophysical survey (except sites 8 and 22), and a habitat and biota survey. Field activities to be performed during the site investigation include the advancement of soil borings, installation of monitoring wells, collection of soil and groundwater samples, surface water and sediment sampling (Site 16), and hydrologic assessments. Chemical analyses will be completed by a laboratory approved by the Naval Facilities Engineering Service Center using Contract Laboratory Program protocol. Field sampling, analytical methods, and reporting will be conducted at U.S. Environmental Protection Agency Level IV protocol.

This plan, in conjunction with the Comprehensive Sampling and Analysis Plan, will provide guidelines for sampling and analytical techniques to be used during the investigation and outline proper documentation procedures for the investigation.

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## List of Abbreviations

The following list contains many of the acronyms, abbreviations, and **units** of measure used in **this** report.

bls	Below Land <b>Surface</b>
CLEAN	Comprehensive Long-Term Environmental Action Navy
CLP'	Contract <b>Laboratory</b> Program
CSAP	Comprehensive Sampling and Analysis Plan
<b>DQO</b>	Data Quality Objective
E/A&H	EnSafe/Allen & Hoshall
E&E	Ecology & Environment, Inc.
FDEP	Florida Department of Environmental Protection
<b>FS</b>	Feasibility Study
FSA	Full <b>Scan</b> of Analysis
GS	Grain <b>Size</b>
Hex-chrome	Hexavalent Chromium
IAS	Initial Assessment Study
IRP	Installation Restoration Program
msl	mean sea level
NAS Pensacola	Naval Air Station Pensacola
NEESA	Naval Energy and Environmental Support Activity
<b>PPS</b>	Physical Parameters, Soil
PPW	Physical Parameters, Water
PRG	Preliminary remediation goal
QA	Quality Assurance
QC	Quality Control
<b>RI</b>	Remedial Investigation
SAP	Sampling <b>and</b> Analysis Plan
SOP/QAM	Standard Operating <b>Procedures</b> and Quality <b>Assurance</b> <b>Manual</b>
SOUTHNAVAFACENGCOM	Southern Division, <b>U.S.</b> Navy, Naval Facilities Engineering Command
TAL	Target Analyte List
TCL	Target Compound List
USEPA	United <b>States</b> Environmental Protection Agency

## EXECUTIVE SUMMARY

This Sampling and Analysis Plan is for Site 4 (Army Rubble Disposal Area), Site 6 (Fort Redoubt Disposal Area), Site 7 (Firefighting School), Site 8 (Rifle Range Disposal Area), Site 16 (Brush Disposal Area), and Site 22 (Refueler Repair Shop). The purpose of these investigations will be to delineate to the greatest degree possible the nature, magnitude, and extent of contaminated soil and groundwater. Physical surveys to be conducted during the site investigation include a well inventory, a contaminant source survey, a geophysical survey (except sites 8 and 22), and a habitat and biota survey. Field activities to be performed during the site investigation include the advancement of soil borings, installation of monitoring wells, collection of soil and groundwater samples, surface water and sediment sampling (Site 16), and hydrologic assessments. Chemical analyses will be completed by a laboratory approved by the Naval Facilities Engineering Service Center using Contract Laboratory Program protocol. Field sampling, analytical methods, and reporting will be conducted at U.S. Environmental Protection Agency Level IV protocol.

This plan, in conjunction with the Comprehensive Sampling and Analysis Plan, will provide guidelines for sampling and analytical techniques to be used during the investigation and outline proper documentation procedures for the investigation.

## 1.0 INTRODUCTION

As part of the U.S. Navy Comprehensive Long-Term Environmental Action Navy **Program**, site investigations will be completed by EnSafe/Allen & Hoshall (E/A&H) at Site 4 (Army Rubble Disposal Area), Site 6 (Fort Redoubt Disposal Area), Site 7 (Firefighting School), Site 8 (Rifle Range Disposal **Area**), Site 16 (Brush Disposal Area), **and** Site 22 (Refueler Repair Shop) at NAS Pensacola. These sites fall under RI/FS Category VII of the *Revised 1995 Site Management Plan of the Installation Restoration Program for the Naval Air Station Pensacola, Pensacola, Florida* (Southern Division, **U.S.** Navy, Naval Facilities Engineering Command {SOUTHNAVFACENGCOM} 1995). Sites 4, 6, 7, 8, **and** 16 are screening sites, while Site 22 is a Remedial Investigation (RI) site. **This** Sampling and Analysis Plan (**SAP**) has been developed by E/A&H for these investigations, as tasked by SOUTHNAVFACENGCOM under Contract No. N62467-89-D-0318/970.

Primary references for **this** SAP include the *Comprehensive Sampling and Analysis Plan for Naval Air Station Pensacola* (CSAP[E/A&H 1995]), the United States Environmental Protection Agency (USEPA) Region IV *Standard Operating Procedures and Quality Assurance Manual* (SOP/QAM), and the site work plans completed by Ecology and Environment (**E&E**), Inc. These include: *Contamination Assessment/Remedial Activities Investigation Work Plan — Group H* (Sites 8 and 22 [E&E 1992a]), *Group L* (Sites 4, 6, and 16 [E&E 1992b]), and *Group K* (Site 7 [E&E 1992c]). The investigation of these sites will be completed to fulfill requirements of the E&E site work plans and **this** site-specific **SAP**. These investigations will be conducted in accordance with the SOP/QAM and **CSAP**.

The Category VII field investigation will **assess** the **nature** of any potential contamination and the need for site remediation. Field activities on each site **will be** preceded by physical surveys, including a well inventory, contaminant source survey, habitat **and** biota survey, and geophysical survey (except Sites 8 and 22). Field investigations will include the advancement of soil

borings, installation of monitoring wells, collection of **soil** and groundwater samples, surface water and sediment sampling (**Site 16** only) and hydrologic assessments as defined in the **CSAP**.

A three-phased approach will be used during the field investigation, depending on the depth of investigation required at each site.

- **Phase I (nature and magnitude phase).** Phase I activities will be performed on all sites to identify the presence or absence of **contaminants**, based on comparison to a set of Preliminary Remediation Goals (PRGs-discussed below) established for these sites. Further assessment activities will depend on whether **soil**, groundwater, surface water, and sediment samples exceed the applicable PRGs. **Since** it is anticipated that minimal contamination will be found on the Category VII screening sites (Sites **4, 6, 7, 8,** and **16**), permanent monitoring wells will be installed on **these** sites during the Phase I investigation. Temporary wells will be installed during the Phase I investigation on Site **22** (an RI site). Temporary wells will be used in anticipation of the requirement to complete subsequent investigative phases at Site **22**. Detecting of contaminants above PRGs will move an investigation into **Phases II and III**.
  
- e **Phase II (delineation phase).** Phase II field work will further delineate plume/soil contamination through installation of additional borings and monitoring wells, with additional sampling completed as necessary. Sampling strategies will be based on the Phase I analytical results and may include **tailoring** the analytical suite to specific analytes/compounds of concern. **Recommendations** for **permanent** monitoring well locations will be established following the **Phase II** investigation.
  
- e **Phase III (confirmation phase).** **Phase III** field work will include the installation of permanent monitoring wells to replace strategically placed **temporary** monitoring wells and will be **used** to confirm contamination delineation and in the baseline **risk** assessment

(note that a baseline risk assessment will **be** performed only on Site **22** and on screening sites which exhibit significant contamination). Phase III permanent wells will also become as part of a base-wide periodic groundwater monitoring program.

It is anticipated that data presentations (consisting of **figures** and tables) will be provided to USEPA and FDEP at the completion of Phases I **and** II.

Chemical analyses will be performed by a laboratory approved by the Naval Facilities Engineering Service Center using Contract Laboratory Program (CLP) protocol. Field sampling, analytical methods, and reporting will be conducted at **USEPA CLP Level IV** protocol.

Upon completion of the investigative work and laboratory analyses, a report *summary* of the activities and results of the investigation will **be** presented to the **USEPA** and Florida Department of Environmental Protection (FDEP). **This** report will compare analytical results to a set of screening values selected for soil, sediment, groundwater, and surface water, after **this** point referred to as PRGs:

**Soil PRGs**

- e Risk-based concentrations for residential soil, as derived from the **USEPA** Region III Contaminant of Concern Screening Table (**USEPA 1994a**).
  
- e Selected soil cleanup goals based on an aggregate or child resident **scenario** (lowest level) as derived ~~from~~ the FDEP list of Cleanup Goals for the **Military** Sites in Florida (FDEP 1995).
  
- e EPA, Office of Solid Waste and Emergency Response ~~draft~~ revised Interim **Soil** Lead Guidance (**USEPA 1994b**).

### Groundwater PRGs

- USEPA Maximum Contaminant Levels (USEPA 1995)
- Florida Primary Drinking Water Standards (FDEP 1994)
- USEPA Secondary Maximum Contaminant Levels (USEPA 1995)
- Florida Secondary Drinking Water Standards (FDEP 1994)
- Florida Groundwater Guidance Concentrations (FDEP 1994)

As any of the above PRGs are updated, they will be incorporated in the investigation (up to the ~~Draft~~ Final Reports). The reports will outline any 'additional work required to characterize the nature and extent of identified contaminants above PRGs. If groundwater contamination is present, or if soil contaminants may leach to groundwater, site-specific soil action levels may be developed for each contaminant (it is anticipated that this will be completed during Phase II, where required). If required, the report will provide data for the completion of a baseline risk assessment (BRA). The final investigative reports will be submitted as follows:

- A Preliminary Site Characterization Report will be submitted for all Category VII screening sites if there are no analytical results above PRGs, or if on-site circumstances indicate that results above PRGs pose no concern for ecological and/or health risk.
- An RI Report will be submitted for Site 22, or for any Category VII screening site where site conditions suggest the presence of ecological and/or health risk. The RI report will include the BRA, which will analyze the potential adverse effects on actual or hypothetical human and ecological receptors arising from exposures to hazardous substances released from the site. If an RI report is required, a Feasibility Study (FS) Report will be submitted to examine alternative remedies.

This *SAP*, in conjunction with the CSAP, will provide guidelines for sampling and analytical techniques to be used during the Category VII site investigations and outline proper documentation procedures for each investigation.

