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CONTAMINATION ASSESSMENT/ REMEDIAL ACTIVITIES INVESTIGATION WORK PLAN — GROUP I NAVAL AIR STATION PENSACOLA PENSACOM, FLORIDA

Transformer Storage Yard (Site 17) PCB Spill Area (Site 18) Transformer Accident Area (Site 28)

July 1992

Prepared for:

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TABLE OF CONTENTS

Section		Page
1	INTRODUCTION	1-1
2	SITE DESCRIPTION	2-1
	2.1 Site 17--Transformer Storage Yard	2-1
	2.2 Site 18--PCB Spill Area	2-1
	2.3 Site 28--Transformer Accident Area	2-5
3	SITE HISTORY	3-1
	3.1 Site 17--Transformer Storage Yard	3-1
	3.2 Site 18--PCB Spill Area	3-2
	3.3 Site 28--Transformer Accident Area	3-2
4	CLIMATOLOGY	4-1
5	BIOLOGICAL RESOURCES	5-1
	5.1 Regional Biological Resources	5-1
	5.1.1 Terrestrial	5-1
	5.1.2 Aquatic	5-4
	5.2 Site-Specific Biological Resources	5-9
6	SURFACE WATER HYDROLOGY	6-1
	6.1 General Occurrence and Significance of Surface Water	6-1
	6.2 Site-Specific Surface Water Hydrology	6-2

[Bold items enclosed in brackets denote changes to last version of document]

Table of Contents (Cont.)

Section		Page
7	PHYSIOGRAPHY AND HYDROGEOLOGY	7-1
	7.1 Physiography and Regional Eydrogeology	7-1
	7.1.1 Physiography	7-1
	7.1.2 Regional Hydrogeology	7-1
	7.1.2.1 Surficial/Sand-and-Gravel Aquifer	7-[1]
	7.1.2.2 Intermediate System	7-4
	7.1.2.3 Floridan Aquifer System	7-5
	7.2 Site Hydrogeology	7-5
	7.2.1 Site 17—Transformer Storage Yard	7-5
	7.2.2 Site 18--PCB Spill Area	7-6
	7.2.3 Site 28--Transformer Accident &ea	7-7
8	PROJECT MANAGEMENT PLAN	8-1
9	SITE MANAGEMENT PLAN	9-1
10	HEALTH AND SAFETY PLAN	10-1
11	QUALITY ASSURANCE PROJECT PLAN	11-1
12	AERIAL PHOTOGRAPH ANALYSIS	12-1
13	UTILITIES SURVEY	13-1
14	FIELDWORK METHODOLOGY	14-1
	14.1 Phase I—Field Screening	14-1
	14.1.1 Physical Survey	14-[2]
	14.1.1.1 Overall Physical Reconnaissance	14-[2]

170012

[Bold items enclosed in brackets denote changes to last version of document]

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Table of Contents (Cont.)

Section		Page
	14.1.1.2 HNu/OVA Surface Emissions Survey and Particulate Air [Screening]	14-[3]
	14.1.1.3 Habitat/Biota Survey	14-[3]
	14.1.2 Analytical Screening	14-[4J
	14.1.2.1 Laboratory Analyses	14-[4]
	14.1.3 Hydrologic Assessment	14-[10]
14.2	Phase 11--Characterization	14-[10]
	14.2.1 Biota Sampling	14-[14]
	14.2.2 Sediment Sampling	14-[14]
	14.2.3 Soil Sampling	14-[14]
	14.2.4 Shallow Monitoring Well Installation and Development	14-[18]
	14.2.5 Groundwater Sampling	14-[18)
	14.2.6 Hydrologic Assessment	14-[18]
	14.2.7 Air Sampling	14-[19]
14.3	Phase 111--Extent Delineation	14-[19]
	14.3.1 Biota Sampling	14-[19]
	14.3.2 Soil Sampling	14-[20]
	14.3.3 Shallow Monitoring Well Installation and Development	14-[20]
	14.3.4 Intermediate and Deep Monitoring Well Installation and Development	14-[20]
	14.3.5 Groundwater Sampling	14-[20]
	14.3.6 Hydrologic Assessment	14-[20]
	14.3.7 Air Sampling	14-[21]
14.4	Phase IV--Extent Delineation	14-[21)
14.5	Topographic Survey and Base Map	14-[21]
14.6	Field Quality Assurance/Quality Control	14-[22]
	14.6.1 Documentation	14-[22]
	14.6.2 Field Quality Assurance/Quality Control Samples	14-[22]

[Bold items enclosed in brackets denote *changes* to last version of document]

Table of Contents (Cont.)

Section		Page
	14.7 Decontamination and Waste Management Procedures	14-[22]
	14.7.1 Decontamination Procedures	14-[22]
	14.7.2 Waste Management Procedures	14-[22]
15	LABORATORY QUALITY ASSURANCE/QUALITY CONTROL	15-1
16	GROUNDWATER MODELING	16-1
17	TREATABILITY STUDY	17-1
18	BASELINE RISK ASSESSMENT	18-1
	18.1 Contaminant Identification	18-2
	18.2 Exposure Assessment	18-2
	18.3 Toxicity Assessment	18-3
	18.4 Risk Characterization	18-3
19	FEASIBILITY STUDY	19-1
	19.1 Screening of Applicable Remedial Technologies	19-1
	19.2 Assessment of Applicable Remedial Technologies	19-2
	19.3 Risk Assessment	19-2
	19.4 Development and Evaluation of Remedial Action Alternatives	19-2
	19.5 Selection of Recommended Remedial Action Alternatives	19-2
	19.6 Feasibility Study Report	19-3
20	REPORT	20-1
21	DOCUMENT REVISION	21-1
22	PROJECT MANAGEMENT	22-1

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[Bold items enclosed in brackets denote changes to last version of document]

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Table of Contents (Cont.)

Section		Page
23	PROJECT SCHEDULE	23-1
24	REFERENCES	24-1
25	FLORIDA PROFESSIONAL GEOLOGIST SEAL	25-1

Appendix

A	G & M (1984) SITE 17 PCB ANALYSES AND SAMPLE LOCATIONS	A-1
B	NEESA (1983) GENERAL LOCATION OF SITE 18 SOIL SAMPLE	B-1
C	GENERAL LOCATION OF PCB SPILL AT SITE 28 (NEESA 1983)	C-1
D	SITE-SPECIFIC SAFETY PLANS	D-1
E	SITE-SPECIFIC QUALITY ASSURANCE PROJECT PLANS	E-1
F	THREATENED AND ENDANGERED FLORA AND FAUNA ASSOCIATED WITH NAS PENSACOLA	F-1

[Bold item enclosed in brackets denote **changes** to last version of document]

LIST OF TABLES

Table		Page
14-1	Phase I Sampling and Analytical Requirements--Group I	14-[9]
14-2	Phase II Sampling and Analytical Requirements--Group I	14-[12]

[Bold items enclosed in brackets denote **changes** to last version of document]

LIST OF ILLUSTRATIONS

Figure		Page
2-1	Location Map-NAS Pensacola Sites 17, 18, and 28	2-2
2-2	Site Map--NAS Pensacola Site 17	2-3
2-3	Site Map--NAS Pensacola Site 18	2-4
2-4	Site Map--NAS Pensacola Site 28	2-6
14-1	Tentative Soil Boring, Sediment Sample, and Temporary Monitoring Well Locations, Site 17--Phase I	14-[5]
14-2	Tentative Soil Boring and Temporary Monitoring Well Locations, Site 18--Phase I	14-[6]
14-3	Tentative Soil Boring, Sediment Sample, and Temporary Monitoring Well Locations, Site 28--Phase I	14-[7]
14-4	Tentative Soil Boring, Sediment Sample, and Shallow Monitoring Well Locations, Site 17--Phase II	14-[15]
14-5	Tentative Soil Boring and Shallow Monitoring Well Locations, Site 18--Phase II	14-[16]
14-6	Tentative Soil Boring, Sediment Sample, and Shallow Monitoring Well Locations, Site 28--Phase II	14-[17]
23-1	Phase I Project Schedule--Group I	23-2
23-2	Phase II Project Schedule--Group I	23-3
23-3	Phase III Project Schedule--Group I	23-4
23-4	Phase IV Project Schedule--Group I	23-5

[Bold items *enclosed* in brackets denote *changes* to last version of document]

1. INTRODUCTION

The purpose of this work plan is to outline the procedures and methodologies to be used in conducting a Contamination Assessment/ Remedial Activities Investigation at the Transformer Storage Yard (Site 17), the PCB Spill Area (Site 18), and the Transformer Accident Area (Site 28) located at the Naval Air Station (NAS) in Pensacola, Escambia County, Florida. This work plan has been prepared by Ecology and Environment, Inc., (E & E) for the Southern Division, U.S. Navy, Naval Facilities Engineering Command, under Contract No. N62467-88-C-0200. The work plan has been developed based on information and file documents provided by the Navy and on information gathered by E & E during preliminary site inspections conducted in January 1989.

E & E has developed a phased approach for performing the NAS Pensacola site investigations. Phase I (Field Screening) is directed toward identifying the principal area(s) and primary contaminants of concern at a site, thereby providing a mechanism for focusing the sampling and analytical efforts during subsequent phases of the investigation. Phase II (Characterization) is directed toward the formal confirmation and quantification of the full spectrum of site contaminants (if any), thereby allowing determination whether further investigation is warranted. Thus, the necessity of implementing phases III and IV (Extent Delineation) will be dependent on the results of phases I and 11. Phases III and IV, if required, will be directed not only toward fully identifying the horizontal and vertical extents of contamination, but also toward providing the quantitative data base necessary to support the screening and evaluation of potential remedial alternatives. The main objectives/advantages of this phased approach are as follows:

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- Efficient identification of those sites vhere environmental contamination has actually occurred as a result of past and/or present operations, thereby allowing non-contaminated sites to be eliminated from the program in the most environmentally sound, cost-effective, and timely manner possible;

- Focused placement of sampling locations and focused selection of analytical parameters in later phases of the investigation, thereby allowing full characterization of site contamination in the most environmentally sound, cost-effective, and timely manner possible; and

- Early screening of potential remedial alternatives, which, in turn, allovs critical parameters necessary to the evaluation of these alternatives to be incorporated into the analytical program in later phases of the investigation.

It is anticipated that some of the NAS Pensacola sites may not require investigation beyond Phase 11, and hence will comprise Contamination Assessment-type investigations. On the otherhand, sites which have documented contamination will likely require the additional phases of work, and hence will comprise a full-scale Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Remedial Investigation (RI)/Feasibility Study (FS). For simplicity, the investigations for all NAS Pensacola sites will be referred to as contamination assessment/ remedial activities investigations. The final results of site investigations that do not require study beyond Phase II will be incorporated into a contamination assessment report. If appropriate, these sites will be recommended for no further action. The final results of site investigations that require work beyond Phase II will be incorporated into a RI report, which will provide all the information necessary for the development and completion of an FS.

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2. SITE DESCRIPTION

2.1 Site 17--Transformer Storage Yard

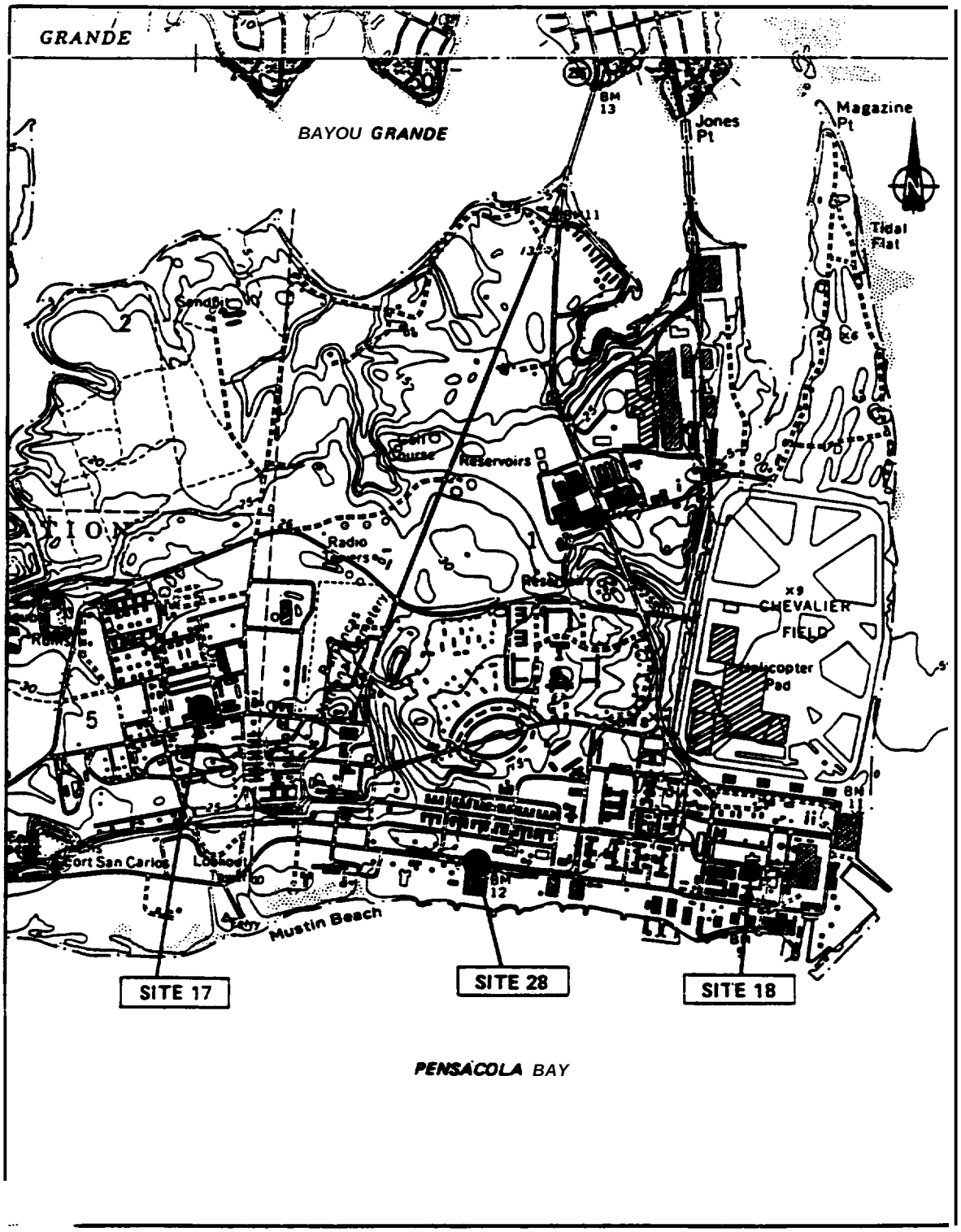
The Transformer Storage Yard Area (Site 17), an approximately 50- by 200-foot area within a fenced machinery storage yard, was used for 12 years to store used transformers, some of which contained PCB oil. The fenced machinery storage yard is located along the southern side of Arriola Court and the western side of Brown Road (see figures 2-1 and 2-2). The transformer storage area within this yard was located along the eastern side which faced Brown Road.

A storm drain, connected to the stormwater runoff system, is located approximately 10 feet west of the transformer storage area (see Figure 2-2). The entire site is paved with asphalt, but a 15- to 20-foot-wide strip east and south of and adjacent to the fenced machinery storage yard is covered with grass. There are no monitoring wells or surface water bodies located in the immediate vicinity of the site. NAS Pensacola Supply Well No. 3 is approximately 2,500 feet west of Site 17.

The site vicinity is generally flat with land surface elevations averaging approximately 20 to 25 feet above mean sea level (MSL). NAS Pensacola sites 8 and 22 lie approximately 2,000 and 1,700 feet, respectively, northeast of Site 17.

2.2 Site 18--PCB Spill Area

Site 18 is located near the northwest corner of Building 107, on the southwest corner of Mustin Street and Center Avenue, on the east side of Substation A (see figures 2-1 and 2-3). The substation itself is



U.S.G.S. 7.5 Minute Series (Topographic) Quadrangles: Fort Barrancas, Fla. 1970 and West Pensacola, Fla. 1970, Photorevised 1987.

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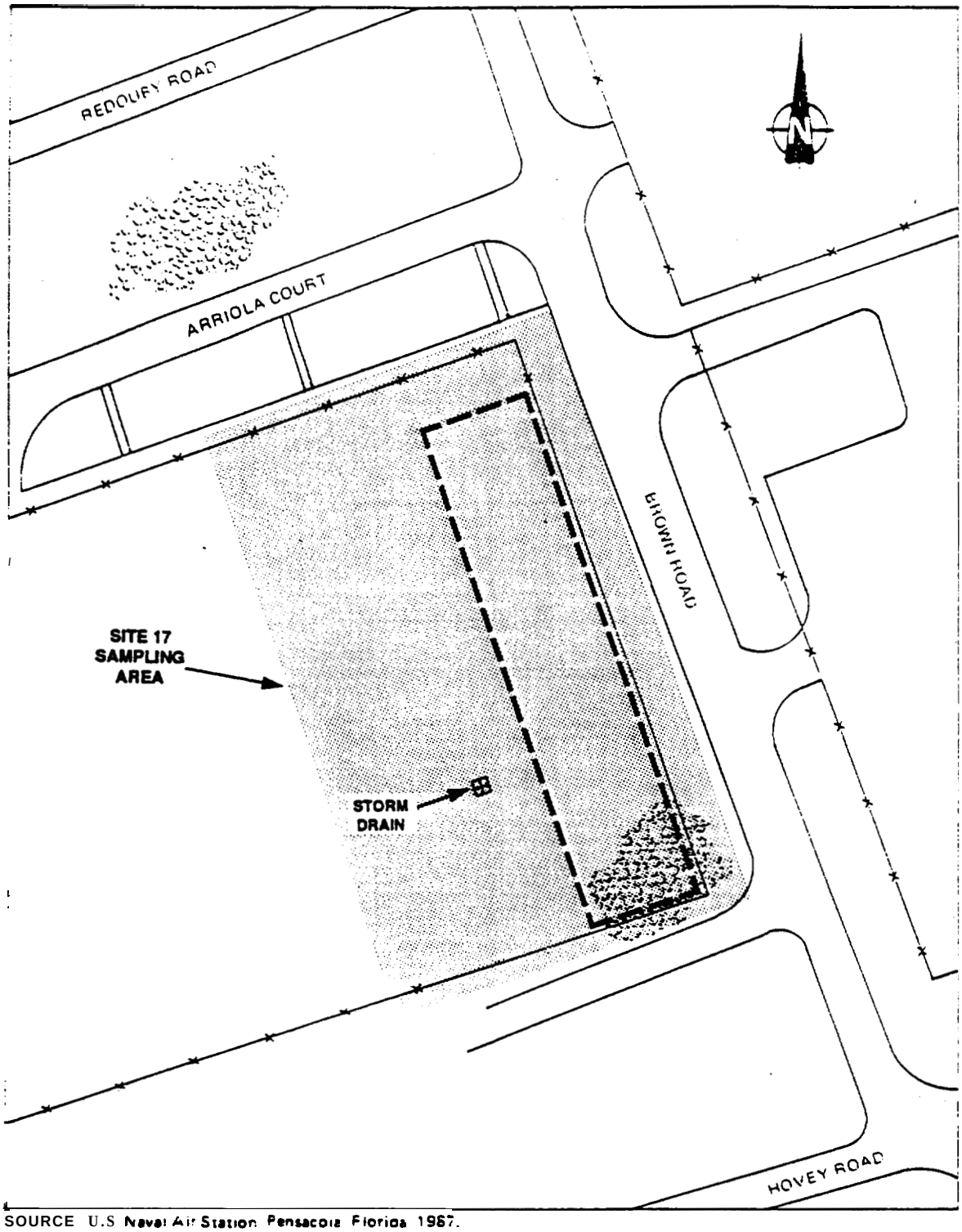
Figure 2-1 LOCATION *MAP* — **NAS PENSACOLA SITES 17, 18, AND 28**



SOURCE U.S Naval Air Station Pensacola Florida 1987.

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Old Transformer Storage Area

Figure 2-2 SITE MAP — NAS PENSACOLA SITE 17

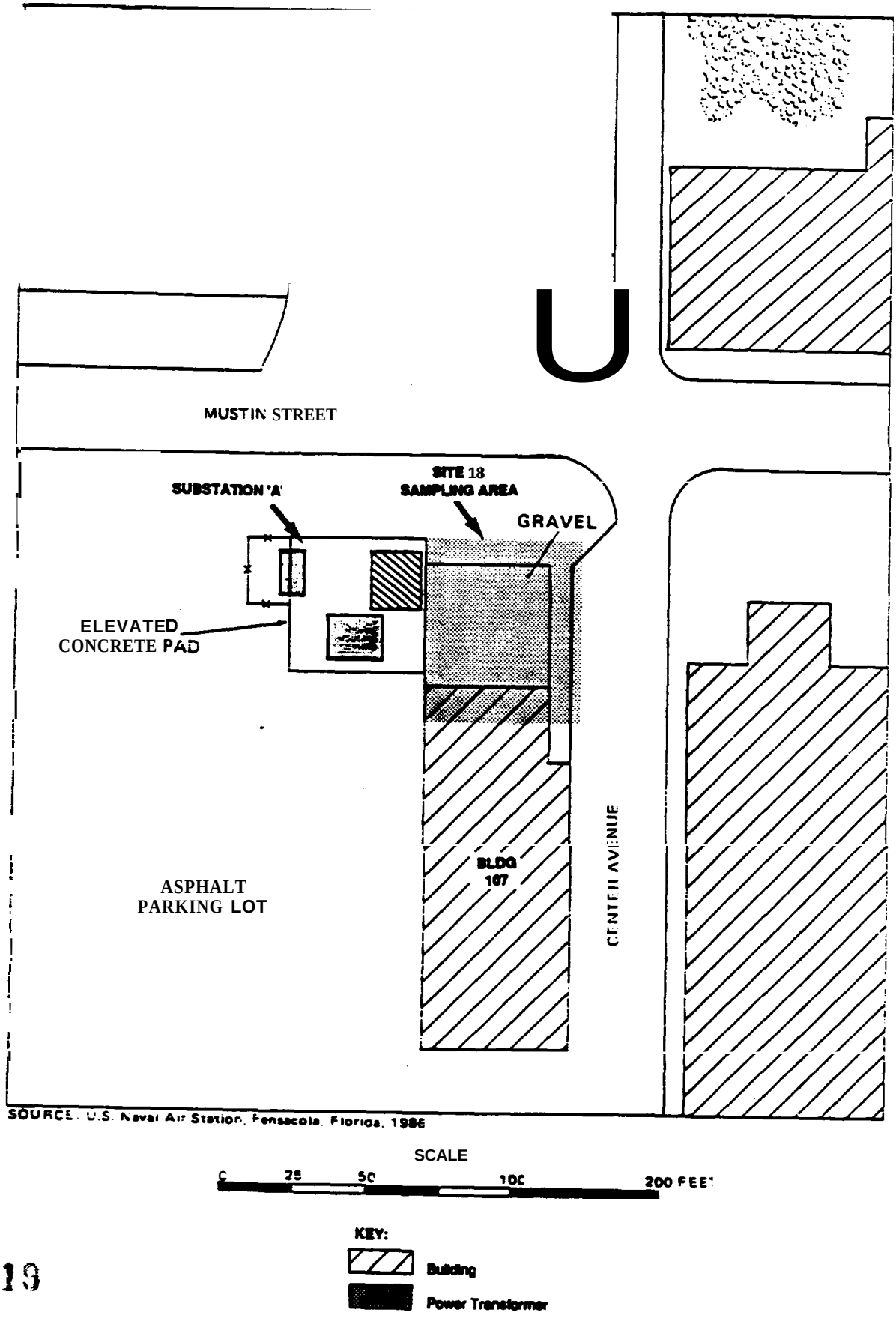

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Figure 2-3 SITE MAP — NAS PENSACOLA **SITE** 18

constructed on a concrete pad built approximately 4 feet off the ground. The area where the spill reportedly occurred is approximately 10 by 20 feet and is covered by gravel. The area surrounding the site and the substation is covered by asphalt.

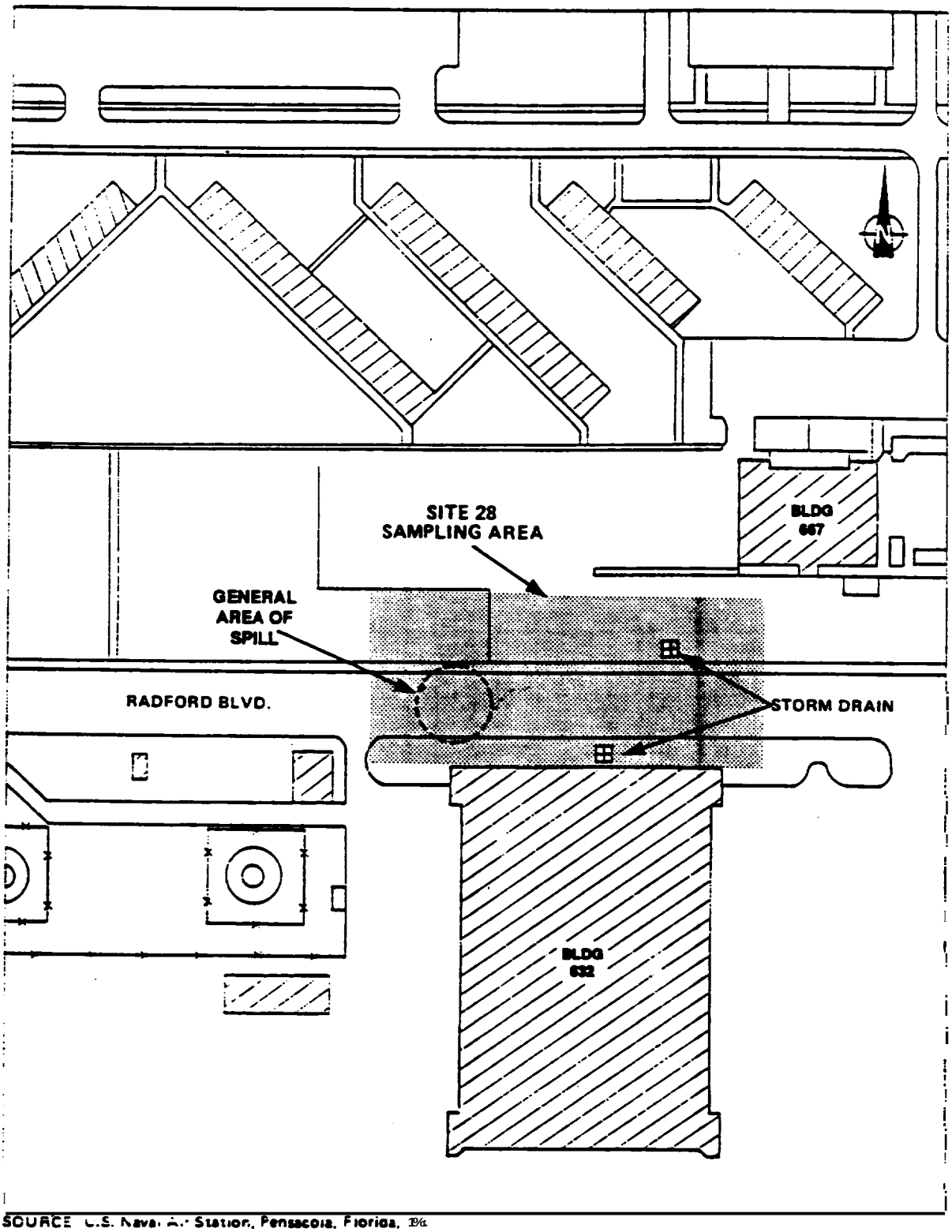
The site vicinity is generally flat with land surface elevations averaging approximately 5 to 10 feet above MSL. There are no monitoring wells located in the immediate vicinity of the site. Pensacola Bay is approximately 1,000 feet south of the site. NAS Pensacola Supply Well No. 2 is approximately 1 mile northwest of Site 18.