## **2.0 BACKGROUND INFORMATION**

### **2.1 Site Descriptions and Histories**

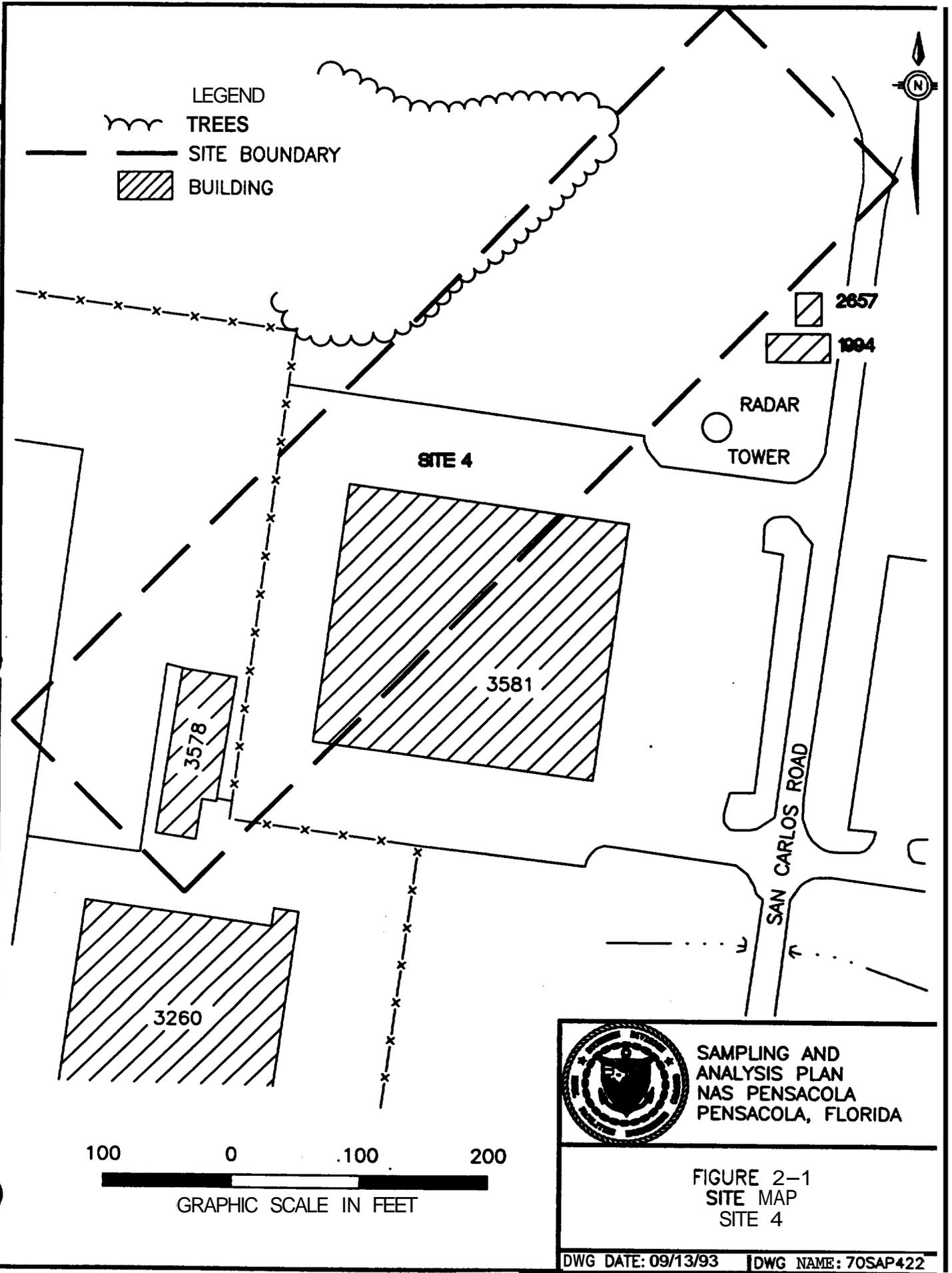
#### **Screening Site 4**

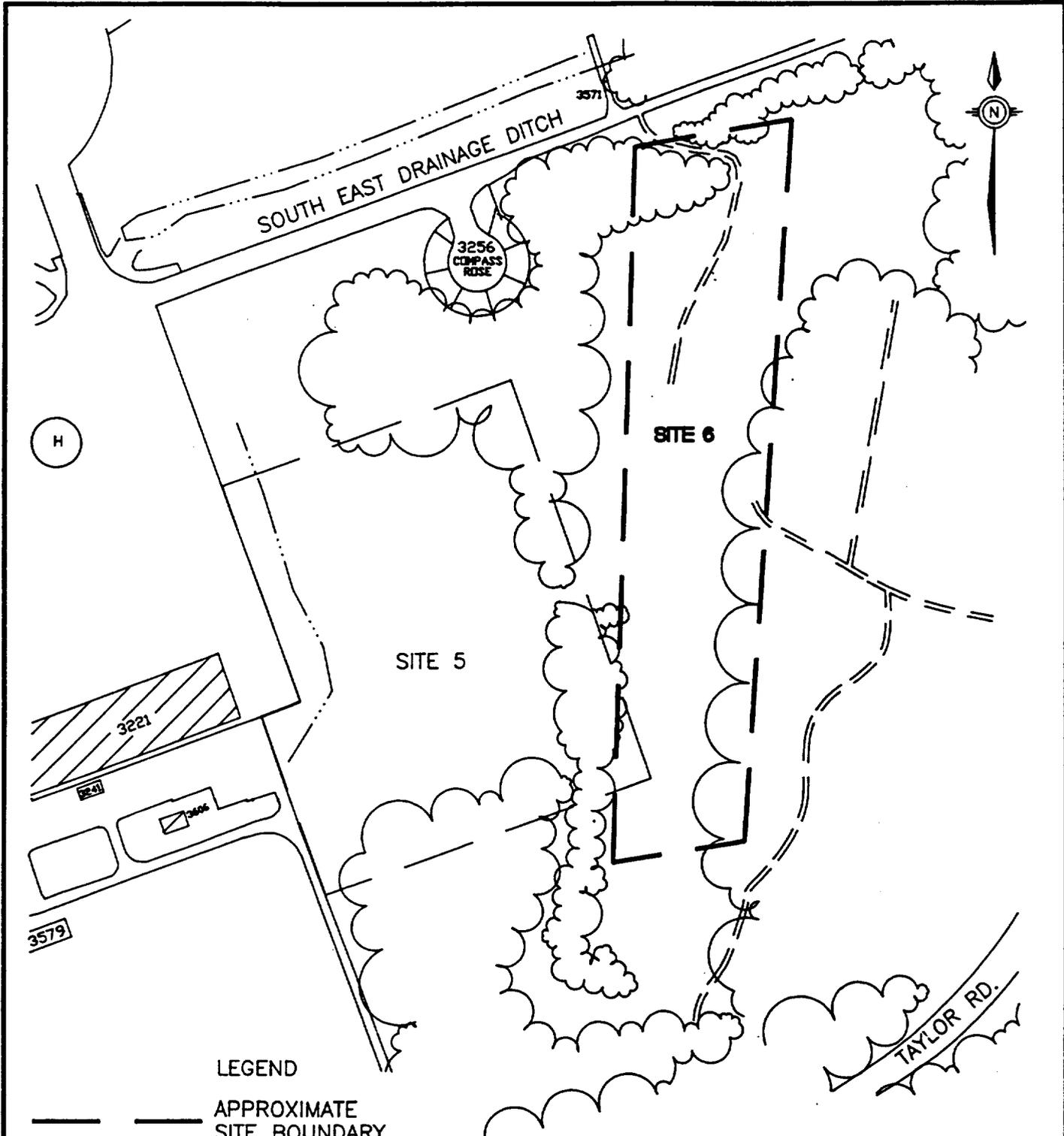
Site 4 is an area approximately 150 feet by 800 feet, located immediately north of Building 3260, near the airfield operations department at Forrest Sherman Field (see Figure 2-1). The southern portion is developed and includes part of Building 3581, Building 3578, and a large concrete pad. The northern portion is a generally undeveloped grassy area with two small buildings (1994 and 2657) at its eastern extent. The surface elevation of the site averages 30 feet above mean sea level (msl [E&E 1992b]). The nearest IRP monitoring wells are located about 2000 feet west of the site (Site 3 wells).

In the early 1950s, rubble from the demolition of the old U.S. Army barracks at Fort Barrancas was disposed of at Site 4. An Initial Assessment Study (IAS) of potentially contaminated sites at NAS Pensacola was conducted by Naval Energy and Environmental Support Activity (NEESA) in June 1983. Based on field inspection, review of historical records, and interviews with NAS Pensacola personnel, NEESA concluded that no hazardous waste had been disposed of at Site 4, and the site posed no threat to human health or the environment. No field investigations involving the sampling of soil and/or groundwater have been performed yet at Site 4.

#### **Screening Site 6**

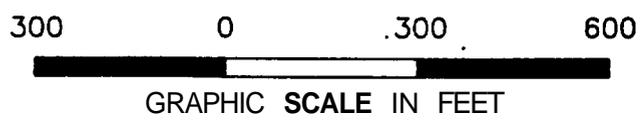
Site 6 is situated southeast of Forrest Sherman Field (see Figure 2-2). The site consists of an area approximately 450 feet by 1,650 feet. The site is bordered to the north by Tow Way Road