2.3 Site 28--Transformer Accident Area

The area of the transformer accident (reportedly occurred in 1969) is along Radford Avenue adjacent to and near the northeast corner of Building 632 (see figures 2-1 and 2-4). Since the date of the accident, Radford Avenue was expanded from four to five lanes and repaved with asphalt. The road slopes slightly from the crown towards either side. It is assumed from previous reports (Naval Energy and Environmental Support Activity [NEESA] 1983) that the transformer accident occurred in the area that is now the southern lanes of Radford Avenue.

Storm sewer drains are located along both the northern and southern sides of Radford Avenue in the vicinity of the transformer accident. These storm sewers are connected to the NAS Pensacola sanitary sewer system which presently disposes wastes into the treatment plant. However, at the time of the transformer accident (1969) this system did not exist to the extent present today, and, in all likelihood, any transformer oil would have been washed down the storm sewer system which emptied into Pensacola Bay.

Adjacent to the northern and southern sides of Radford Avenue is a grassy area approximately 15 feet wide bisected by concrete sidewalks. The site vicinity is generally flat, except for the slope built into the roadway, with land surface elevations averaging approximately 5 to 10 feet above MSL.



SOURCE: U.S. Naval Air Station, Pensacola, Florida, 19[illegible]

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Building

Figure 2-4 SITE MAP—"AS PENSACOLA SITE 28

There are no monitoring wells within the immediate vicinity of Site 28, however, Pensacola Bay lies approximately 500 feet south of Radford Avenue. NAS Pensacola Supply Well No. 1 is approximately 2,500 feet north-northwest of Site 28.

3. SITE HISTORY

3.1 Site 17--Transformer Storage Yard

The Transformer Storage Yard was used by the NAS Pensacola Public Works Center Utilities Department for 12 years (1964 to 1976) to openly store old transformers containing both PCB- and nonPCB-laden transformer oil. The area may have contained as many as 200 to 300 transformers at one time, some of which may have leaked unknown quantities of oil containing PCBs (NBESA 1983).

In June 1983, an Initial Assessment Study (IAS) of Site 17 was completed based on information from historical records, field inspections, and personal interviews. During the IAS, a sample of a black oily residue on Site 17 was analyzed and found to contain 70,000 parts per million (ppm) of Arochlor 1260, as well as other PCB types and chlorinated hydrocarbons. The IAS recommended further study of the site and the removal of the asphalt and any contaminated soil identified by the recommended study.

In July 1984, a Verification Study was performed by Geraghty and Miller, Inc., (G & M). During this study, three shallow soil borings were completed (to a depth of 2 feet) through the asphalt-covered area of Site 17 (see Figure 14-1). Low concentrations (9 ppm) of Arochlor 1260 were detected in one soil sample (17-2) collected near the on-site storm drain (G & M 1984). Appendix A contains a summary of the PCB analyses and the sample locations. As a result of these analyses, G & M recommended that no further action be taken at Site 17.

3.2 Site 18--PCB Spill Area

In 1966, a transformer at Substation A reportedly failed, spilling approximately 50 gallons of transformer oil containing an unknovn concentration of PCBs on the small gravel-covered area along the northeast side of Substation A. It is assumed that no cleanup effort was conducted (NEESA 1983).

In June 1983, an IAS was conducted at Site 18 by NEESA. The site was evaluated based on information in historical records, field inspections, and personnel interviews. During the field investigation, NEESA team members collected a sample of the oily residue within the gravel area. Appendix B includes a rap showing the general sample location. Analysis of this sample indicated that Arochlor 1260 vas present at a concentration of 4 ppm, less than that considered hazardous under the Toxic Substances Control Act. Since the levels of PCB were low, the U S recommended that no further study of the site vas warranted (NEESA 1983).

3.3 Site 28--Transformer Accident Area

In 1969, a transformer fell from a truck traveling on Radford Avenue just north of Building 632. The transformer broke open and spilled approximately 50 gallons of transformer oil onto the pavement (see Figure *2-4).* It is not known whether the oil contained PCBs. The oil was reportedly washed into a nearby storm sewer drain (NEESA 1983). Appendix C includes a map showing the general location of the spill.

The IAS conducted in June 1983 concluded that as the transformer oil was washed into the storm sewer system, there was no need to investigate Site 28 further. No samples have been collected at the site.

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4. CLIMATOLOGY

NAS Pensacola is located in an area that typically experiences a mild, subtropical climate. This climate is a result of the latitude (approximately 30° North) and the stabilizing effect of the adjacent Gulf of Mexico (Wolfe ~~et al~~. 1988). The average annual temperature ranges from 55° Fahrenheit (F) in the winter to 81° F in the summer. Although the annual temperature range is fairly stable, actual daily values can be more extreme, ranging from less than 7° F in the winter to more than 102° F in the summer. Thunderstorms occur during approximately half the days during the summer months and can cause a 10° to 20° F drop in temperature within only a few minutes (Wolfe ~~et al~~. 1988).

Precipitation rates in the NAS Pensacola vicinity are relatively high with an average annual rainfall of approximately 60 inches. Rainfall amounts are highest in July and August during almost daily thunderstorms (averaging 7 inches per month) and lowest during spring and fall (averaging 4 inches per month; Kennedy 1982). High intensity thunderstorms are common, producing as much as 3 to 4 inches of rainfall during a single hour. Evaporation rates are also highest in the summer months; therefore, potential recharge from heavy summer rains is reduced. Spring and fall rains are generally less intense but longer in duration, producing less surface runoff and higher rates of infiltration and net recharge.

Wind velocities are generally moderate except during thunderstorms (Carlisle 1960). Prevailing winds are northerly during the winter and southerly during the summer. An ocean-land temperature differential produces a daily clockwise rotation of the surface wind direction near the coast, commonly known as the sea-breeze effect (Flood and Associates

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1978). Hurricanes and tornadoes are infrequent but can cause substantial damage to the nearshore environment. Six hurricanes have passed within 50 miles of Pensacola since 1980.

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5. BIOLOGICAL RESOURCES

The NAS Pensacola facility consists of approximately 5,800 acres and encompasses approximately 15 terrestrial and aquatic habitats. The majority of the land on the eastern side of the facility is developed for military use or is designated as a historical or cultural resource. However, the NAS Pensacola installation has approximately 3,500 acres in natural or seminatural (plantation) condition, primarily in the western portion of the facility.

5.1 Regional Biological Resources

5.1.1 Terrestrial

Vegetation. The primary vegetated communities of the NAS Pensacola facility can be considered one of two types: north Florida coastal strand communities, and sand pine scrub communities. The north Florida coastal strand communities are stabilized coastal dunes with a sand substrate, vegetatively characterized by the plants Uniola paniculata (sea oats), Hydrocotyle bonariensis (beach pennywort), Ipomoea stolonifera (beach morning-glory), Coccoloba uvifera (sea grape), Quercus geminata (twin live oak), and the stunted shrubs species Yucca aloifolia (yucca), Opuntia, and Cereus. This community type has been ranked by the Florida Natural Areas Inventory (FNAI) as locally restricted and vulnerable to extinction due to developmental activities. This community type can have three to five distinct habitat types (Wolfe et al. 1988).

The sand pine scrub community is a more upland coastal community characterized by coastal dune formations from an older geologic age with deep, fine, white sand substrate and the plants Pinus clausa (sand

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pine), Quercus spp. (scrub oak species, geminata, champanii, myrtifolia, and inopina), Cladonia species, and Ceratiola ericoides (rosemary). This community type has been ranked by FNAI as imperiled statevide because of its rarity and because of its vulnerability to extinction due to some artificial or biological factor. This community type can have three to five distinct habitats (Volfe et al. 1988).

Two other community types m y be found in the western portions of the NAS Pensacola facility. These are flatwoods and sandhill vegetative communities. Flatwoods vegetation occupies areas which vere ocean bottoms in recent geologic times. Primary overstory vegetation is dominated by Pinus palustris (longleaf pine), Pinus elliottii (slash pine), and Serenoa repens (saw palmetto). Flatwoods communities also occupy areas of lov depressions and small creeks and drainage courses, but the overstory vegetation is usually replaced by Taxodium ascendens (pond cypress), Cliftonia monophylla (black titi), Cyrilla racemiflora (swamp titi) and other hydric or riparian species. Open moist savannah areas vithin flatwoods, are dominated by the herbaceous plants Pinguicula spp. (butterwort), Sarracenia spp. (pitcher-plants), Uticularia spp. (bladderworts), Polygala spp. (milkworts), and Drosera spp. (sundews; Volfe et al. 1988).

Sandhill communities are found in dry soils which are lower in fertility than flatvoods soils. The overstory of this community type is dominated by Pinus palustris (longleaf pine), Quercus laevis (turkey oak), Q. marilandica (bluejack oak), Q. stellata (post oak), and Q. falvata (southern red oak). The understory is dominated by Diospyros virginiana (vild persimmon) and Crataegus lacrimata (Pensacola havthorn). The more abundant herbaceous plants found in moist areas are Pteridium aquilinum (bracken fern) and Aristida stricta (wire grass). These habitats vere verified with walk-through surveys and ground truthing by the Navy in March 1986 (Navy 1986).

Freshvater Vetland Vegetation. Much of the geological aaterial underlying the NAS Pensacola facility is deep, porous sand often containing relatively impermeable clay lenses. In combination vith high

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annual rainfall, this geologic condition causes the formation of small areas of perched groundwater. In areas with relatively steep slopes, groundwater seepage escapes into well-defined stream channels called steepheads as found near Site 30. In gently sloping areas, the presence of perched groundwater conditions results in the formation of wetland bogs, as found near Sherman Field. Wetland or seepage bogs are characterized by herbaceous plant species as described in the sections above for flatwoods and sandhill communities. Most of these communities and other vegetative communities east of Sherman Field have been considerably altered by development on the base that has changed surface and/or groundwater flow (NEESA 1983).

Shrub bogs are found within flatwoods, downslope of herbaceous bogs. These evergreen bogs are dominated by Cliftonia monophylla (black titi), and/or Cyrilla racemiflora (swamp titi). Associated species include Clethra almifolia (sweet pepperbush), Ilex cassine (dahoon holly), and Lyonia spp. (fetterbushes; Wolfe et al. 1988).

Intermittent streams found on NAS Pensacola have lost most of the original vegetation associated with this habitat. For example, at S te 30, the stream that empties the small swamp into Bayou Grande has lost a considerable amount of vegetation along the stream banks and near Bayou Grande as a result of base development. In areas unaffected by development, hardwoods dominate the canopy around the stream. Such species as Magnolia virginiana (sweetbay), Illicum floridanum (star anise), and Smilax bona-nox (spiked cat brier) are dominants of seepage or steephead streams (Wolfe et al. 1988).

Biota surveys must be conducted for any wetland or stream habitat that is influenced by a site to determine which specific flora and fauna may be affected by site activities.

Birds. A literature search reveals 250 possible bird species associated with the area. Thirteen of these species are endangered, and seven are species of concern (see Appendix C). In March 1986, the Navy conducted a survey and found 23 species of birds on the NAS Pensacola facility.

The Navy recorded moderate size rookeries of the great blue heron and found large numbers of nesting osprey in the southwestern portions of the NAS Pensacola facility. Because of the large number and diversity of habitats found around the facility and considering that the survey was conducted during a predominantly non-mating season, it is likely that there are more species of birds using the facility and surrounding waters as feeding and nesting sites than have been found.

Reptiles a d Amphibians. During the 1986 survey conducted by the Navy, only four out of a possible 30 species of reptiles and amphibians associated with the area were identified on the NAS Pensacola facility, none of vhich are endangered. A recent check of the FNAI files confirms that the presence of the gopher tortoise (Gopherus polyphemus) can most likely be found in suitable habitats on the western portions of the facility (see Appendix F). Host of the reptiles and amphibians that may be found on the facility can be expected to use the surface water bodies in some stage of their life cycle. Any contamination of surface water bodies can be detrimental to existing populations of reptiles and amphibians utilizing that water body.

5.1.2 Aquatic

Freshwater. Little is known of the flora and fauna inhabiting the streams, swamps, and bogs found on NAS Pensacola. These habitats may have been significantly altered for drainage control and base development. Some of the species associated with aquatic habitats are Semotilu atromaculatus (creek chub), Gambusia affini (mosquitofish), and Etheostoma sp. (darters). Birds, mammals, reptiles, and amphibians that associate vith aquatic habitats may also be found in and around those sites vith surface waters (Volfe et at. 1988).

Coastal Wetlands. There are no reported coastal marshes or estuarine vetlands around the NAS Pensacola facility, principally along the lov energy shores of Bayou Grande. The habitat type is usually dominated by

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saltmarsh cordgrass (Spartina alterniflora) or black needlerush (Juncus roemarianus). A biota survey of these and other potential habitat areas will be conducted to determine the extent of estuarine flora and fauna.

Seagrass beds are reported to be present within Big Lagoon along the southwestern portion of the NAS facility. These grassbeds are composed primarily of Thalassia testudinum, Syringodium filiforme, and Halodule beaudettei. Seagrass beds in the area surrounding the facility have not been historically mapped, and very little is known of their composition, locality, or areal extent. Grass beds of unknown species composition extending along the north shore of Pensacola Bay in the 1950s disappeared by 1961. An examination of historical aerial photographs (see Section 12) may elucidate past distributions of seagrasses.

Plankton. The only existing study of the phytoplankton and zooplankton in the waters surrounding the NAS Pensacola facility was conducted by the Navy in March 1986. The phytoplankton has been characterized as low in productivity (as compared to other Gulf coast estuaries), and mainly dominated by the diatoms Navicula tripuncata, Bacteriastrum spp., Chaetocerus spp., Thalassionema nitzschoides, and Hemiaulus spp. The zooplankton is primarily dominated by Calonoid copepods and benthic invertebrate larvae. This study is very limited by the fact that samples were collected with undefined methods and only during the early spring. This sampling protocol does not define population fluctuations that are characteristic of low population abundances commonly found in estuaries during the summer months. Examination of the zooplankton data results in the same conclusions. It should be pointed out that any contamination entering Pensacola Bay from either groundwater or surface water sources may be accumulated in the invertebrate larvae that predominate most estuarine water bodies.

Benthos. Marine soft-sediment communities are found adjacent to the northern, eastern, and southern areas of the NAS Pensacola facility in Pensacola Bay. Although no intensive benthic surveys were conducted along the perimeter of the facility, surveys at nearby sites by the

Florida Department of Environmental Regulation (FDER) and the Navy have described the benthic communities within Pensacola Bay as a whole. FDER collected benthic samples in most of Pensacola Bay and found that the sediments were dominated by polychaetes (Aricidea spp., Capitella spp., various spionids, and Eaploscoloplos spp.) and bivalves (Anodontia alba and Tellina spp.) during most of the year. FDER samples collected along the wastewater treatment plant outfall show a drastic drop in species abundance and diversity close to the sewage outfall (Navy 1986). This indicates that the benthic community might have been negatively influenced by the sewage outfall.

Samples collected by the Navy (1986) indicate a low density yet moderate diversity of benthic infaunal organisms when compared to other estuarine systems within and around the turning basin. A complete comparison of the Navy's data with other literature cannot be made at this time because their data are not given in numbers per unit area. However, the Navy's data reveal that very few deep dwelling organisms reside in the areas around the turning basin, and a lack of deep dwelling benthic organisms may be an indication of a benthic community under stressed conditions (Luckenbach et al. 1988).

Fish and Shellfish. Early studies of Pensacola Bay have identified 180 bony fish species and seven cartilaginous fish species (Cooley 1978). The 13 most abundant species were spot (Leiostomus xanthurus), pinfish (Lagodon rhomboides), Atlantic croaker (Micropogonias undulatus), gulf menhaden (Brevoortia patronus), bay anchovy (Anchoa mitchilli), longspine porgy (Stenotus caprinus), silver perch (Bairdiella chrysoura), southern hake (Urophycis floridana), inshore lizardfish (Synodus foetens), gafftopsail catfish (Bagre marinus), sand seatrout (Cynoscion arenarius), and spotted hake (Urophycis regia; Heil 1988).

Fish diversity was highest in tbe more saline waters near the NAS Pensacola facility during spring and summer. In the less saline waters of East Bay, diversity was lowest in summer and highest during the vinter months. Fish population density was the highest in the more saline waters, with peaks throughout the summer (Cooley 1978).

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Moderate densities of blue crab (Callinectes sapidus), shrimp (Penaeus duorarum, P. setiferus, and P. aztecus), and oysters (Crassostrea virginica) have been collected throughout Pensacola Bay (Heil 1989). Shrimp are caught in greater abundances near NAS Pensacola because of the higher salinities. Blue crabs and oysters are more readily caught in the East Bay area. In fact, the only legal shellfishing areas recognized by the Florida Department of Natural Resources (FDNR) are in the East Bay area. Scallops (Aequipecten irradians) are collected only within grassbed areas. No information is available at this time on where scallops are collected by the general public and how many are removed. The nearest seagrass beds to the NAS facility are located in Big Lagoon along the southwest portion 'of the facility.

Sport and Commercial Fishing. A moderate amount of commercial fishing occurs in Escambia County, accounting for 2% of the total Florida landings for 1980 to 1985 (Navy 1986). The dominant finfish species in terms of total weight was the black mullet. The most economically important species of finfish was the red snapper. E & E examined the commercial landing data for Escambia County for 1987 and 1988 (Heil 1989) and found that the most important commercial species by weight were black mullet (24% of county landings), brown shrimp (21%), vermillion snapper (19.5%), red snapper (7.6%), porgies (4.7%), and amberjack (4%). Other less important commercial fish caught were Spanish mackerel, sand seatrout, black grouper, spotted seatrout, blue crab, and squid. These data, as well as the Navy's data, also suggest that a significant tuna fishery may be developing in the Pensacola Bay area (0 pounds landed in 1983; 1,582 pounds in 1987).

Sport fisheries data for the state of Florida are not available at this time due to the lack of a state saltwater fishing license (Heil 1989). A telephone survey conducted by the U.S. Fish and Wildlife Service ranks the spotted seatrout as a primary fish species sought by fisherman in 1987. Following this species were king mackerel, red drum, Spanish mackerel, groupers, red snapper, flounders, and sand seatrout. It is likely that the sport fishing catch equals or exceeds commercial landings for species sought by both interests (Navy 1986).

The estuarine system is a very important element in the life history of most of the commercial and sport fishing species sought. Between 65 and 90% of all commercially valuable fish species are estuarine dependent during some phase of their life cycle. Shrimp, blue crab, and shellfish are known to release larvae that feed in and around estuaries until settlement. During early life history stages, the juveniles reside within seagrass beds or other protected habitats until maturity. Any contamination of the water or sediments around NAS Pensacola could be detrimental to fish and shellfish population structure or could be accumulated by the organisms residing near the facility.

Marine Mammals. Few mammals have been sighted within the area of the NAS Pensacola facility; most of the 13 species of mammals reported for the northeastern Gulf of Mexico stay predominantly in Gulf waters. The Atlantic bottlenose dolphin (Tursiops truncatus), however, has been sighted regularly off the NAS Pensacola facility. Uanatees have been sighted irregularly, with one recent sighting in the area recorded by the FNAI in October 1988. A goosebeaked whale (Ziphius cavirostris) was reported stranded on Santa Rosa Island, and a pilot whale (Globicephala macrorhynchus) was found stranded on a beach near Pensacola (Navy 1986).

Although no surveys of marine mammals have been conducted, it can be assumed that they are quantitatively ranked as uncommon to common in abundance within the waters surrounding the NAS Pensacola facility.

Threatened and **Endangered Species.** A number of threatened and endangered species (see Appendix P) have been identified in the vicinity of the NAS Pensacola facility. Many rare, threatened, and endangered species are associated with the wetland or bog habitats found on NAS Pensacola. A total of 57 occurrences for *six* plant species were recorded in an inventory conducted by FNAI (1988b) of the NAS Pensacola facility (see Appendix F). Host of these plants were found in the area around Sherman Field and habitats to the west. Any site remediation and, more importantly, any assessment of environmental endangerment must consider the water level requirements of rare and endangered plant species, the foraging activities of birds in the waters surrounding the

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NAS Pensacola facility, and nesting and feeding animals on the facility grounds. Complete biotic surveys may be necessary to determine the presence of threatened or endangered species and potential pathways of contamination to these species.

5.2 Site-Specific Biological Resources

Habitats on sites 17, 18 and 28 have been completely altered by base activities. Native vegetation has, for the most part, been replaced by buildings, roads, easements, and asphalt parking lots. Site 17 has some overstory hardwood tree species present, but the understory shrub species have been removed for the most part. It is expected that few species of birds, reptiles, and rodents will utilize these sites for feeding, nesting, or as migration corridors. Site 17 will have more species utilizing the site as a migration corridor only because of its fairly isolated location and the number of hardwood tree species present.

6. SURFACE WATER HYDROLOGY

6.1 General Occurrence and Significance of Surface Water

The NAS Pensacola facility is located on a coastal peninsula bounded by Bayou Grande to the north, Pensacola Bay to the south and east, and Big Lagoon to the southwest. Pensacola Bay and Big Lagoon are partially separated from the Gulf of Mexico by Santa Rosa Island and Perdido Key, both of which are barrier islands.

Surface soils consist primarily of permeable sands which allow rapid infiltration of precipitation. This direct infiltration limits stream formation and constitutes the major source of recharge to the underlying Sand-and-Gravel Aquifer.

There are no naturally occurring perennial streams on NAS Pensacola; however, there are approximately 10 naturally occurring intermittent streams and numerous artificial drainage pathways which include many stormwater outfalls. Discharge is mainly to the south into Pensacola Bay; however, some small intermittent streams discharge into Bayou Grande to the north from Sherman Field and Chevalier Field (USGS 1970a, 1970b).

The southwestern and northern portions of NAS Pensacola contain areas of freshwater wetlands. These are particularly sensitive areas formed by the intersection of the water table with the land surface. These systems are defined by and dependent upon a dynamic water-cycle, with periodic inundation and exposure corresponding to seasonal fluctuations in the water table.

The discharge of surface waters into Pensacola Bay, Bayou Grande, and the coastal wetland areas presents the potential for transport of contaminants into these systems. This could have a significant impact on seagrass and other sensitive plant communities, as well as on shell fishing, recreational fishing, and swimming in these coastal zones.

Discharges, either through the surface water or groundwater, into wetland areas found on site could also have a significant impact on the biotic communities that are dependent on those habitats.

6.2 Site-Specific Surface Vater Hydrology

There are no surface water bodies found on sites 17, 18, or 28. Pensacola Bay is 500 feet south of Site 28 and 750 feet south of Site 18. The nearest surface water body to Site 17 is Pensacola Bay, approximately 0.75 mile to the south.

Contaminants from Site 28 reportedly entered the storm sewer system; therefore, it is possible that these contaminants may have been carried into Pensacola Bay. No sampling is anticipated in Pensacola Bay for this investigation--sampling of this area is being conducted as part of the Site 2 investigation.

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7. PHYSIOGRAPHY AND HYDROGEOLOGY

7.1 Physiography and Regional Hydrogeology

7.1.1 Physiography

NAS Pensacola is located in the Gulf Coastal Lowlands Subdivision of the Coastal Plain Province physiographic division (Brooks 1981). The 5,800-acre facility is located on a peninsula bounded on the east and south by Pensacola Bay and Big Lagoon and on the north by Bayou Grande. The most prominent topographic feature on the peninsula is an escarpment or bluff which parallels the southern and eastern shorelines and on which Fort Barrancas was built. In the eastern portion of NAS Pensacola, the bluff runs north-south just to the west of Chevalier Field. Seaward of the escarpment is a nearly level marine terrace with surface elevations of approximately 5 feet above HSL. The central part of the peninsula, located landward of the escarpment, is a broad gently rolling upland area with surface elevations up to 40 feet MSL (USGS 1970a, 1970b). Sandy soils occur throughout the NAS Pensacola area. As a result, most of the rainfall infiltrates directly into the subsurface. Consequently there are few streams or surface water bodies on the peninsula.

7.1.2 Regional Hydrogeology

There are three principal hydrogeologic units of importance which underlie the NAS Pensacola. These are, in descending order, the Surficial Aquifer, the Intermediate System, and the Floridan Aquifer System.

7.1.2.1 Surficial/Sand-and-Gravel Aquifer

The Surficial Aquifer occurs from land surface to a depth of approximately 300 feet at NAS Pensacola and is composed of a sequence of unconsolidated to poorly indurated clastic deposits (Wagner ~~et al~~.

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1984). In this portion of Florida, the Surficial Aquifer constitutes an important source of water supply and is called the Sand-and-Gravel Aquifer (Southeastern Geological Society [SEGS) 1986). [Based on the total dissolved solids (TDS) content of groundvater from wells that tap the Sand-and-Gravel Aquifer in southern Escambia County (Clemens et al. 1989), the groundwater is classified as Class G-1 (FDER 1988b).] The sediments making up this aquifer belong to all or part of the Pliocene to Eolocene Series vhich, in this area, consist mainly of the Citronelle Formation overlain by a thin cover of marine terrace deposits. Given that the Sand-and-Gravel Aquifer is contiguous with land surface and recharge occurs principally by the direct infiltration of precipitation, the aquifer is particularly susceptible to contamination from surface sources. In the NAS Pensacola vicinity, the Sand-and-Gravel Aquifer is made up of three zones based on contrasting permeabilities. These zones are referred to as the surficial zone, the lov permeability zone, and the main producing zone (Wilkins et al. 1985).

Surficial Zone. The surficial zone is contiguous with land surface and contains groundwater under water table or perched water table conditions. The results of numerous borings conducted at NAS Pensacola (G & M 1984, 1986) indicate that the surficial zone ranges in thickness between 40 and 70 feet and consists of tan and brown, fine- to medium-grained quartz sand. Depth to the water table within the surficial zone is variable depending on location and ranges from less than 1 foot near surface water bodies to more than 20 feet in areas of higher elevation. In general, the direction of ground water flow is controlled by the topography and by discharge to surface water bodies. Consequently, shallow groundwater in the surficial zone moves toward areas of lower elevation and/or the nearest surface water body. Overall, the surficial zone has a high permeability. Numerous aquifer (slug) tests and laboratory permeability tests conducted on wells in or sediments from the surficial zone at NAS Pensacola yielded hydraulic conductivity values ranging from 16 to 56 ft/day (G & M 1986). Horizontal groundvater flow velocities in the surficial zone will depend on site-specific hydraulic conductivities and horizontal hydraulic gradients, however, velocities would generally be expected to be high.

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Low Permeability Zone. Underlying the surficial zone is a zone of lower permeability sediments dominated by clay and silt-sized material. This zone is referred to as the low permeability zone. At NAS Pensacola, this zone is generally composed of gray to blue, sandy, silty, slightly fossiliferous (shelly) clay and clayey sand ranging in thickness from 8 to 40 feet (G & M 1984, 1986).

The results of laboratory permeability tests conducted on samples from this zone indicate that vertical hydraulic conductivities are low, ranging from 4.2×10^{-5} to 9.9×10^{-2} ft/day. Thus, the low permeability zone probably functions as a confining or semiconfining unit inhibiting the flow of groundwater between the surficial zone and 'the underlying main producing zone. The low permeability zone has been encountered in at least 16 borings at widely spread locations throughout NAS Pensacola (G & M 1984, 1986). Although additional boring or geophysical techniques would be required to confirm its presence at a given location, it is likely that this unit is ubiquitous at NAS Pensacola. Few, if any, wells are open to the low permeability zone at NAS Pensacola; thus, no information is available regarding groundwater flow direction.

Main Producing Zone. The bottom portion of the Sand-and-Gravel Aquifer is called the main producing zone and consists mainly of sand and gravel interbedded with thin beds of silt and clay. The depth at which the main producing zone is encountered is somewhat variable, ranging from 60 to approximately 120 feet BLS at NAS Pensacola. This zone generally has the highest permeability characteristics due to thicker and more persistent sand and gravel beds, and is tapped by most of the major wells in the Pensacola area (Wilkins ~~et al~~. 1985). NAS Pensacola has three supply wells which produce water from this zone; however, due to high iron content in the water, the wells are infrequently used (G & M 1986). The principal sources of water for NAS Pensacola are wells located at Corry Field, approximately 3 miles to the north. The thickness of the main producing zone can be highly variable; however, it is estimated to be up to about 100 feet at NAS Pensacola. Insufficient data exist for wells open to the main producing zone at NAS Pensacola to

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determine direction of groundvater flov within this zone; hovever, the flov direction is assumed to be generally southward under ambient conditions. Pumpage of the supply wells would locally cause groundwater in this zone to flow,toward the wells.