LEGEND

- — — — — APPROXIMATE SITE BOUNDARY
- ~~~~~ TREES
- ▨ BUILDING



SAMPLING AND ANALYSIS PLAN  
 NAS PENSACOLA  
 PENSACOLA, FLORIDA

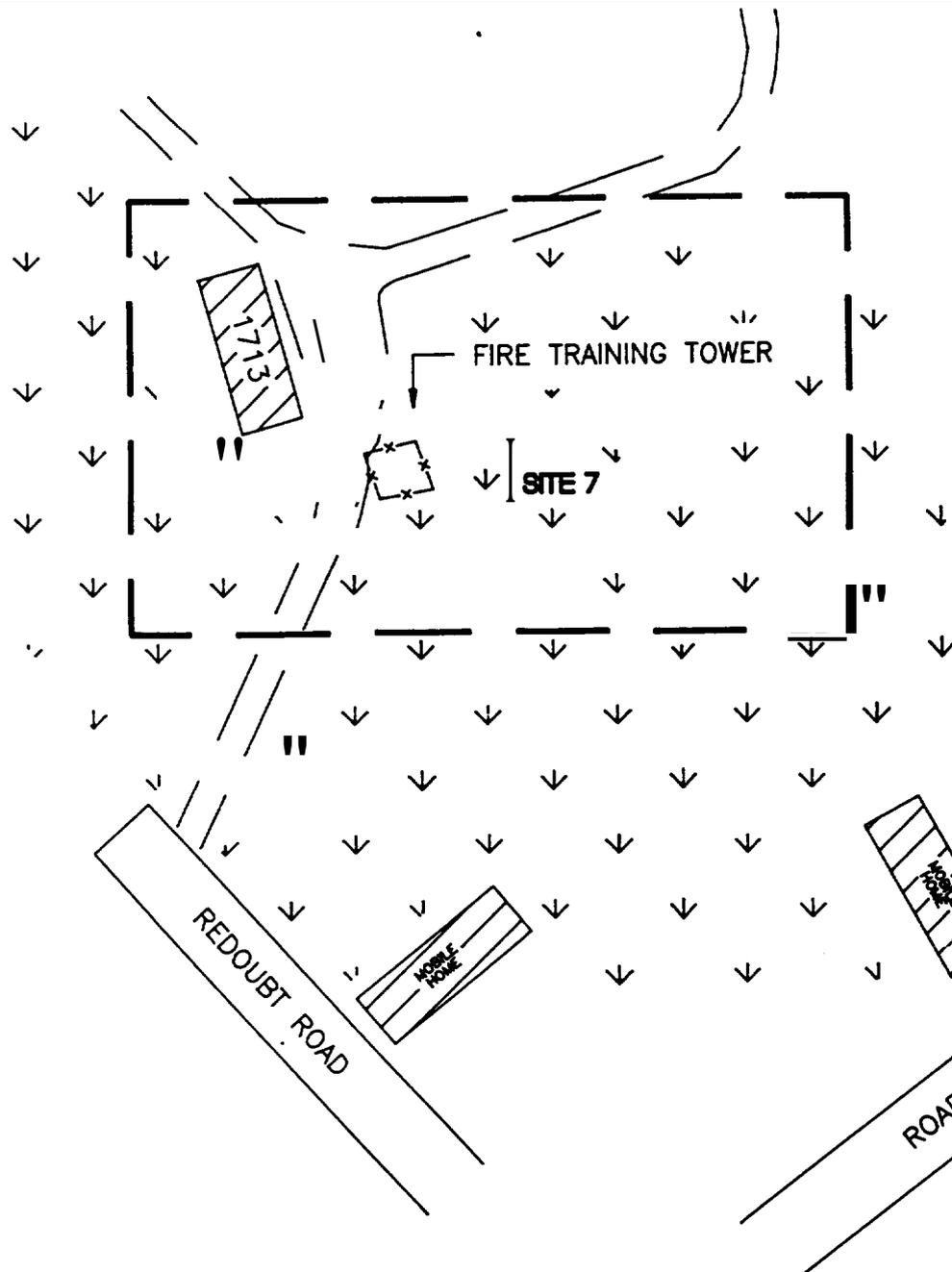
FIGURE 2-2  
 SITE MAP  
 SITE 6

and the airfield's Southeast Drainage Ditch. To the east **and** south **are** wooded areas, and to the west is Screening **PSC Site 5** (the Borrow Pit). The site is accessed by a gated, unpaved road leading from Tow Way Road. Site 6 is an open **area** covered by rubble **and** debris, including concrete, asphalt, scrap wood, brush, metal and plastic. Elevation at the site is approximately 25 to 30 feet above msl (E&E 1992b). Increased activity **was** recently noted at the site during a site visit by E/A&H personnel. The area is being used **as** a dump site for fill dirt and concrete rubble in conjunction with ongoing BRAC construction activities at Chevalier Field. Areas not covered with rubble are vegetated with weeds and **grasses**. The nearest monitoring wells are located about 1000 feet west of the site at Site **5**, and Site 3221NE (a former underground storage tank site).

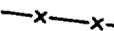
Between 1973 and 1982 the site was used for the disposal of rubble **and** debris. The 1983 **IAS** performed by NEESA reported some building debris containing asbestos may have **been** disposed of at the site. No other hazardous materials were disposed of at Site 6. The study therefore concluded the site did not pose a threat to human health or the environment (NEESA 1983). No field investigations involving the sampling of soil and/or groundwater have been performed at Site 6.

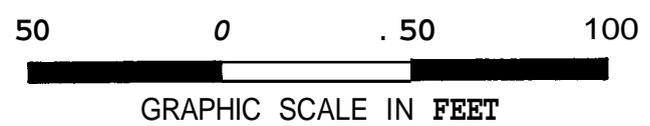
### Screening Site 7

Site 7 is approximately 400 feet southeast of Fort Redoubt near the intersection of Redoubt and Taylor Roads (see Figure 2-3). Building 1713 is included within Site 7. Wooded **areas** surround the site to the north **and** south of Building 1713. Several mobile homes **are** located southeast of the site. The grounds surrounding Building 1713 **are** mostly unpaved. A firefighting tower is about 25 feet east-southeast of **Building** 1713. A large clearing is adjacent to the tower. Elevation at the site is approximately **20 to 25** feet above msl. An **NAS Pensacola** water supply well (Well **No. 3**) is 1,300 feet south-southwest of the site (**E&E 1992c**). The nearest IRP monitoring wells are approximately 1300 feet to the east (**RI Site 1 wells**).



LEGEND

-   APPROXIMATE SITE BOUNDARY
-   UNMAINTAINED ROAD
-      GRASS SURFACE
-  FENCE
-  BUILDING



SAMPLING AND  
ANALYSIS PLAN  
NAS PENSACOLA  
PENSACOLA, FLORIDA

FIGURE 2-3  
SITE MAP  
SITE 7

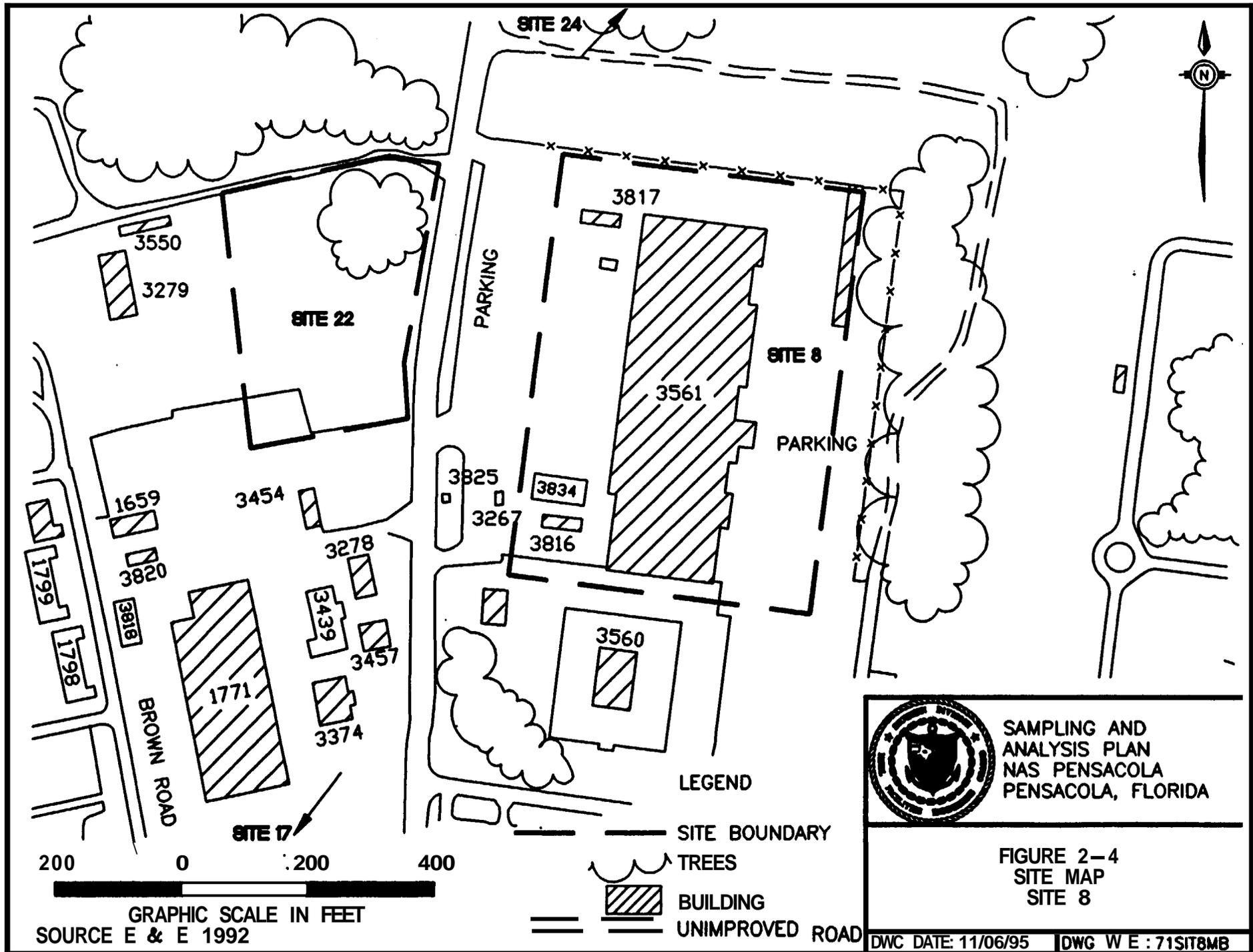
DWG DATE: 07/14/95    DWG NAME 70SIT72A

The firefighting training school has been in operation *since* 1940. **The** 1983 **IAS** performed by **NEESA** reported that the facility was used for firefighter training. Flammable liquids were **used** to **start** fires in an open **tank** of water for firefighting practice. The study also indicated that there was no evidence of hazardous waste disposal or threat to human health or the environment. Further study of Site **7** was therefore not recommended (**NEESA** 1983).

The results of the previous Phase I investigation are outlined in the *Interim Data Report, Contamination Assessment/Remedial Investigation, Firefighting School (Site 7 [E&E 1992d])*. The report concluded that overall, significant soil and groundwater contamination are absent across most of Site **7**. Low levels of TRPHs (presumably related to nearby automobile and/or aircraft traffic) were found in soils across Site **7**. Relatively higher TRPHs were found in the central and north portions of the site, which were attributed to past firefighting training activities. A significant PAH concentration was found in an upgradient groundwater sample, attributed to past firefighting training or some other upgradient **source**. Inorganics above standards from a single soil sample was related to an isolated metals source near the site's southern boundary. Groundwater metals above standards were not inconclusively linked to onsite activities. Overall, the report recommended further assessment at Site **7** (E&E 1992d).

### **Screening Site 8 .**

Site **8** is in the **450** feet by 600 feet area currently occupied by Building 3561, the site of the NAS Pensacola Public Works Center (PWC) Maintenance/Material Department (**see** Figure 2-4). An asphalt parking lot **surrounds** the building on the eastern, western, **and** northern sides. A grassy area exists along the southern side, between Buildings 3560 **and** 3561. Elevation at the site is approximately 20 to 25 feet above msl. Chain-link fencing surrounds the paved parking area on the northern, eastern, and western sides. **An** inactive NAS Pensacola Supply Well (No.1) is approximately 1,500 feet southwest of the site (E&E 1992a). The nearest IRP monitoring wells are located about 1200 feet west of the site (RI Site 1 wells).



3550  
3279

1659  
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3816

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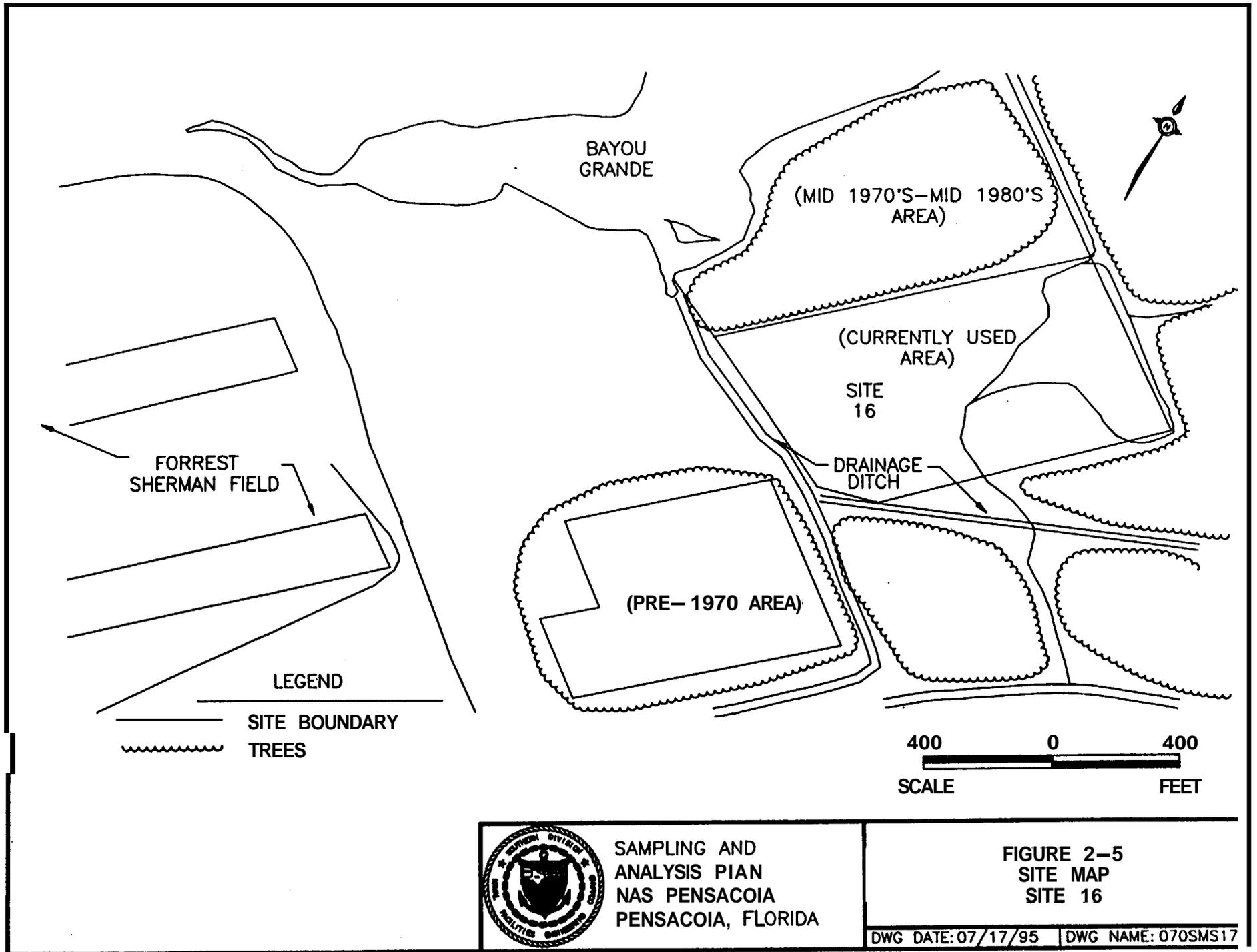


The Rifle Range Disposal Area was reportedly used for the disposal of solid waste (primarily paper) from NAS Pensacola between **1951** and **1955**. NEESA's **1983 IAS** reported that disposal was accomplished by burning and burial. Aerial photographs and maps from the **1950s** and **1960s** show a rifle range was located where Building **3561** is currently located. Earlier aerial photos show an excavation at the northern end of the rifle range, while later photos show the excavated area to **be** overgrown with vegetation. None of the photos indicate the disposal of dry garbage. Dry refuse was reportedly burned in a trench on site measuring **12** feet wide by 50 feet long by **7** feet deep. The majority of the excavation noted in the earlier photos is currently covered by Building **3561** and the surrounding paved area, which were constructed during the mid **1970s**. No refuse was reportedly encountered during construction of the building (**NEESA 1983**). No field investigations involving the sampling of soil and or groundwater have been performed at Site **8**.

Besides the site itself, there are several potential **sources** of contamination within the immediate vicinity of Site **8**. The DDT Mixing Area (**RI Site 24**) is approximately **400** feet to the north. The Refueler Repair Shop (**RI Site 22**) is approximately **650** feet to the west. The Transformer Storage Yard (Site **17**) is approximately **1,300** feet to the southeast.

#### **Screening Site 16**

Site **16** is situated near the eastern end of Runway **09/27** at Forrest Sherman Field (see Figure **2-5**). Due to limited site information, a preliminary analysis of available aerial photos was conducted. Analysis of these photos suggest that the site consists of **an** approximately **30** acre area. The site contains a cleared **area** to **the** southeast, in **use** for brush disposal purposes since the mid **1980s**. **To** the **north** is a sparsely wooded **area** bordering **an** inlet of Bayou Grande, which appears to have been **used** from the early **1970s** until **the** mid **1980s**. To the southwest is an area used prior to the early **1970s**, now a wooded **zone**. To the south of the site **are** woods and the Southeast Drainage Ditch, which curves north to form the current



SAMPLING AND  
ANALYSIS PLAN  
NAS PENSACOLA  
PENSACOLA, FLORIDA

FIGURE 2-5  
SITE MAP  
SITE 16

DWG DATE: 07/17/95 | DWG NAME: 070SMS17

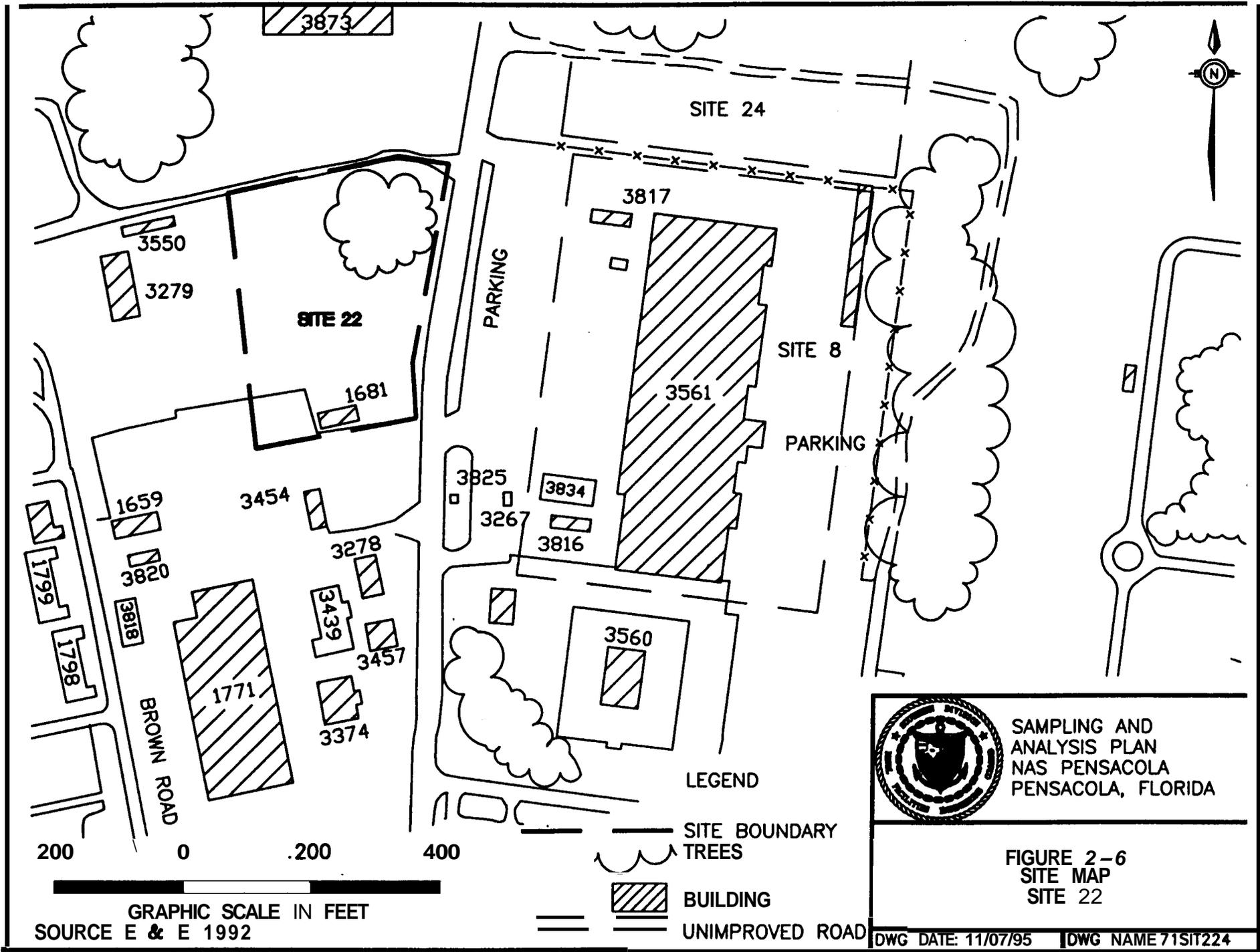
disposal area's western boundary. A wooded area comprising a portion of RI Site 1 lies to the east. Municipal supply well No. 3 is approximately 2,500 feet southeast of the site. The nearest IRP monitoring wells are located about 900 feet east of the site area (RI Site 1 wells).

Since the late 1960s, Site 16 has been used for the disposal of brush and tree limbs from pruning and trimming activities at NAS Pensacola. Analysis of aerial photographs taken before 1951 suggest the Army may have used a portion of the site for incineration of garbage and ash disposal. The 1983 IAS stated the site contained only brush, tree limbs and some metal refuse, and concluded hazardous waste had not been disposed of at Site 16. The report also noted that the site did not pose a threat to human health or the environment (NEESA 1983). A preliminary site reconnaissance conducted by Ecology & Environment in 1989 and 1990 revealed the refuse had been removed from the site, though charred debris still remained along the drainage ditch (E&E 1992b). No investigation involving soil or groundwater sampling has been performed at Site 16.

#### **RI/FS Site 22**

Site 22 is southwest of the intersection of Taylor and John Tower Roads, across Tower Road from Building 3561 (Figure 2-6). Much of the site is covered by either crushed oyster shell, hard-packed gravel or soil, and weedy vegetation. A large paved area lies along the site's southern edge. Building 1681 occupies the southwest corner of the site. The recently constructed NASP Naval Brig/Correctional Custody Unit (Bldg. 3873) lies directly north of the site. Inactive NAS Pensacola Supply Well No. 1 is approximately 2,000 feet to the southeast (E&E 1992a). The nearest IRP monitoring wells are located about 500 feet northwest of the site (RI Site 1 wells).

The 1983 IAS stated that between 1958 and 1977, the NAS Pensacola PWC Transportation Department Refueler Shop used the area east-northeast of Building 1681 to dispose of residual



fuel drained from refueler trucks during vehicle maintenance. An estimated 19,000 gallons of aviation gasoline and jet fuel were disposed of onsite over the 19-year period. Calculations performed by **NEESA** indicate that, assuming the fuel was all high-octane aviation gasoline, containing as much as 4.86 grams of tetraethyl lead per gallon, an estimated **203** pounds of tetraethyl lead could have **been deposited** in the site **area** (NEESA 1983). A 1989 site visit by Ecology and Environment, Inc. noted areas of stained soil and petroleum **odors** in the central and southern portions of the site (E&E 1992a). In its 1984 Verification Study, Geraghty and Miller, Inc. (G&M) stated that fuel odors were noted in four soil borings located approximately **150** feet north-northwest of Building 1681. **G&M** concluded **the** fuel was lost by evaporation and any remaining fuel is immobilized in the unsaturated **zone** where it will continue to undergo evaporation and biodegradation. The **G&M report** recommended no further study of the site (**G&M 1984**).

Aside from the site itself, several potential sources of contamination are in the immediate vicinity of **this** site: the Rifle Range Disposal Area (Site **8**) is approximately 600 feet **to** the east; the Transformer Storage **Yard** (Site **17**) is approximately 1,200 feet to the south; and the DDT Mixing Area (Site 24) is approximately 700 feet **to** the northeast (E&E 1992a).

## **2.2 Physical Setting**

Climatology, biological resources, surface water hydrology, physiography, **and** hydrogeology for **NAS** Pensacola in general and the Category VII sites specifically **are** detailed in **Sections 4** through 7 of the E&E site work plans (1992).

## **3.0 PHYSICAL SURVEY**

**Four** physical surveys will be conducted at the Category VII sites before field activities begin, including well inventories (primarily to determine the suitability of **currently** existing wells for sampling), contaminant **source** surveys, habitat **and** biota surveys, **and** geophysical surveys (note: geophysical surveys will not be **performed** at Sites 8 and **22**). Following evaluation of the data

from these surveys, the intrusive work will be conducted. Should the physical survey data indicate a change in investigative procedures be required, the USEPA and FDEP will be notified.

### **Well** Inventory

An inventory of existing monitoring wells will be completed at each site in accordance with Section 3.1 of the **CSAP**.

### Contaminant Source **Survey**

The contaminant source survey will be conducted at each site to determine any potential sources and any present or past waste **streams** at the facility. The survey will include a review of previous investigative reports, interviews with present and former **NAS** Pensacola personnel, aerial photo analysis and a utilities survey.

The survey will include the identification of the following:

- e Location of previous and current underground **and** overhead piping and utilities.
- e Past and present chemicals used at the facility.
- e Locations of any known surface spills.
- e Locations of any known historical outfalls.
- e **Locations** and contents of any known present or former underground storage tanks.

### Geophysical **Survey**

Due to the uncertainty of the **nature** of disposed material, geophysical surveys will be performed across Sites **4, 6, 7, and 16** to determine the presence of **buried** metallic materials or plumes of metal constituents in groundwater and to aid in the determination of fill **areas**. Electromagnetic terrain conductivity and magnetometer surveys will be conducted, with the results **used** to aid

in selecting soil and groundwater sampling points. The surveys will be performed in accordance with Section 3.3 of the **CSAP**.

To facilitate the geophysical surveys, a 50-foot interval survey grid will be established across each site except at areas of obstruction (i.e., buildings). The two baselines of the grid will be established by using a hand level, with the baselines flagged at 50-foot intervals. Geophysical measurements will be collected at each of the grid points. The baselines and other key elements of the grid will be surveyed using global positioning system surveying techniques for inclusion on report maps.

**Habitat and Biota Survey (Note: references to "phases" pertain to ecological risk assessment stages)**

A Phase I habitat and biota survey will be performed at each site in accordance with Section 8 of the **CSAP**. Data obtained during these investigations will also be used to assess ecological risk and where contaminant migration may potentially affect onsite or surrounding terrestrial and aquatic habitats. Phase II sampling will be implemented as outlined in Section 8 of the **CSAP** if ecological impacts are suspected.

**4.0 FIELD SAMPLING PLAN**

The field sampling plan describes the sampling and field measurement procedures to be used during each site investigation. Each site investigation will include the advancement of soil borings, installation of groundwater monitoring wells, and collection of soil and groundwater samples. Surface water and sediment samples will also be collected during the Site 16 investigation. Geophysical (except Sites 8 and 22), hydrologic, and ecological assessments will also be conducted at each site.

#### 4.1 Sampling Objectives

The objectives of the field sampling effort are to:

- e Identify potential sources of contaminants and assess their nature.