As a result of the overlying low permeability zone, groundvater within the main producing zone occurs under confined or semiconfined conditions. At one nested well location on NAS Pensacola (east of Building 648), the water level elevation in a well open to the main producing zone is approximately 7 feet lower than that in an adjacent well open to the surficial zone (G & H 1986). This indicates that a significant downward hydraulic gradient exists betveen these tvo zones. Thus, a considerable potential exists for vertical groundvater flov from the surficial to the main producing zone at this location. It is not known to what extent this potential exists elsevhere at NAS Pensacola.

7.1.2.2 Intermediate System

The lover limit of the Sand-and-Gravel Aquifer coincides vith the top of a regionally extensive and vertically persistent hydrogeologic unit of much lover permeability. This unit is referred to as the Intermediate System. In the vicinity of NAS Pensacola, the top of the Intermediate System generally lies within the sediments termed Hiocene Coarse Clastics or corresponds to the top of the Upper Member of the Pensacola Clay and occurs at a depth of approximately 300 feet (Vilkins et at. 1985). In general, the Intermediate System consists of fine-grained sediments and functions as an effective confining unit vhich retards the exchange of water between the overlying Sand-and-Gravel Aquifer and the underlying Floridan Aquifer System (SEGS 1986). The entire sequence is primarily poor to non-vater bearing. However, relatively thin beds of sand which exist within the unit may yield small quantities of water. In the NAS Pensacola area the Intermediate System is approximately 1,100 feet thick and is composed of the lover portion of the Hiocene Coarse Clastics, the Upper Member of the Pensacola Clay, the Escambia Sand Member of the Pensacola Clay, and the Lover Member of the Pensacola Clay, all of Miocene Age.

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7.1.2.3 Floridan Aquifer System

Immediately underlying the Intermediate System and occurring at a depth of approximately 1,500 feet BLS at NAS Pensacola is the Floridan Aquifer System. The Floridan Aquifer in this area is comprised of the Middle to Lower Miocene Chickasawhay Limestone and undifferentiated Tampa Stage Limestone. Groundwater within the Floridan Aquifer in this area is highly mineralized and is not used for water supply (Wagner et al. 1984).

7.2 Site Hydrogeology

7.2.1 Site 17--Transformer Storage Pard

The soils of Escambia County are primarily derived from marine and stream deposit parent material. The IAS soil association map (NEESA 1983) indicates that the surface soils at Site 17 are predominately sands and sandy loams. These sands are light gray; some contain small amounts of organic material which can impart a salt-and-pepper coloring. Lithologic information from borings taken nearby indicates that there are fine- to medium-grained quartz sands to depths of approximately 50 to 60 feet BLS. This interval corresponds to the surficial zone of the Sand and Gravel Aquifer. Underlying the surficial zone is an approximately 15-foot-thick layer of marine clay that acts as a confining or semiconfining zone of low permeability and inhibits groundwater flow between the surficial and deeper main producing zone.

The Site 17 area land surface elevation is 20 to 25 feet above MSL. The roughly estimated depth to groundwater is 15 feet BLS. Groundwater flow in the surficial zone is generally controlled by local topography; groundwater flows from areas of high elevation to areas of lower elevation. Pensacola Bay lies approximately 3,000 feet south of Site 17; in the main producing zone, groundwater flows generally southerly towards the bay, which probably acts as a discharge zone. The extent of recharge via surface infiltration to the Sand-and-Gravel Aquifer in the Site 17 vicinity is most likely limited due to extensive, paved surfaces.

Currently, no monitoring wells exist on this site; however, vertical hydraulic conductivity tests performed on samples from the surficial zone at the Sherman Field Fuel Farm area (Site 37) vere found to be 6.8 and *28.4* feet per day (ft/d; G & M 1984). The samples vere collected at depths of 5 feet and 14 feet, respectively, indicating that vertical hydraulic conductivity increases with depth. In addition, in unconsolidated sedimentary deposits, the horizontal hydraulic conductivity can be expected to be greater than the vertical hydraulic conductivity (Heath 1987).

7.2.2 Site 18--PCB Spill Area

The IAS soil association map (NEESA 1983) indicates that the surface soils at Site 18 are predorinately sands and sandy loams. Lithology information from borings taken nearby indicate that there are fine- to medium-grained quartz sands to depths of approximately 40 to 50 feet BLS. This interval corresponds to the surficial zone of the Sand and Gravel Aquifer. Underlying the surficial zone is an approximately 15-foot-thick layer of marine clay that acts as a confining or semiconfining zone of lov permeability and inhibits groundvater flov betveen the surficial and deeper lain producing zone.

The Site 18 area land surface elevation is 5 to 10 feet above HSL. The roughly estimated depth to groundvater is 5 feet. Groundvater flov in tbc surficial zone is generally controlled by local topography; groundvater flows from areas of high elevation to areas of lover elevation. Pensacola Bay lies approximately 750 feet south of Site 18; in the site 18 area, the shallow groundwater robably flovs south toward the bay. In the main producing zone, groundvater flovs generally southerly towards the bay, which probably acts as a discharge zone. The extent of recharge via surface infiltration to the Sand and Gravel Aquifer is most likely limited in the Site 18 vicinity due to extensive, paved surfaces.

Currently, no monitoring wells exist on this site; hovever, vertical hydraulic conductivity tests performed on samples from the surficial zone at the Sherman Field Fuel Farm area were found to be *6.8* and 28.4

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ft/d (G & M 1984). The samples were collected at depths of 5 to 14 feet, respectively, indicating that vertical hydraulic conductivity increases with depth. In addition, in unconsolidated sedimentary deposits, the horizontal conductivity can be expected to be greater than the vertical hydraulic conductivity (Heath 1987).

7.2.3 Site 28 — Transformer Accident Area

The IAS soil association map (NEESA 1983) indicates that the surface soils at Site 28 are predominately sands and sandy loams. Lithologic information from borings taken nearby indicates that there are fine- to medium-grained quartz sands to depths of approximately 25 feet BLS. This interval corresponds to the surficial zone of the Sand and Gravel Aquifer. Underlying the surficial zone is an approximately 15-foot-thick layer of sandy marine clay that acts as a confining or semiconfining zone of low permeability and inhibits groundwater flow between the surficial and deeper main producing zone.

The Site 28 area land surface elevation is 5 to 10 feet above MSL. The roughly estimated depth to groundwater is 5 feet BLS. Groundwater flow in the surficial zone is generally controlled by local topography; groundwater flows from areas of high elevation to areas of lower elevation. Pensacola Bay lies approximately 500 feet south of Site 28; in the Site 28 area, the shallow groundwater probably flows south, toward the bay. In the main producing zone, groundwater flows generally southerly towards the bay, which probably acts as a discharge zone. The extent of recharge via surface infiltration to the Sand and Gravel Aquifer is most likely limited in the Site 28 vicinity due to extensive, paved surfaces.

Currently, no monitoring wells exist on this site; however, vertical hydraulic conductivity tests performed on samples from the surficial zone in a nearby area indicated that the vertical hydraulic conductivity increases with depth. In addition, in unconsolidated sedimentary deposits, the horizontal hydraulic conductivity can be expected to be greater than the vertical hydraulic conductivity (Heath 1987).

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8. PROJECT MANAGEMENT PLAN

The Generic Project Management Plan (GPMP) defines the technical approach and schedule as well as the qualifications of personnel who will be directing and performing this Contamination Assessment/Remedial Activities Investigation. This work plan will incorporate and reference applicable technical and schedule sections, as appropriate, and will follow E & E's project management guidelines (see Section 22).

9. SITE MANAGEMENT PLAN

The Generic Site Management Plan (GSMP) defines the management procedures for field activities on both the site and program level. The management and implementation of all field activities conducted as part of the Contamination Assessment/Remedial Activities Investigation of Site 1 will follow the GSMP and any updated versions. Data Quality Objectives (DQOs) and all applicable or relevant and appropriate requirements (ARARs) have been considered in developing the initial phases of fieldwork described here, and will be updated and revised for any subsequent phases of fieldwork.

10. HEALTH AND SAFETY PLAN

A comprehensive General Eealth and Safety Plan (GESP), and individual site-specific safety plans (SSPs[; see Appendix D]), have been developed to provide readily available emergency information and preventative safety measures. The GESP outlines health and safety procedures and protocols to be followed during all field investigations at each of the (39) sites on NAS Pensacola. The plan includes'standard operating procedures (e.g., site entry and decontamination); hazard communication and training (e.g., safety training, briefings, and documentation); safety equipment and instrumentation (e.g., monitoring and personnel protective equipment); hazard evaluation by contaminant class (e.g., metals and organics); and hazard evaluation for each task (e.g., drilling and sampling). The GESP will be periodically updated, as required, during the course of this program.

In addition, the GESP and the individual SSPs will define the toxicological properties and health hazards associated with each site. The SSP will include emergency action information pertinent to the safety of the field personnel and of the public (e.g., hospitals, ambulatory units, poison control centers, fire departments, and police/sheriff departments). The SSP will also identify first-aid and personal safety equipment and will provide recommended site security precautions. The GESP and the SSP will comply with the Occupational Safety and Eealth Administration (OSHA) Guidelines for Hazardous Waste Operations (29 Code of Federal Regulations [CFR] Section 1910).

11. QUALITY ASSURANCE PROJECT PLAN

A Generic Quality Assurance Project Plan (GQAPP) has been prepared and submitted to the Navy. This comprehensive document will be referenced for all field and laboratory procedures for this program, and will be used to develop the Site-Specific Quality Assurance Plans (SQAPs[; see Appendix B]).

The SQAP will provide site-specific quality assurance/quality control (QA/QC) measures used to obtain accurate and precise data for all site investigation activities. The SQAP will address all phases of the investigation from development of the initial sampling plan through verification and reporting of the analytical results. All of the QA/QC procedures described in the GQAPP and SQAP will be in accordance with applicable professional technical standards, U.S. Environmental Protection Agency (EPA) requirements, and specific Navy goals and requirements for this project. All samples will be collected, handled, packaged, preserved, and transported in accordance with the GQAPP and SQAP and with U.S. Navy and EPA procedures.

12. AERIAL PBOTOGRAPH ANALYSIS

Prior to the initiation of fieldwork, E & E will examine all available aerial photographs of NAS Pensacola for past and present conditions, features, and developments which may have direct relevance to the fieldwork methodology. The aerial photograph analysis task will involve assembling and stereoscopically analyzing historical photographic imagery and topographic maps available for the site area. For the purpose of supporting the development of field investigation strategies, efforts will be made to obtain photographs of an appropriate scale that will allow for analysis of past and present surface conditions, drainage, and land use. Photographs showing the history of site activities will be analyzed to obtain information regarding the evolution of site features which might have affected hydrologic conditions. The historical perspective gained by studying aerial photographs will provide insight applicable to such tasks as field reconnaissance and monitoring well placement. In addition, the analysis of historical and current aerial photographs, performed in conjunction with geophysical investigation, will aid in the accurate determination of the extent of the formerly used area at the site.

13. UTILITIES SURVEY

Prior to conducting any auguring, boring, drilling, or excavation activities, E & E will locate all underground cables, pipes, utilities, or other obstructions which may become damaged or otherwise hinder fieldwork. The appropriate authorities (e.g., NAS Pensacola Public Works and Southern Bell) will be contacted to identify the location of all underground utilities in the site area. In addition, E & E will examine available maps and documents and conduct a metal detector survey on site to determine the presence of any other potentially hazardous subsurface features. If appropriate and applicable, other surface geophysical techniques may be used to locate deeper obstructions not readily detected with a metal detector. The locations of all underground utilities or obstructions will be marked with surveyors flags, day-glow paint, or by other methods as appropriate. This task may be conducted as part of the physical survey but will be considered a separate task for cost purposes.

14. FIELDWORK METHODOLOGY

14.1 Phase I--Field Screening

The primary objective of the Phase I field screening investigation is to effectively and efficiently focus the Site Characterization (Phase 11) and subsequent Extent Delineation (phases III and IV) studies. The field screening phase will employ a variety of field investigation techniques, including the collection of samples for laboratory analysis. However, the analysis of these samples will be subject to less rigorous QA/QC requirements, reflecting the "focusing" objective (as opposed to a formal contaminant quantification objective) of this phase. Each field screening task will utilize all existing information from preceding tasks, including aerial photograph analyses, to adjust the locations of the various surveys and sampling locations, thereby achieving optimum results. The objectives/advantages of the field screening methods are discussed in detail in Section 9.1 of the GQAPP.

[It should be noted that much of the data from the tasks described belov will be available to the investigation teams while the fieldvork is still underway. To the greatest extent possible, these data and/or other field observations will be utilized to adjust and/or redirect Phase I efforts in order to maximize the amount of information obtained regarding the horizontal and vertical extents of possible contamination at sites 17, 18, and 28. Adjustments to the Phase I scope of work may include, but may not be limited to: 1) sampling of additional media which are not already included in this vork plan; 2) installation of additional and/or deeper (i.e., intermediate depth) temporary monitoring wells; and 3) collection and analysis of additional samples from any given medium. Furthermore, additional data from other site investigations may become available prior to or during the completion of

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Phase I activities at these sites. This could warrant either an increase or decrease in the scope of vork proposed in this vork plan.

When the data indicate the need to increase or expand the Phase I scope of vork, these data shall also be evaluated to determine vhether it is appropriate to collect and *analyze* **any additional** samples using **DQO Level** IV protocol. If the data **evaluation** clearly indicates that the **collection** of an **additional sample from** a specified location and **medium will** provide final information--information which **may** be used to **determine** the **nature** and extent of contamination, for risk assessment **purposes,** or to **make** a final **decision** on the **site--then** the additional **sample** will be collected and analyzed using DQO Level IV protocol. If the data evaluation indicates that tbe sampling location may be optimized following receipt and evaluation of all of the Phase I data, then the DQO Level IV sampling event may be postponed until the evaluation of all Phase I data is complete.]