- e Delineate the nature and extent of contamination.
- e Identify contaminant migration pathways and potential receptors.
- e Assess the need for site remediation.

#### 4.2 Sampling and Analytical Requirements

The sampling and analytical requirements for the Category VII site investigations are summarized in Table 4-1 and discussed in this section. The proposed number of samples by medium is also listed. The Navy, USEPA, and FDEP will be apprised if changes occur in the number of samples collected. If the field investigation identifies additional or previously undetected contamination sources, further investigation will be undertaken. Further inquiry may include advancement of additional soil borings, installation of additional monitoring wells, collection of additional samples, or the sampling of media not mentioned in this site-specific SAP. Changes to the field sampling plan require authorization from the Navy via submission of a field change request form, with notification of the USEPA and FDEP.

The USEPA CLP Target Analyte List/Target Compound List (TAL/TCL) will be used to provide a full spectrum of legally defensible contaminant analyses. Soil and groundwater will be analyzed for the full TAL/TCL list with additional non-CLP analysis, conducted when warranted. Hexavalent chromium (Hex-chrome) analysis of selected samples has been dropped because of the failure to detect hex-chrome during previous investigations at NAS Pensacola (OU 10, Site 1, and Site 39). Also, site histories (no metal-plating operations, etc. typically associated with hex-chrome) indicate that hex-chrome is not a parameter of concern.

Table 4-1  
 Category VII Sampling and Analytical Requirements  
 Number of Samples by Site<sup>1</sup>

Medium	Site 4	Site 6	Site 7	Site 8	Site 16	Site 22+	Sample Totals By Medium	Analyses	DQO <sup>a</sup> Level
Soil <sup>b</sup>	9	15	16	20	30	20	110	FSA	IV
	(1)	(2)	(2)	(2)	(3)	(2)	(12)	PPS	IV
	(1)	(2)	(2)	(2)	(2)	(2)	(11)	GS	IV
Groundwater <sup>d</sup>	3	3	4	4	5	3	22	FSA	N
	(1)	(2)	(2)	(2)	(2)	(1)	(10)	PPW	N
Surface Water	NA	NA	NA	NA	1	NA	1	FSA	IV
					(1)		(1)	PPW	IV
Sediment	NA	NA	NA	NA	1	NA	1	FSA	IV
					(1)		(1)	PPS	IV
					(1)		(1)	GS	IV
Sample Totals By Site	12	18	20	24	37	23	134	FSA	IV
	(2)	(4)	(4)	(4)	(7)	(3)	(24)	PPS/PPW	IV
	(1)	(2)	(2)	(2)	(3)	(2)	(12)	GS	IV
							(Total All Samples)		

Sam: Modified from Ecology and Environment, Inc., 1992.

**Notes:**

- = Includes Phase I requirements only.
- a = The number of samples shown in parentheses will be analyzed for the additional parameters indicated.
- b = DQO = Data Quality Objective
- c = Total number of soil samples (# borings X # intervals = # samples): Site 4 (3 X 3 = 9), Site 6 (3 X 5 = 15), Site 7 (4 X 4 = 16), Site 8 (5 X 4 = 20), Site 16 (10 X 3 = 30), Site 22 (5 X 4 = 20)
- d = Total number of groundwater samples (# wells X 1 groundwater sample each: Site 4 (3), Site 6 (3), Site 7 (4), Site 8 (4), Site 16 (5), Site 22 (3))

**FSA — Full Scan Analysis**

TAL metals (unfiltered), TCL cyanide, TCL pesticides, TCL polychlorinated biphenyls, TCL semivolatile organic compounds, and TCL volatile organic compounds.

**PPW — Physical Parameters, Water**

5-day biological oxygen demand, chemical oxygen demand, hardness, total suspended solids, alkalinity, total phosphorus, nitrate-N, total Kjeldahl nitrogen, and heterotrophic plate count.

**PPS — Physical Parameters, Soil**

Total phosphorus, nitrate-N, total Kjeldahl nitrogen, heterotrophic plate count, total organic carbon, and cation exchange capacity.

**GS — Grain Size Analysis**

Analyses proposed in **this SAP** have been reorganized since the **E&E** site work plans, which were subdivided into "Suites A through E." **The** lists of remedial/physical parameters proposed in each **E&E** work plan have been modified. Changes were made to the proposed **analyses** to address CERCLA rather than RCRA requirements (i.e., the omission of Appendix IX analyses) and to acquire additional information regarding **the** physical characteristics of site **soil and** groundwater if an **FS** is **required**. Therefore, certain parameters have been omitted **from this SAP** because they are either redundant, do not provide legally defensible information, or have limited use. Proposed analytical parameters **are** now organized into the four basic groups listed below.

#### **New Analytical Organization**

- **Full Scan Analysis (FSA)**— The parameters include **TAL** metals (unfiltered), **TCL** cyanide, **TCL** pesticides, **TCL** polychlorinated biphenyls, **TCL** semivolatile organic compounds, and **TCL** volatile organic compounds.
  
- **Physical Parameters, Water (PPW)** — The parameters include 5-day biological oxygen demand (**USEPA 405.1**), chemical oxygen demand (**USEPA 410 .1 to .3**), hardness (**USEPA 200.7**), total suspended solids (**USEPA 160.2**), alkalinity (**USEPA 310.1**), total phosphorus (**USEPA 365.3**), nitrate-N (**USEPA 352.1**), total Kjeldahl nitrogen (**USEPA 351.9**), and heterotrophic plate count (**SM9215B**).
  
- **Physical Parameters, Soil (PPS)** — The parameters include total phosphorus (**USEPA 365.3**), nitrate-N (**USEPA 352.1**), total Kjeldahl nitrogen (**USEPA 351.4**), heterotrophic plate count (**SM9215B**), total organic carbon (**SW848-9060**), and cation exchange capacity (**SWIM-9081**).
  
- **Grain Size Analysis (GS [ASTM D422])**

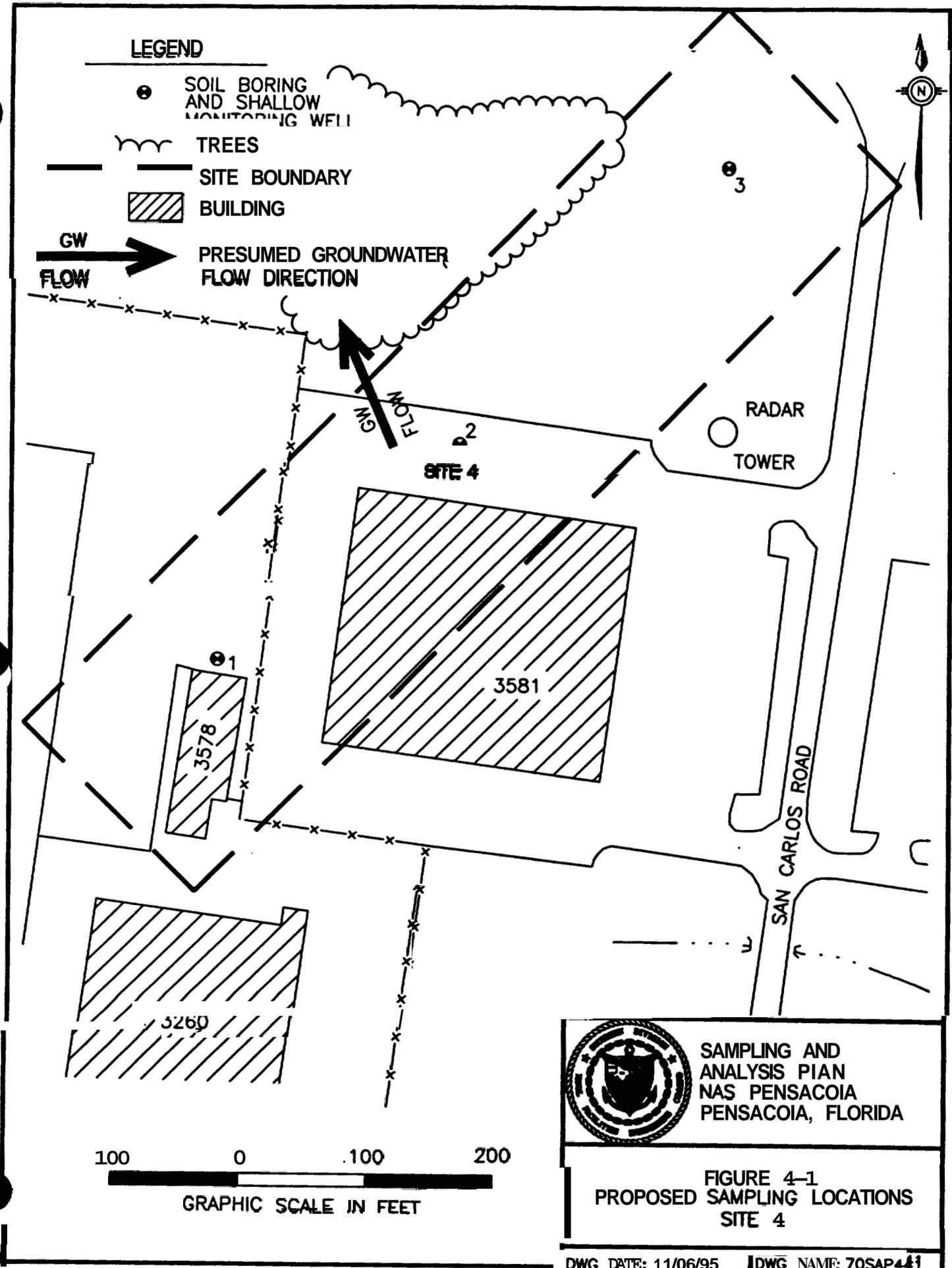
Leachability sampling, should it be required, will consist of leachate extraction **using SPLP** methodology. The extracted leachate will then be analyzed for contaminants of concern using low-concentration CLP protocol.

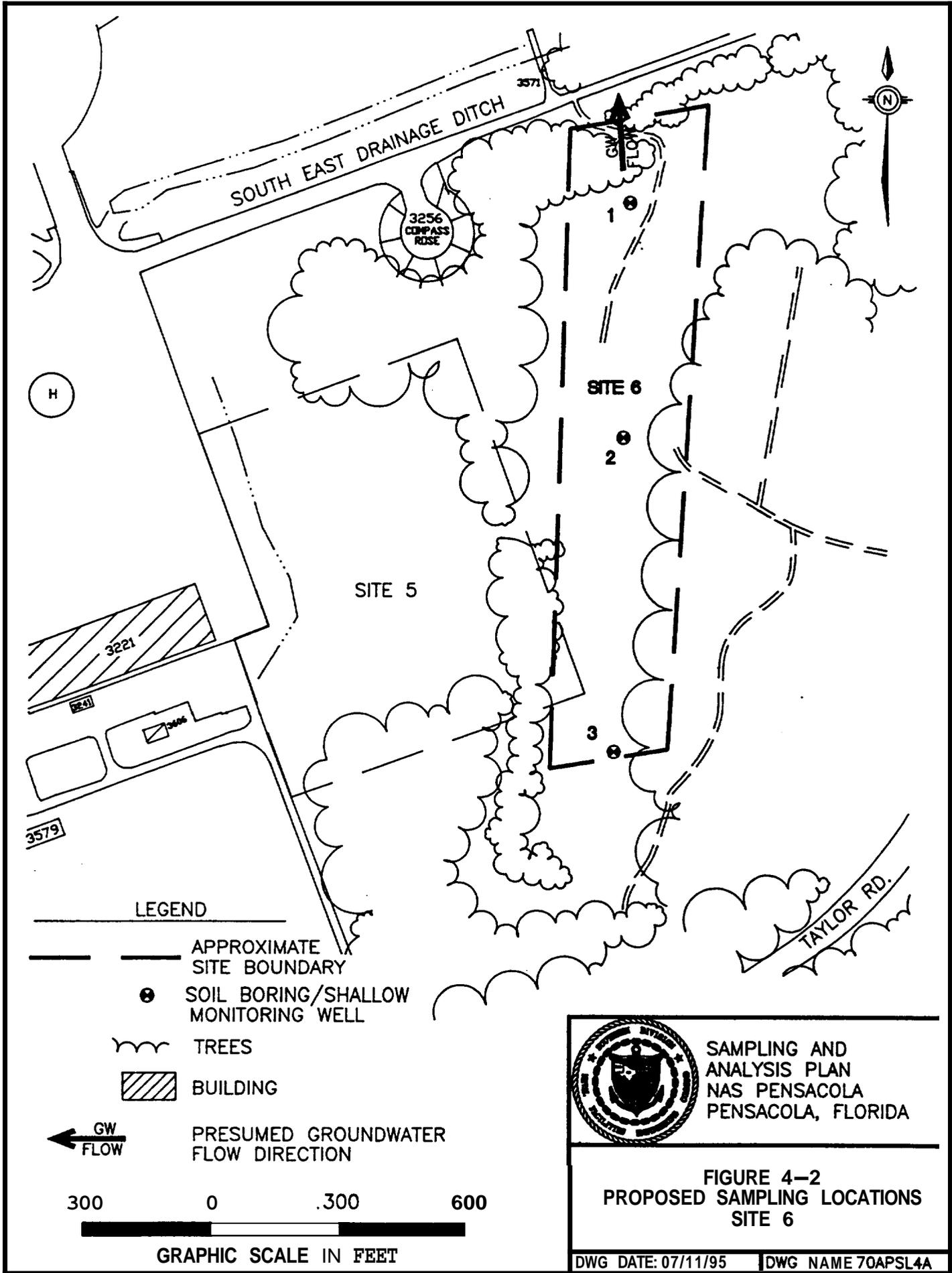
#### **4.3 Sample Locations and Rationale**

The sampling program and any proposed modifications to the E&E site work plans **are** described in **this** section. Figures **4-1** through **4-6** detail the proposed sampling locations for each site.

The presumed groundwater flow directions were **arrived** at using previously collected data and/or topography. At each site, an attempt was made to locate site-specific “background” sampling points, “source” sampling points, **and** downgradient sampling points.

For sites utilizing geophysical surveys, these will **be used to** define the boundaries and potential contaminants within each site area. Soil borings and monitoring well positions will **be** based on those results. If the geophysical surveys do not identify buried metal objects, wells and borings will be located inside the site boundaries, and soil borings will be sampled as described below. If a geophysical survey identifies buried metal objects, the proposed wells for **that** site will be installed outside **the** site area, immediately downgradient from any anomalies. Borings for wells moved outside the site’s boundaries will be advanced for monitoring well construction only and no soil samples will be collected. In **this** case, 0 to 1 foot soil samples will be collected from inside a site’s boundaries at the proposed boring locations, and sampled for FSA for purposes of risk assessment. Should the geophysical surveys, coupled with site media data, indicate that significant potential **sources** exist at the sites, invasive techniques such **as** trenching may **be** utilized to characterize the source(s).





H

SOUTH EAST DRAINAGE DITCH

3256  
COMPASS  
ROSE

SITE 6

SITE 5

3221

3579

TAYLOR RD.

LEGEND

- — — — — APPROXIMATE SITE BOUNDARY
- SOIL BORING/SHALLOW MONITORING WELL
- ~~~~~ TREES
- ▨ BUILDING
- ← GW FLOW PRESUMED GROUNDWATER FLOW DIRECTION

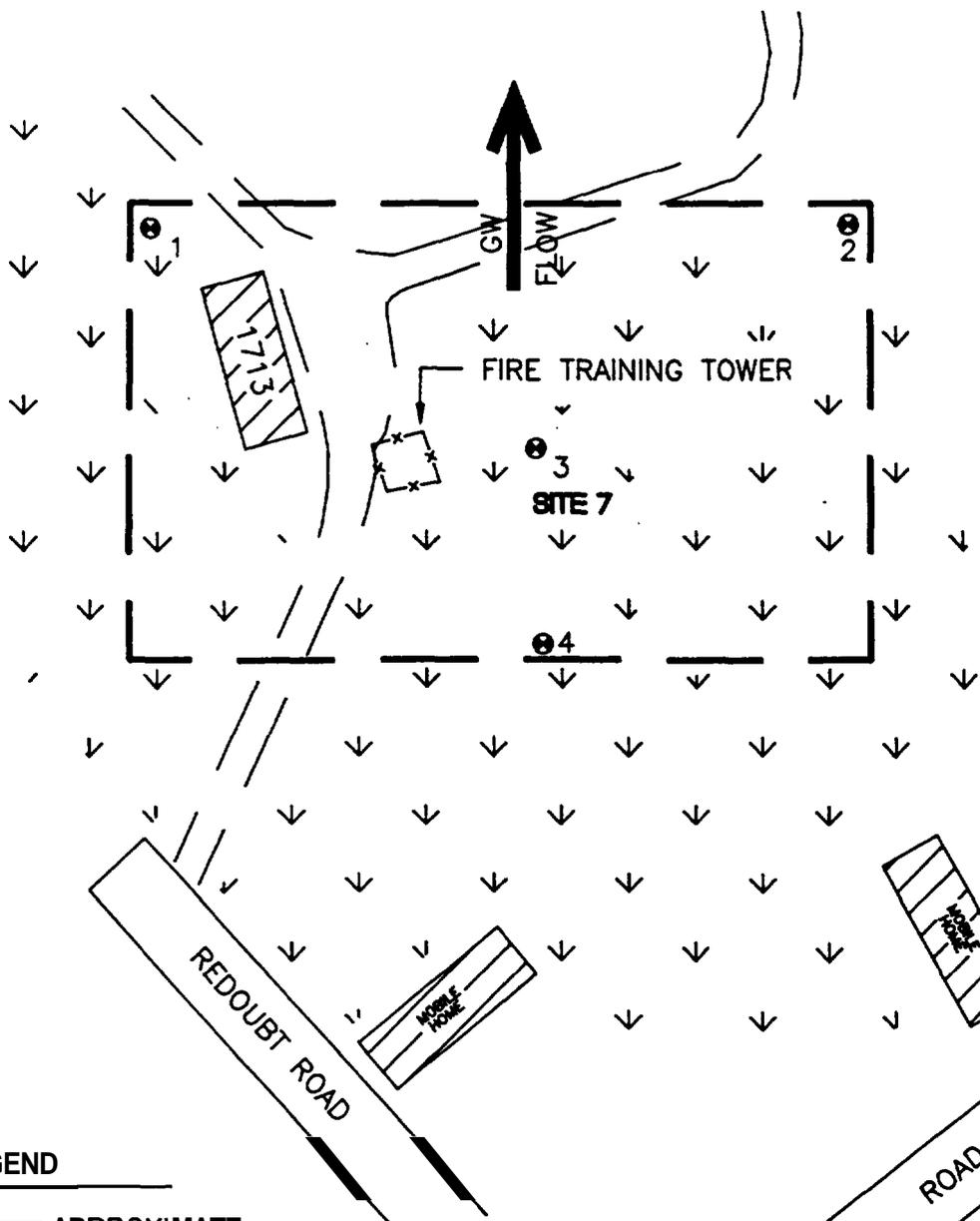
300 0 .300 600

GRAPHIC SCALE IN FEET

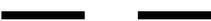
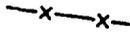