14.1.1 Physical Survey

14.1.1.1 Overall Physical Reconnaissance

A field reconnaissance survey will be conducted on and around the site areas. Available aerial photographs and maps will be used to locate surface features. Visual inspections will be made of surface conditions, stressed vegetation, and surface drainage patterns.

During the reconnaissance survey, the field team will identify areas vhich present the most suitable conditions for the establishment of grid survey baselines. The use of a grid system as part of the Phase I field investigation is discussed in the folloving sections.

The reconnaissance survey team will utilize air monitoring equipment during valkovers of site areas, in accordance vith sections 6.1.1 and 6.3.2 of the GQAPP. In the event that any **[areas** vith readings above **background]** are located, the area(s) will be flagged and identified on a site map for future reference. All findings of the physical reconnaissance will be mapped in detail and recorded in the field logbook.

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[Bold items **enclosed** in brackets denote changes to last version of document]

14.1.1.2 HNu/OVA Surface Emissions Survey and Particulate Air [Screening]

An emissions survey will be conducted using HNu and/or organic vapor analyzer (OVA) air monitoring equipment. The survey will be conducted in accordance with Section 6.1.1 of the GQAPP. Measurements will be made at each established grid point, and readings will be recorded in the field logbook.

The effort will initially require the establishment of a grid system over each site area. To accomplish this, at least two baseline transects will be established (providing an x and y axis), and flagged at SO-foot intervals. A transit survey instrument will be used to establish the baselines, and a Brunton compass and tape measure will be used to complete the grid system for the study area. The grid spacing will be based on 50-foot centers.

In addition, preliminary air screening will be conducted with a particulate monitor, such as a Hini-Ram, to determine if the site represents a source of particulates in the air. The air [screening] will be conducted in accordance with Section 6.1.[1] of the GQAPP.

14.1.1.3 Habitat/Biota Survey

During the physical reconnaissance, an E & E biologist/ecologist will determine the on-site terrestrial and aquatic habitats and the surrounding habitats which may be affected by off-site contaminant migrations. During the walkover survey, rare, threatened, and endangered species and their potential habitats will be identified, and an evaluation will be made of general site conditions to support viable populations of plants and animals. [Using historical aerial photographs and the survey results, a map illustrating the identified habitats will be generated.] A habitat/biota survey will be conducted for each site as well as an evaluation of the literature.

14.1.2 Analytical Screening

14.1.2.1 Laboratory Analyses

The Phase I tentative sediment sample, soil boring, and monitoring well locations for Site 17 vere selected based on the assumption that, as described in sections 2.1 and 3.1, the eastern portion of the storage yard vas used to store transformers containing PCB oils (see Figure 14-1). In addition, PCBs have **been** detected in an oily residue collected on site and in the soil near the stormwater drain (NEESA 1983; G & M 1988). Thus, the Phase I sampling locations at Site 17 are proposed on and around the edges of the asphalt pavement as well as around and in the on-site storm drain.

The tentative soil boring and monitoring well locations for Phase I at Site 18 vere selected based on the assumption that, as described in sections 2.2 and 3.2, a transformer on the east side of Substation A leaked oil containing PCBs into the gravel-covered area east of the substation (see Figure 14-2). In addition, a sample of oily residue collected from the gravelled area contained PCBs (NEESA 1983). Thus, all the proposed Phase I sampling locations at Site 18 are located in the gravelled area.

The tentative sediment saaple, soil boring, and monitoring well locations for Phase I at Site 28 vere selected based on the assumption that, as described in sections 2.3 and 3.3, a spill of transformer oil containing PCBs occurred on Radford Boulevard near the northeast corner of Building 632 and the oil vas subsequently vashed into a nearby stormwater drain (see Figure 14-3). Thus, the proposed Site 28 Phase I sediment samples are located in the existing on-site stormwater drains and the soil boring and temporary monitoring vells are located on and along the edges of Radford Boulevard.

Phase I sampling activities for sites 17, 18, and 28 will include soil and sediaent sampling, installation of shallov temporary monitoring vells, and groundvater sampling. All samples will be analyzed in the laboratory for analytical screening parameters. The analytical screening program has been developed for the Phase I effort to

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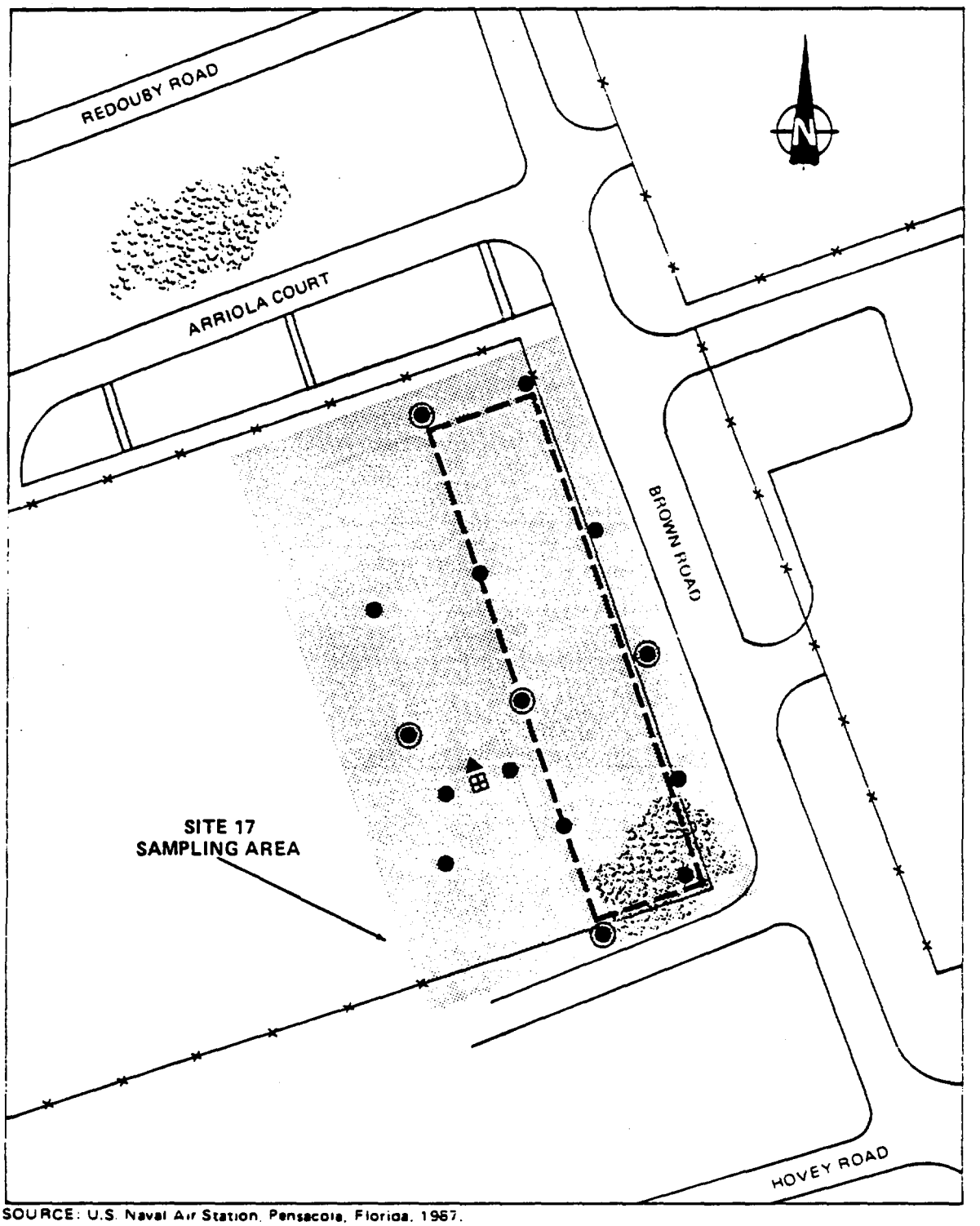


SOURCE: U.S. Naval Air Station, Pensacola, Florida, 1987.

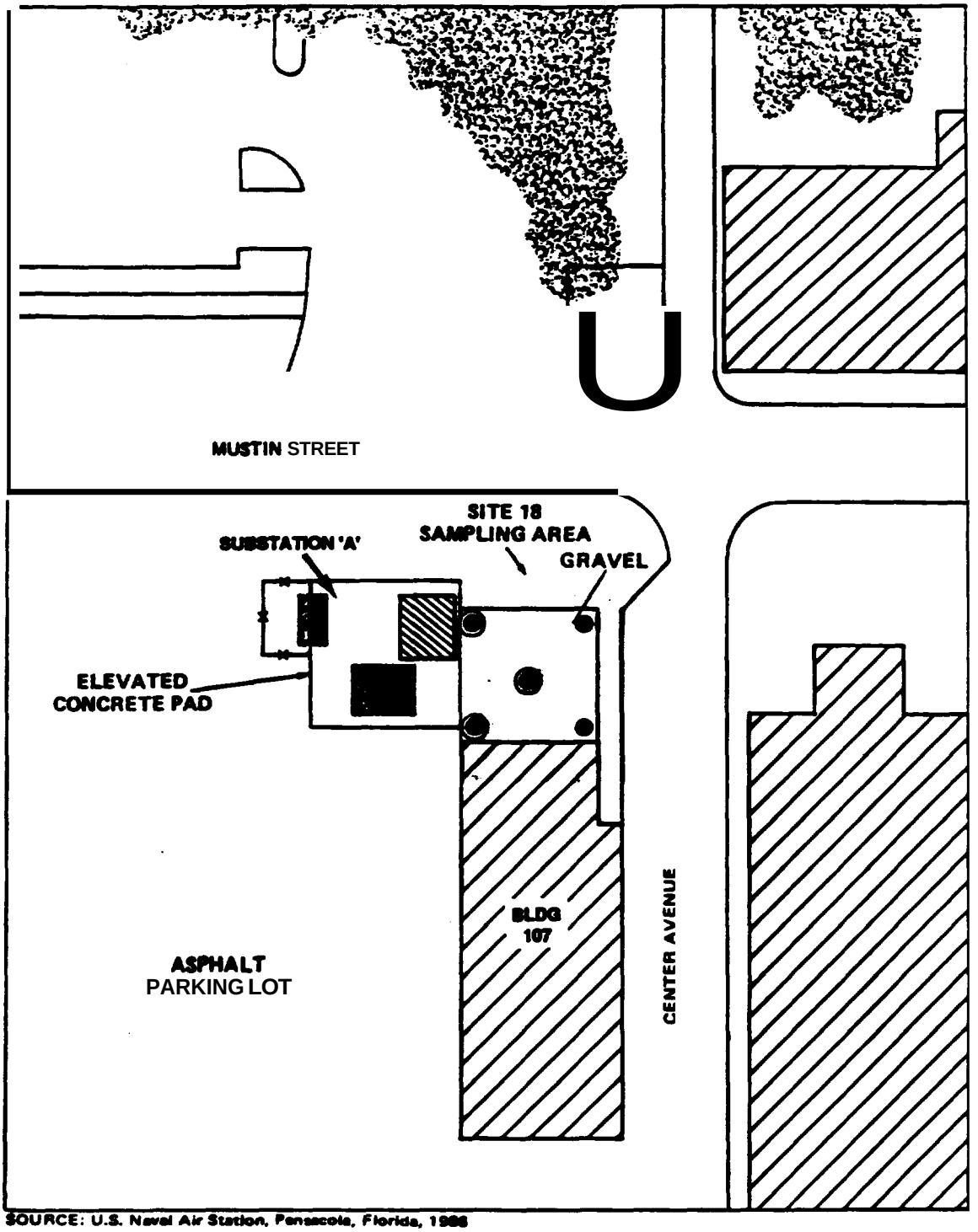
SCALE

0 25 50 100 150 200 FEET

KEY:

- ▲ Tentative Sediment Sample
- ● Tentative Soil Boring
- ○ Tentative Temporary Monitoring Well
- ▭ Old Transformer Storage Area

Figure 14-1 TENTATIVE SOIL BORING, SEDIMENT SAMPLE, AND TEMPORARY MONITORING WELL LOCATIONS, SITE 17 — PHASE I



SOURCE: U.S. Naval Air Station, Pensacola, Florida, 1988

SCALE

0 25 50 100 200 FEET

KEY:

- Tentative Soil Boring
- Tentative Temporary Monitoring Well
- Building
- Power Transformer