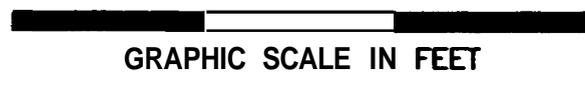
SAMPLING AND ANALYSIS PLAN  
NAS PENSACOLA  
PENSACOLA, FLORIDA

FIGURE 4-2  
PROPOSED SAMPLING LOCATIONS  
SITE 6



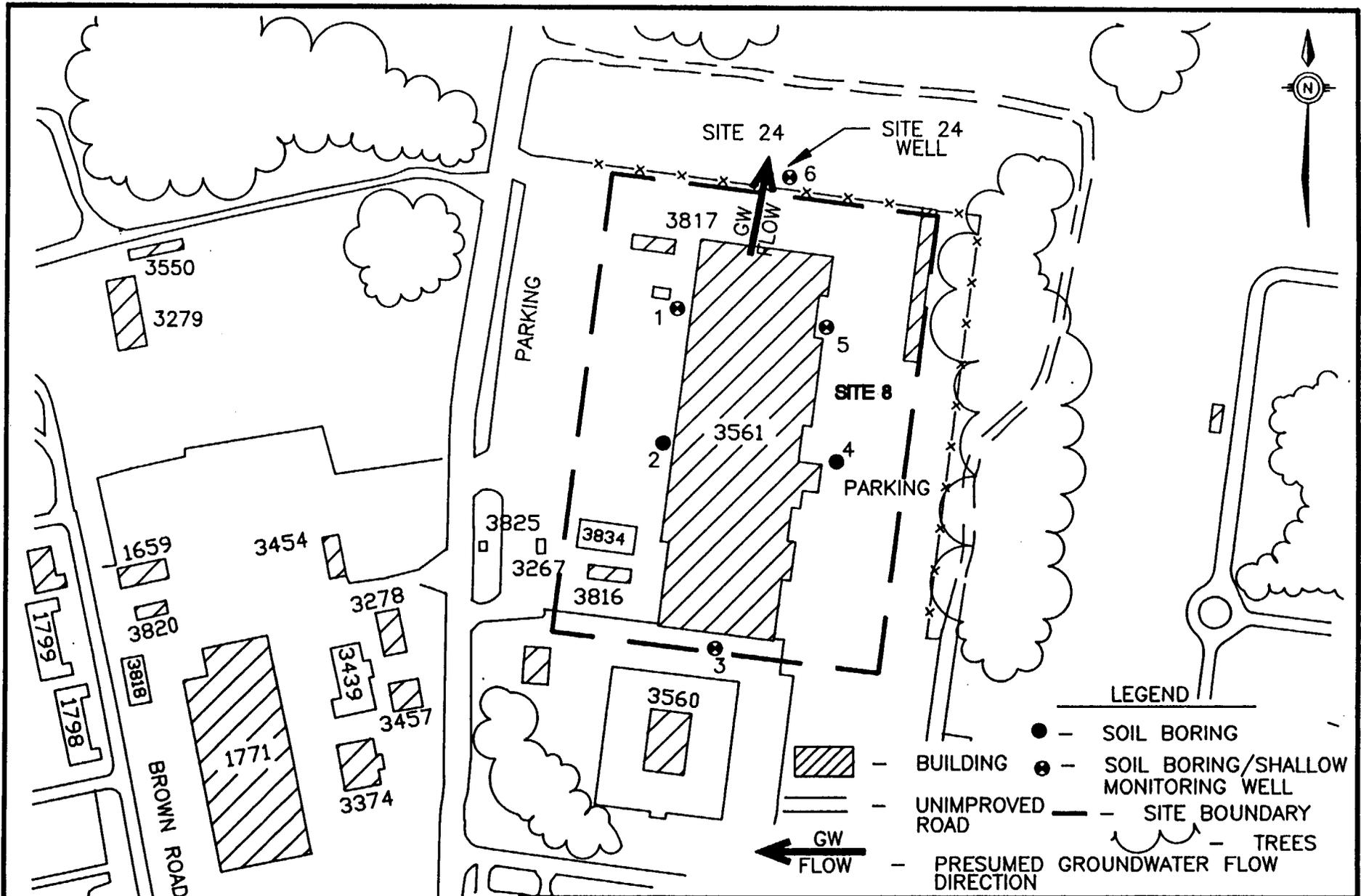
**LEGEND**

-  **APPROXIMATE SITE BOUNDARY**
-  **SOIL BORING/SHALLOW MONITORING WELL**
-  **UNMAINTAINED ROAD**
-  **GRASS SURFACE**
-  **FENCE**
-  **BUILDING**
-  **PRESUMED GROUNDWATER FLOW DIRECTION**



**SAMPLING AND ANALYSIS PLAN  
NAS PENSACOLA  
PENSACOLA, FLORIDA**

**FIGURE 4-3  
PROPOSED SAMPLING LOCATIONS  
SITE 7**



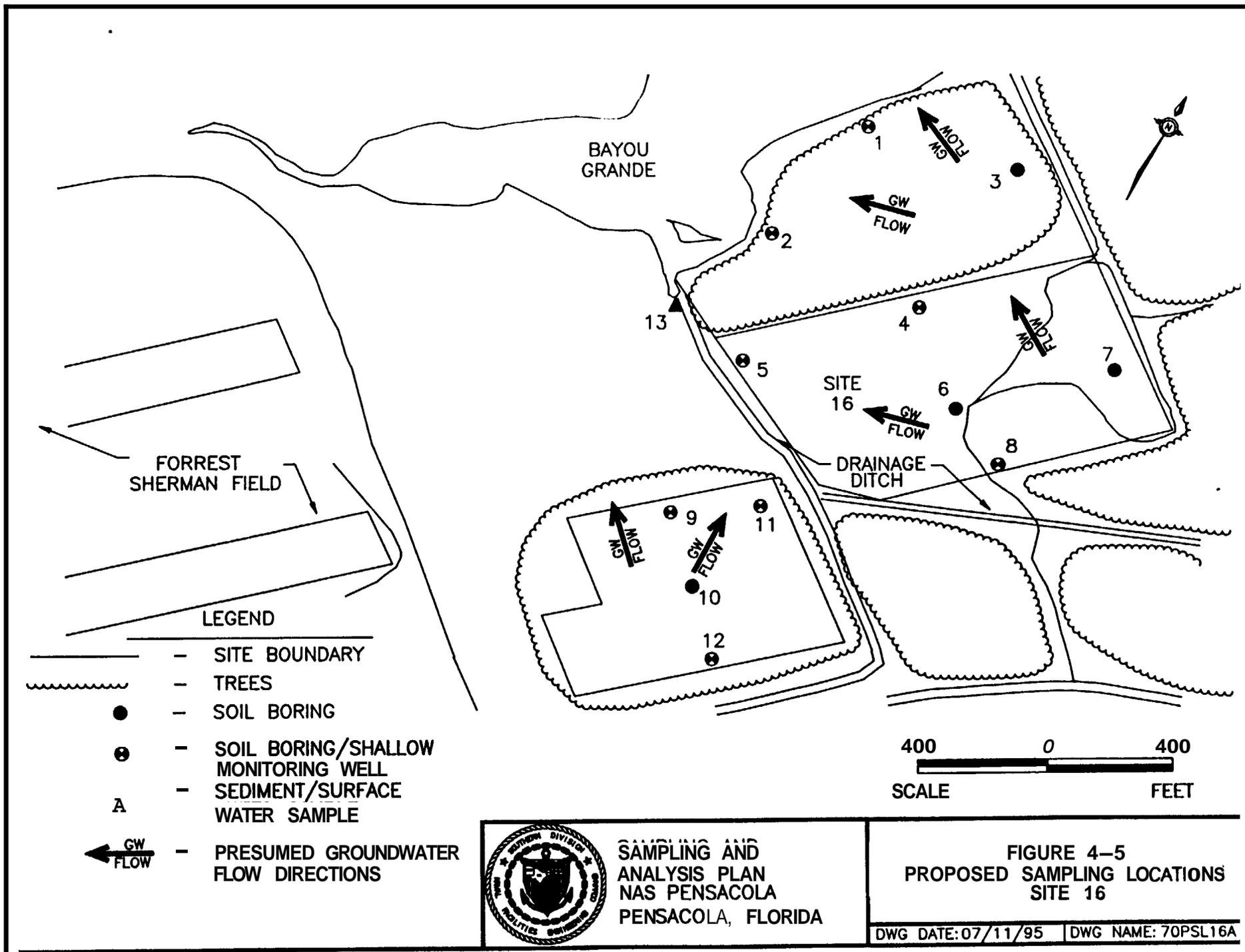
200 0 200 400  
 GRAPHIC SCALE IN FEET  
 SOURCE E & E 1992