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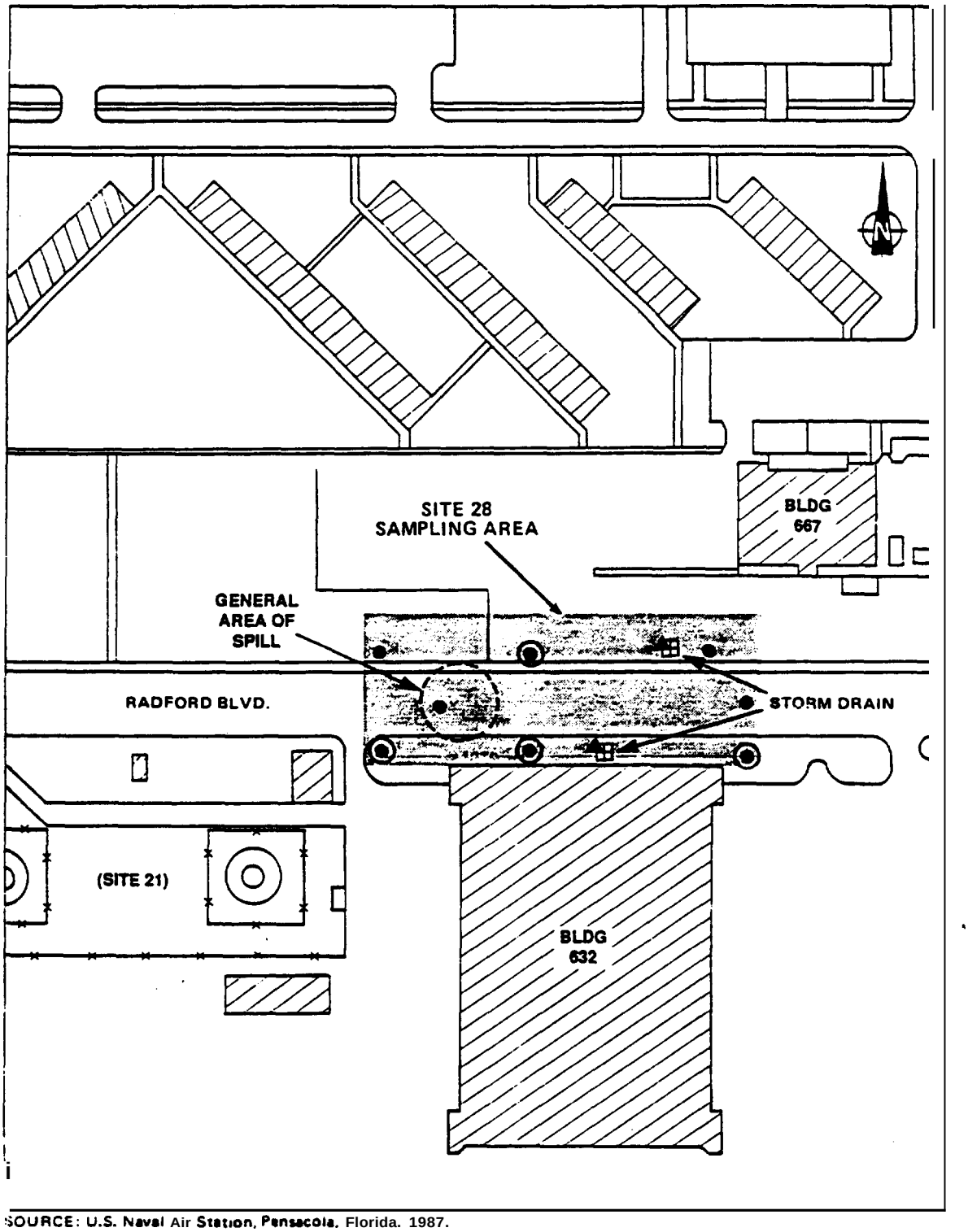
Figure 14-2 TENTATIVE SOIL BORING AND TEMPORARY MONITORING WELL LOCATIONS, SITE 18 — PHASE I



SOURCE: U.S. Naval Air Station, Pensacola, Florida. 1987.

SCALE

0 62.5 125 250 500 FEET

KEY:

- ▲ Tentative Sediment Sample
- ● Tentative Soil Boring
- ○ Tentative Temporary Monitoring Well
- Building

Figure 14-3 TENTATIVE SOIL BORING, SEDIMENT SAMPLE, AND TEMPORARY MONITORING WELL LOCATIONS, SITE 28 — PHASE I

efficiently and cost effectively focus subsequent phases of site characterization and contaminant extent delineation. Analytical screening is addressed in detail in Section 9.1 of the GQAPP. Analytical requirements for samples collected in Phase I are shovn in Table 14-1.

Sediment. One sediment sample will be collected from the on-site stormvater drain on Site 17, and tvo sediment samples will be collected, one from each of the tvo stormvater drains on Site 28. In each stormvater drain, the samples will be collected over a depth interval of surface to 6 inches BLS. The samples will be retrieved using a bucket-type mud auger or some other suitable sampling device. The composition of bottom materials retrieved by the sampling devices will be recorded in the field logbook. All sediment sampling and equipment decontamination activities will be conducted'in accordance with sections 6.9.2 and 6.10 of the GQAPP.

Soil. Approximately **[75]** soil samples will be collected at Site 17, **[15]** at Site 18, and **[24]** at Site 28, at the tentative locations shovn on figures 14-1 through 14-3. Soil samples at all three sites will be composited over intervals of 0 to **[1.0]** foot, **[1.0]** to 2.5 feet, 2.5 to 5 feet, and over every 5 feet to the vater table. For the purposes of calculating the number of samples, it is assumed that the water table is 15 feet BLS across Site 17 and 5 feet BLS across sites 18 and 28. Soil smaples will be collected using either hand-held stainless steel bucket augers or from the flights of a 4-inch solid stem auger, extracted from the boring. The locations for these soil borings are tentative (see figures 14-1 through 14-3), [and **may** be adjusted based on the results of the preliminary reconnaissance surveys and aerial photograph interpretation]. All sampling activities conducted at each site will be conducted in accordance vith Section 6.6 of the GQAPP.

Groundvater. Approximately five temporary stainless steel monitoring vells will be installed across Site 17, three across Site 18, and four across Site 28. Each well will have 5 feet of 0.01-inch slotted screen and will be installed to a depth at which the well screen brackets the

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Table 14-1

PHASE I SAMPLING AND ANALYTICAL REQUIREMENTS—GROUP I

SITE 17

Medium	No. of Samples	Duplicates	Total	Analytical Suite[a,b]
Soil	[75]	4	[79]	A
Sediment	1	1	2	A
Groundwater	5	1	6	A
TOTAL	[81]	6	[87]	

SITE 18

Medium	Ro. of Samples	Duplicates	Total	Asuite[a]icgl
Soil	[15]	1	[16]	A
Groundwater	3	1	4	A
TOTAL	[18]	2	[20]	

SITE 28

Medium	no. of Samples	Duplicates	Total	Analytical Suite[a,b]
Soil	[24]	2	[26]	A
Sediment	2	1	3	A
Groundwater	4	1	5	A
TOTAL	[30]	4	[34]	

14[NASP]UH1101:T0312/490/24

Key:

[a]Analytical suite designations are as follows:

A = Volatile organic compounds, polynuclear aromatic hydrocarbons, phenols, pesticides and total polychlorinated biphenyls, total recoverable petroleum hydrocarbons, and metals (total, unfiltered).

[b]Specific conrtituonts encompassed by tho various chemical groups included within analytical suite A are identified in tables 9-1 through 9-[5] of tho Generic Quality Assurance Project Plan.

[Source: Ecology and Environment, Inc., 1992.]

(Bold items enclosed in brackets denote changes to last version of document]

water table (i.e., the top of the screen extends slightly above the water level). The locations for these wells are tentative (see figures 14-1 through 14-3). The information gained from field reconnaissance surveys and aerial photograph interpretations will allov adjustments and finalization of the temporary shallov well netvork.

The 12 temporary monitoring wells will be purged and sampled in accordance vith Section 6.8 of the GQAPP.

14.1.3 Hydrologic Assessment

The temporary wells and existing well netvork will be surveyed to obtain top of casing (TOC) elevations referenced to USGS datum or to a suitable established benchmark located vithin the vicinity of sites 17, 18, and 28. Static vater levels will be measured in each vell to determine shallow groundvater flow direction and horizontal hydraulic gradient.

At least one rain gauge station will be established in the vicinity of sites 17, 18, and 28, and precipitation will be monitored during field work activities.

Hydrologic data collected during Phase I will be evaluated alongside analytical screening data, and evidence of lateral contaminant migration in shallow groundvater will be assessed. Conclusions drawn from these evaluations will form the basis for permanent monitoring well installations during phases II and 111.

14.2 Phase II—Characterization

The primary objectives of the Phase II field investigation are as follovs:

- To characterize the nature and magnitude of the full spectrum of potential site contaminants;
- To confirm and validate the contaminant distributions indicated by the Phase I analytical screening results by collecting and analyzing samples under full-scale CERCLA-type QA/QC requirements;

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- To support the preliminary identification, screening, and evaluation data requirements of potential remedial alternatives.

The proposed Phase II sampling loctions are designed to focus on an area of contamination which, assumedly, has been identified during Phase I activities (see Section 14.1.2.1). In addition, the Phase II shallow monitoring well locations have generally been located toward the area of the site nearest the suspected source of contamination and/or the side presumed to be hydraulically downgradient. The actual Phase II sampling locations, especially with respect to the Phase I locations, will primarily be a function of the Phase I results respecting contaminant type, magnitude, and distribution across the site.

The Phase II investigation of each site will involve the collection of soil and groundwater samples. [The Phase II investigation of sites 17 and 28 will also include the collection of sediment samples.] Permanent, shallow monitoring wells will also be installed. Air sampling will be conducted only if warranted by the results of Phase I efforts. In addition, limited aquifer testing will be performed.

The analytical requirements for Phase II samples are provided in Table 14-2.

(Every effort will be made to complete the investigation of sites 17, 18, and 28 during Phase II. To the greatest extent possible, the results of the Phase I investigation, as well as field data and/or observations generated during the Phase II investigation, will be utilized to adjust and/or redirect the Phase II efforts in order to maximize the amount of information obtained regarding the horizontal and vertical extents of possible contamination at the sites. Adjustments to the Phase II scope of vork may include, but may not be limited to: 1) sampling of additional media which are not already included in this work plan; 2) installation of additional and/or deeper (i.e., intermediate and/or deep) permanent monitoring vells; 3) collection and analysis of additional samples from any given medium; and 4) performance of full-scale aquifer tests or other studies to further characterize the

[Bold items enclosed in brackets denote changes to last version of document]

Table 14-2

PHASE II SAMPLING AND ANALYTICAL REQUIREMENTS—GROUP I

SITE 17

Medium	No. of Samples	Duplicates	Trip Blanks[a]	Field Blanks	Rinsate Blanks	Preservative Blanks[b]	Total	Analytical Suite[c,d]
Sediment	1	1	1	[NR]	1	Ill	[4] (1)	A
Soil	25	3	2	NR	2	Ill	32 (10)	A C
Groundwater	3	1	1	[1]	1	1	[8] (2)	A B
TOTAL	29	5	4	1	4	1	44(13)	

SITE 18

Medium	No. ot Samples	Duplicates	Trip Blanks[a]	Field Blanks	Rinsate Blanks	Preservative Blanks[b]	Total	Analytical Suite[c,d]
Soil	9	1	1	[NR]	1	NR	[12] (6)	A C
Groundwater	2	1	1	[1]	1	1	7 (2)	A B
TOTAL	11	2	2	1	2	1	[191(8)	

SITE 28

Medium	Bo. of Samples	Duplicates	Trip Blanks[a]	Field Blanks	Rinsate Blank8	Preservative Blanks[b]	Total	Analytical Suite[c,d]
Sediment	1	1	1	[NR]	1	NR	[4] (1)	A
Soil	15	2	2	NR	3	NR	22 (6)	A C
Groundwater	2	1	1	[1]	1	1	[7] (2)	A B
TOTAL	18	4	4	1	5	1	33(9)	

14[NASP]UH1101:T0312/491/15

Key:

[a]Trip blanks will bo analyzed for Target Compound List (TCL) volatile organic compounds (VOCs) only.

[b]Preservative blanks will bo analyzed for TCL VOCs, total recoverable petroleum hydrocarbons (TRPHs), total [Target Analyte List (TAL)] metals, and cyanide.

[c]Analytical suite designations are as follows:

A = TCL VOCs; TCL base-neutral/acid extractable organic compounds; TCL pesticides and polychlorinated biphenyls (PCBs); TRPHs; [TAL] metals (total [i.e., unfiltered] and dissolved [i.e., millipore-filtered, water only]); cyanide; gross alpha, [gross beta, and gamma scan (water only)]; total organic carbon: hardness (water only): and alkalinity (water only). Field and rinsate blanks not analyzed tor dissolved metals.

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Table 14-2 (Cont.)

Key (Cont.):

B = Total suspended solids, total Kjoldahl nitrogon, ammonia nitrogen, orthophorphato phosphorus, dissolved oxygon (in field), 5-day biological oxygon demand (BOD_5), and chemical oxygon demand (COD).

C = pH, alkalinity, percent moisture, grain size, Btu contont, ash contont. total orqanic halogens, sulfur, ignitability, and cation exchange capacity.

[d] Specific constituents encompassed by tho various chemical groups included within tho above-listed analytical suites are identified in tables 9-[6] through 9-[15] of tho Generic Quality Assurance Project Plan.

[*] Tho number of samples shown in parentheses will bo analyzed for tho additional parameters indicated.

NR = Not Required.

[Source: Ecology and Environment, Inc., 1992.1

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hydraulic properties of the soil or aquifer matrix. Furthermore, additional data from other site investigations may become available prior to or during the completion of Phase II activities at these sites. This could varrant either an increase or decrease in the scope of work proposed in this work plan-]

14.2.1 Biota Sampling

The need for formal biological sampling will be based on the results of the Phase I habitat/biota survey and analytical screening results. If biological sampling is required, a separate biological sampling plan will be prepared which outlines sample locations, sampling methodologies, analytical parameters, etc.

14.2.2 Sediment Sampling

The actual number of sediment samples, as well as appropriate sampling locations, will be determined based on the results of Phase I. However, for planning purposes it is assumed that one sediment sample will be collected fror the storm sever drain at Site 17 and one sediment sample will be collected from a storm sever drain on Site 28 (see figures 14-4 and 14-6). Sediment samples will be collected using an Eckman Dredge and/or manually driven split spoons or other suitable coring devices.

14.2.3 Soil Sampling

Soil samples will be collected as part of the shallov monitoring well installation, described below in Section 14.2.[4], and from shallov soil brings. At each location, samples will be collected from the folloving intervals: 0 to (1.0) foot, (1.0) to 2.5 feet, and every 2.5 feet to the vater table or to a maximum depth of 10 feet BLS. Samples deeper tban 10 feet will be collected only if deeper contamination is indicated during Phase I.

The soil samples will be collected using a split-spoon sampling device during well drilling. All sampling, compositing, and lithologic logging will be performed in accordance vith Section 6.6 of the GQAPP. Equipment decontamination will be performed in accordance vith Section 6.10 of the GQAPP.