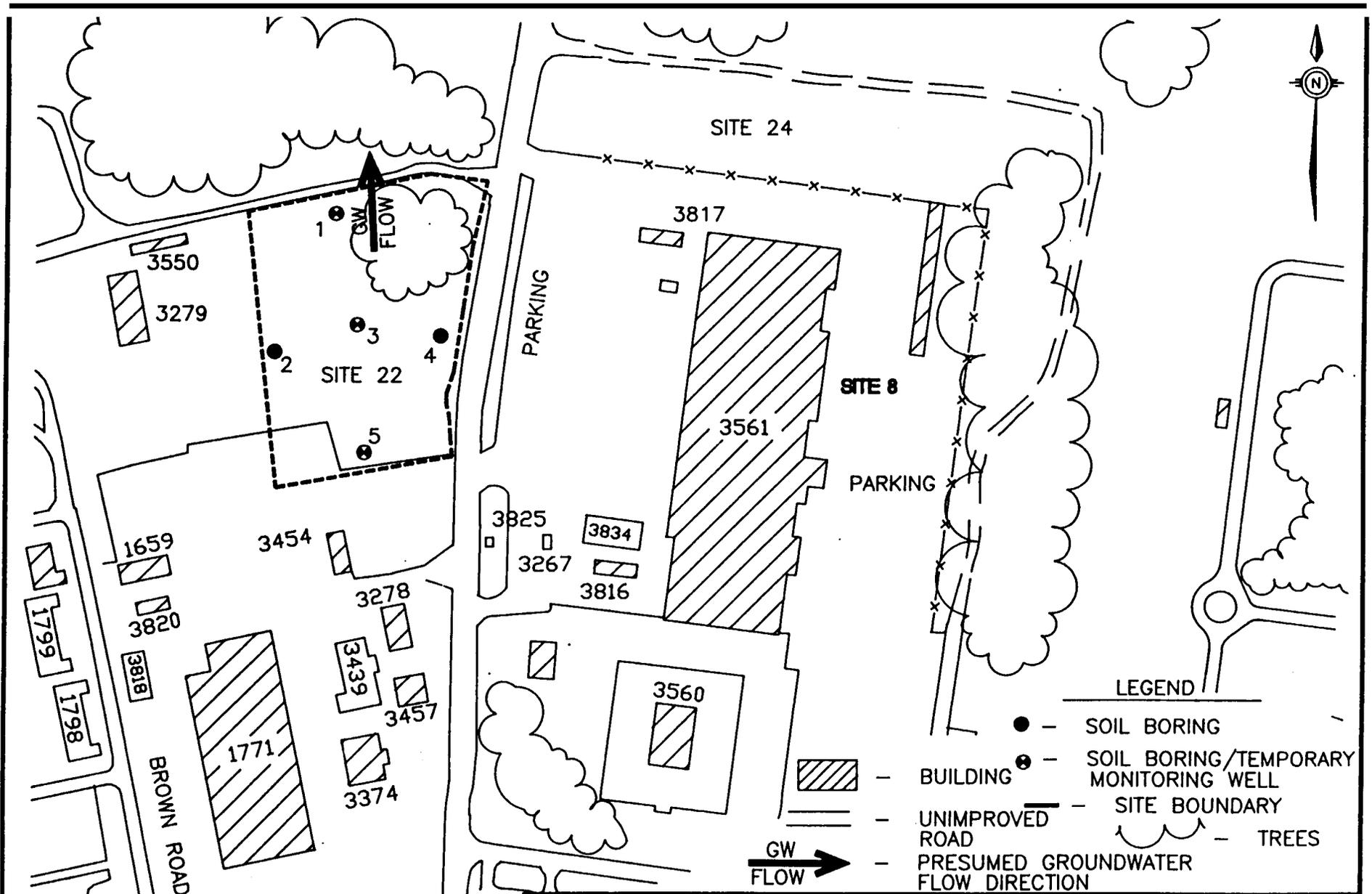


SAMPLING AND ANALYSIS PLAN  
 NAS PENSACOLA  
 PENSACOLA, FLORIDA

- LEGEND
- - SOIL BORING
  - ⊙ - SOIL BORING/SHALLOW MONITORING WELL
  - ▨ - BUILDING
  - - UNIMPROVED ROAD
  - - - - SITE BOUNDARY
  - ☁ - TREES
  - ← - PRESUMED GROUNDWATER FLOW DIRECTION

FIGURE 4-4  
 PROPOSED SAMPLING LOCATIONS  
 SITE 8  
 DWG DATE: 07/11/95 DWG NAME: 71PSL84A





200 0 200 400  
 GRAPHIC SCALE IN FEET  
 SOURCE E & E 1992



SAMPLING AND ANALYSIS PLAN  
 NAS PENSACOLA  
 PENSACOLA, FLORIDA

FIGURE 4-6  
 PROPOSED SAMPLING LOCATIONS  
 SITE 22

DWG DATE: 07/11/95 DWG NAME: 71PSL224

### Soil Sampling Strategy

All boring locations will be sampled at the following intervals: **0** to 1-foot below land surface (bls), **5** to 7 feet, 10 to 12 feet, **15** to 17 feet etc., **until** the water table is reached. **This** is based on an estimated water table of 17 feet bls. If the land surface is covered by concrete or asphalt, the **0** to 1 foot sample will be collected **from** immediately below the concrete or asphalt surface to 1 foot depth. Table **4-2** details the **number** of soil sampling intervals per site, based on the estimated depth to water at each location. **FSA** will be conducted on each soil sample collected. **PPS** analyses will be conducted on select soil samples for the **FS**. The **PPS** samples will be collected to represent both background and potentially contaminated conditions. **GS** analysis will be conducted on soil samples representative of the screened interval of the shallow monitoring wells. Results of the **GS** analysis will be used to calculate recovery well specifications if a groundwater remediation program is required. **GS** samples will be **the** only samples collected from below the water table **unless** visual or olfactory evidence of contamination is observed at **this** interval. In **this** case, a sample will be collected for an **FSA** to characterize and delineate potential contamination.

**Table 4-2**  
**Category VII Soil Sampling Intervals By Site**

Site	Estimated Depth to Water	Estimated No. of Sample Intervals	Estimated Well Completion Depth
Site 4	12	3	19
Site 6	20	5	27
Site 7	16	4	23
Site 8	16	4	23
Site 16	12	3	19
Site 22	16	4	23

### **Groundwater Sampling Strategy**

Groundwater samples will be collected from monitoring wells constructed at select soil borings. Table 4-2 details the estimated completion depth for each well to be constructed. All samples will be analyzed for FSA. Additionally, PPW analyses will be conducted on select groundwater samples collected for the FS to represent both background and potentially contaminated conditions. If the geophysical survey suggests the presence of buried sources, additional wells may be placed immediately downgradient of identified anomalies.

### **Sediment and Surface Water Sampling**

Site 16 is the only Category VII site where sediment and surface water sampling will be conducted. An FSA will be conducted on one sediment sample collected from the Southeast Drainage Ditch near where it drains into Bayou Grande after passing through the Site 16 area. Analytical results from approximately three proposed FSA sediment samples from Bayou Grande immediately north of Site 16 during the Site 40 investigation will be reviewed for comparison. PPS analyses will also be conducted on the sediment sample for the FS. An FSA will be also be conducted on one surface water sample paired with the site 16 sediment sample location. PPW analyses will be conducted on the sample for the FS.

## **4.4 Sampling Procedures**

Proposed sampling procedures are presented in Sections 4 through 7 of the CSAP. The sampling will be in accordance with Section 2.2 of the CSAP with samples processed in accordance with Section 12. The sampling procedures and proposed procedural modifications to the CSAP or E&E site work plan are discussed below.

### **4.4.1 Soil Sampling**

Soil borings will be advanced using hollow-stem auger drilling techniques or hand augers, as appropriate. Soil samples will be collected for field screening with a stainless-steel hand auger in accordance with Section 4.4 of the CSAP. Soil will be sampled from drilled boreholes using

stainless steel split-barrel samplers or taken directly from the stainless steel hand augers in accordance with Section **4.6.1** of the **CSAP**.

#### **4.4.2 Monitoring Well Installation**

Temporary and permanent monitoring well borings will be advanced **in** accordance with Sections 5.2 and 5.3 of the CSAP. Temporary wells will be installed **using** a hand auger, if possible. Permanent monitoring wells will be installed **using** hollow-stem auger drilling techniques. To comply with Florida Administrative Code Chapter 40A-3, neat cement grout is required in all permanent monitoring well installations. A 6-inch bentonite collar will be installed around the risers on temporary monitoring wells to discourage percolation of surface water to groundwater via the borehole. Because of possible floating **contaminants**, shallow monitoring wells will be installed such that the well screen brackets the water table.

At least 24 hours after monitoring well installation is complete, the monitoring wells will be developed in accordance with Section **5.4** of the **CSAP**. Development will continue until the water withdrawn is as **free** of turbidity **as** possible given the lithology of the screened interval and pH, temperature, and specific conductivity have stabilized. These measurements will be recorded in accordance with Section 10.1 of the **CSAP**.

#### **4.4.3 Groundwater Sampling**

Groundwater will be sampled in accordance with Section **6** of the **CSAP**. Wells will be purged and sampled using a "quiescent" sampling method. This method **uses** a **peristaltic** pump **and** dedicated, decontaminated, 0.25-inch outside diameter **Teflon** tubing to purge a well at a slow, controlled, pumping rate (varying from 0.04 to 0.25 gallons per **minute**). Samples **are** collected **as** described in Section F.1.3 of the SOP/QAM. To prevent potential degassing of volatiles, samples collected for volatile organic compounds will be collected by disconnecting the tubing from the pump, and allowing the water in **the tube** to **drain** into the sample vials. Groundwater samples collected with a peristaltic pump should be **collected** near **the** top of the water column

and water should **be** as clear as possible given the subsurface geology (expected to **be** generally between 10 and 30 nephelometric turbidity **units**). Field parameters recorded during groundwater sampling will include organic vapor levels, **pH**, temperature, specific conductivity, turbidity, and groundwater level. These will be collected in accordance with Section 10.1 of the **CSAP**.

#### **4.5 Hydrologic Assessment**

A hydrologic assessment will be performed **in** accordance with Section 9.6 of the **CSAP**. An initial water level assessment will be used to **determine** shallow groundwater elevations, flow direction, **and** hydraulic gradient. Slug tests **and/or** specific capacity tests will be performed at selected monitoring wells to further characterize the site's hydrology. If groundwater remediation is required, the results of the slug **and/or** specific capacity tests will be used to design the appropriate high volume long-term pumping tests. The Navy will accept technical responsibility for the design and implementation of these tests. The USEPA **and** **FDEP** will be kept apprised of the investigation as it progresses, and will be notified before full-scale pumping tests are conducted. If conducted, these tests will be in accordance with Section 9.6.2 of the **CSAP**.

#### **4.6 Ecological Assessment**

At least a ~~Phase~~ I habitat and biota survey will be conducted **in** accordance with Section 8.1 of the **CSAP**. If additional assessment is warranted, supplemental phases **will** also be conducted.

#### **4.7 Cadastral Survey**

A geodetic survey will be performed using global positioning system surveying equipment in accordance with manufacturer's specifications. The wellhead survey measurements will be collected in accordance with Section 3.4 of the **CSAP**.

#### **4.8 Decontamination**

Decontamination procedures will be **performed** in accordance with Section **11** of the **CSAP**.

#### **4.9 Investigation-Derived ~~Wastes~~**

Investigation-derived wastes will **be** handled in accordance with Section **13** of the **CSAP**.

#### **4.10 Field Quality Assurance/Quality Control**

Field quality assurance/quality control samples will **be** collected **in** accordance with the frequency presented in Table **15-1** of the **CSAP**. Procedures will follow Section **15.2** of the **CSAP**.

#### **5.0 QUALITY ASSURANCE PLAN**

The Quality Assurance Plan presented in Section **15** of the **CSAP** will **be** followed during the each field investigation.

#### **6.0 DATA MANAGEMENT PLAN**

The Data Management Plan presented in Section **14** of the **CSAP** will **be** followed during the each field investigation.

## 7.0 REFERENCES

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**8.0 FLORIDA PROFESSIONAL GEOLOGIST SEAL**

I have read and approve of the **Final** Sampling and Analysis **Plan** for **the** Site 4 (Army Rubble Disposal Area), Site 6 (Fort Redoubt Disposal Area), Site 7 (Firefighting School), Site 8 (Rifle Range Disposal Area), Site 16 (Brush Disposal Area), and Site 22 (Refueler Repair Shop) and seal it in accordance with Chapter 492 of the Florida Statutes. In sealing this document, I certify the geological information contained in it is true to the best of my knowledge and the geological methods and procedures included in this plan are consistent with currently accepted geological practices.

Name: Brian E. Caldwell  
License Number: 1330  
State: Florida  
Expiration Date: July 31, 1996

*B E Caldwell*

Signature

*11-8-95*

Date