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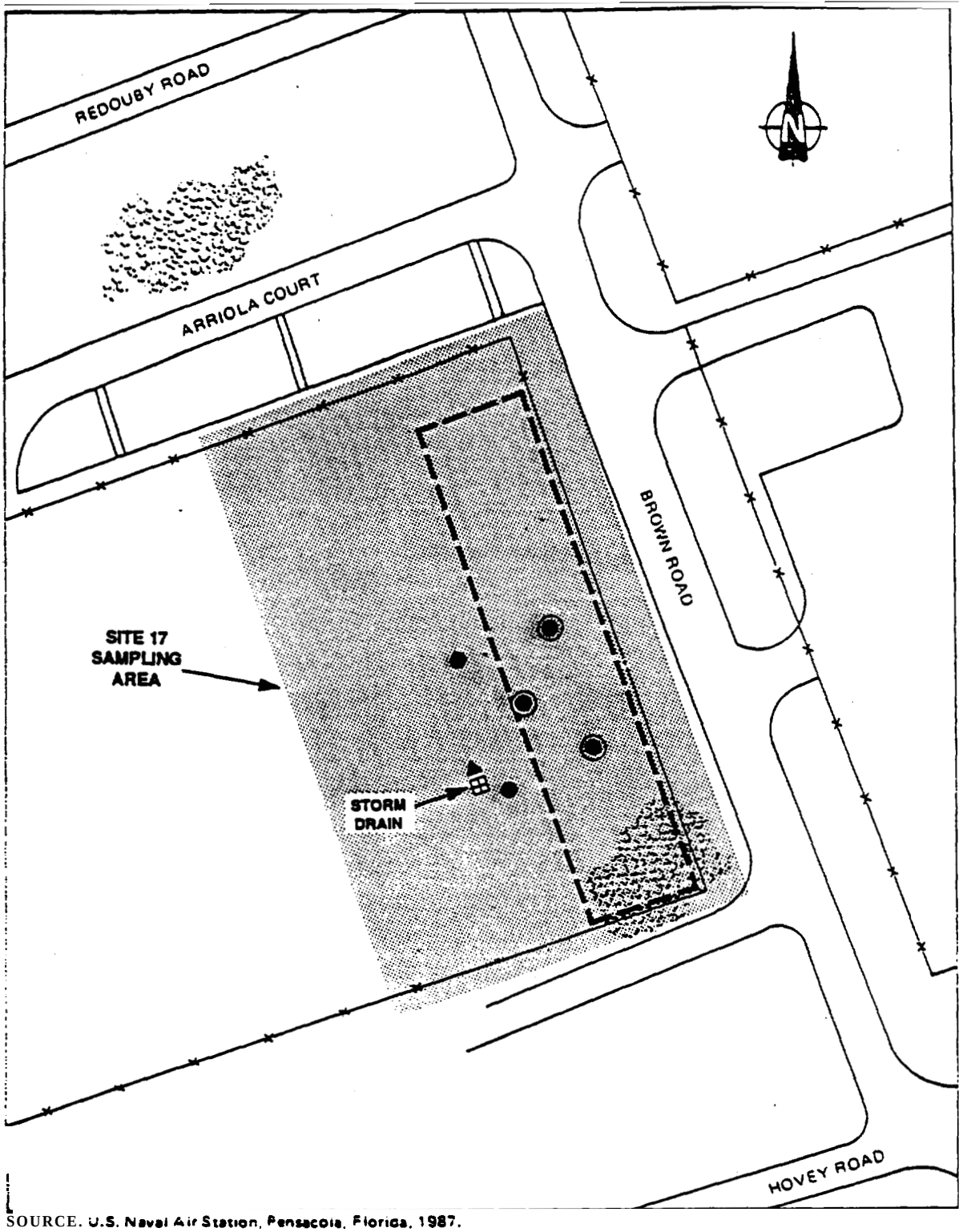

SOURCE. U.S. Naval Air Station, Pensacola, Florida, 1987.

SCALE

0 21 50 100 150 200 FEET

KEY:

- ▲ Tentative Sediment Sample
- ● Tentative Soil Boring
- ○ Tentative Shallow Monitoring Well
- ▭ Old Transformer Storage Area

Figure 14-4 TENTATIVE SOIL BORING, SEDIMENT SAMPLE, AND SHALLOW MONITORING WELL LOCATIONS, SITE 17 — PHASE II

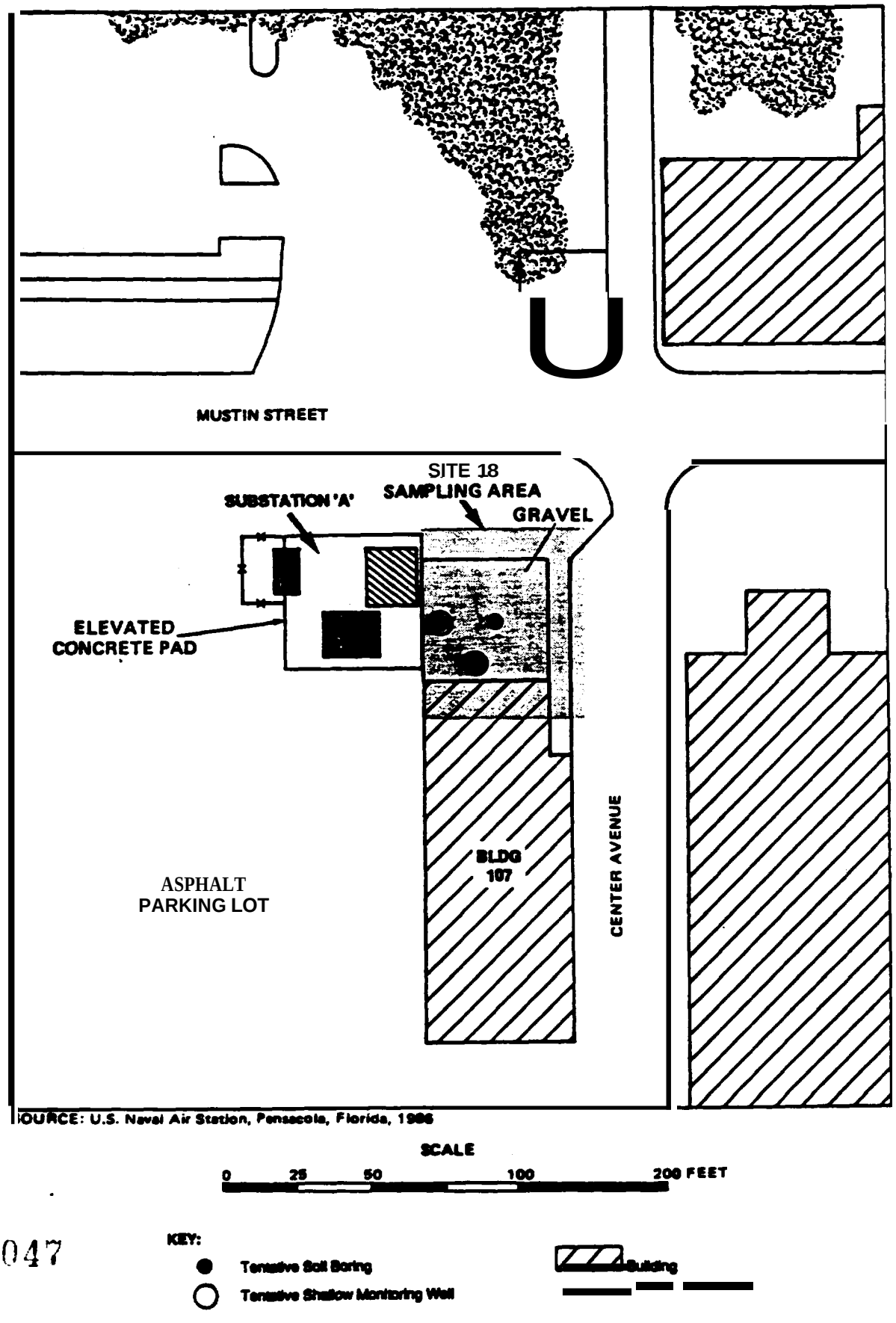

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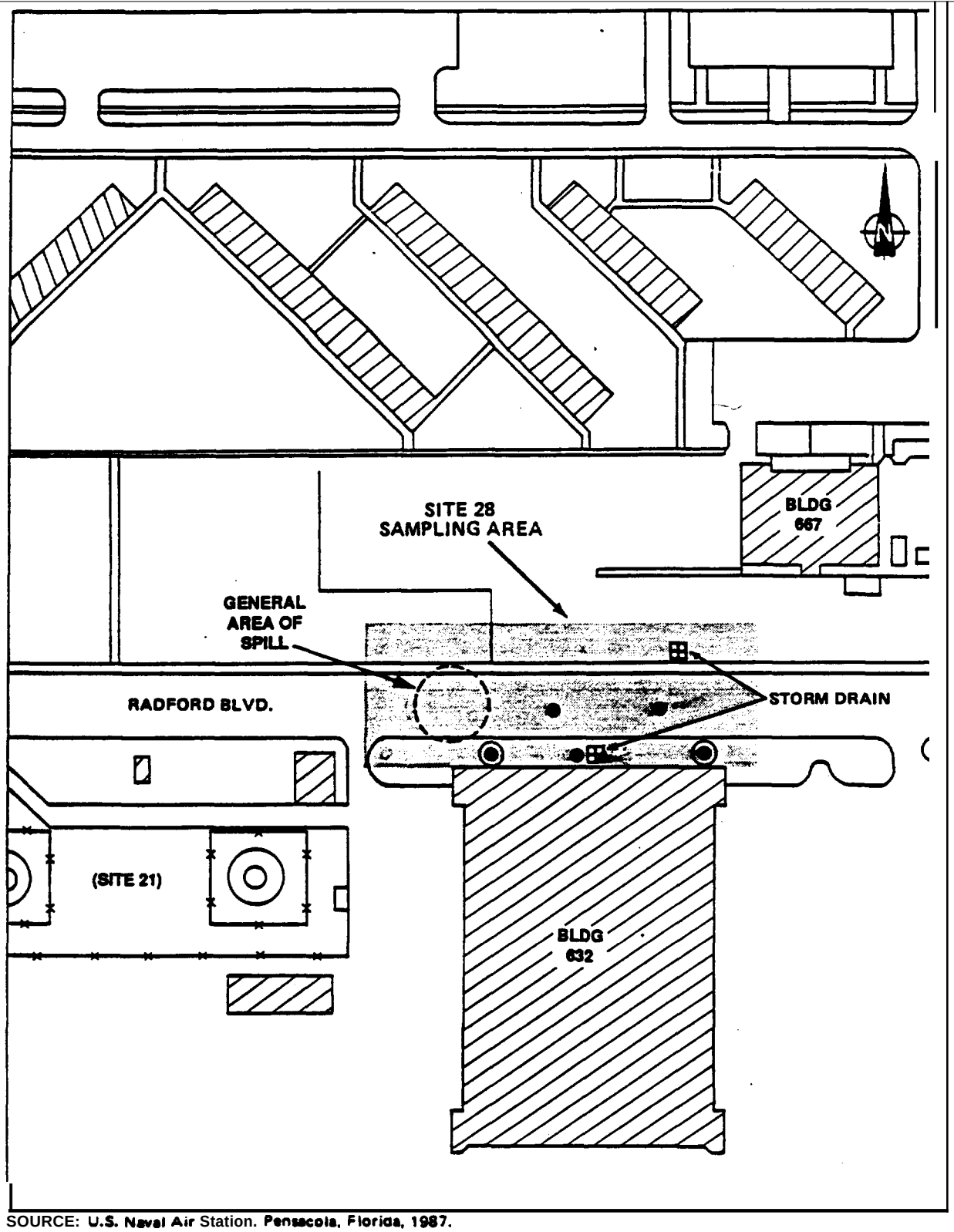
Figure 14-5 TENTATIVE SOIL BORING AND SHALLOW MONITORING WELL LOCATIONS, SITE 18 — PHASE II



SOURCE: U.S. Naval Air Station. Pensacola, Florida, 1987.

SCALE

0 62.5 125 250 500 FEET

KEY:

A Tentative Sediment Sample

■ Tentative Soil Boring

Ea — Tentative Shallow Monitoring Well

Figure 14-6 TENTATIVE SOIL BORING, SEDIMENT SAMPLE, AND SHALLOW MONITORING WELL LOCATIONS, SITE 28 — PHASE II

For planning purposes, five soil samples are assumed at each well/soil baring location at Site 17, and three soil samples per location at sites 18 and 28. A total of 25 soil samples is tentatively projected for Site 17, nine for Site 18, and 15 for Site 28 (see [Table 14-2 and) figures 14-4 through 14-6).

14.2.4 Shallov Monitoring Well Installation and Development

Tbe actual number and locations for Phase II shallow monitoring wells will be determined based on Phase I findings. For planning purposes, the number of permanent shallov monitoring vells to be installed is three at Site 17 and two each at sites 18 and 28. All shallow wells will be constructed of 2-inch polyvinyl chloride (PVC) and will bracket the water table with 10 feet of screen. The vells will be installed utilizing hollov-stem auger techniques and in accordance with sections 6.7 and 6.10 of the GQAPP.

Depending on the results obtained during Phase I, the delineation of the extent of shallow groundwater contamination may be possible during Phase II by the installation of a few monitoring vells in addition to the number proposed. When and where possible and/or practical, additional monitoring wells will be installed during Phase II in order to expedite the overall investigation schedule.

14.2.5 Groundwater Sampling

Groundvater samples will be collected from the estimated seven nevly installed permanent vells at the three sites. The tentative monitoring well network is shown on figures 14-4 through 14-6. The purging and sampling of these vells will be conducted in accordance with sections 6.8 and 6.10 of the GQAPP.

14.2.6 Hydrologic Assessment

Vellhead elevations will be surveyed for all nevly installed monitoring wells, and water levels will be measured in all vells. Surface water staff gauges will be monitored during the investigation, and the elevations will be recorded.

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Limited aquifer testing will be conducted on all newly installed and existing monitoring wells. This will consist primarily of performing short-duration specific capacity tests (immediately following] development of the newly installed monitoring wells [(after the vater levels have fully recovered and stabilized),] and slug or specific capacity tests on the existing monitoring wells. Specific capacity and slug tests are particularly useful for deriving first estimates of aquifer hydraulic properties (i.e., hydraulic conductivity, transmissivity).

Physical and chemical aquifer data collected during Phase II will be evaluated to determine lateral contaminant migration characteristics. A plan for deep well installation will be developed based on the findings of phases I and 11.

14.2.7 Air Sampling

The need for formal air sampling will be based on the findings of the Phase I surface emissions survey and particulate air [screening] and the Phase I shallow soil sampling.

14.3 Phase III--Extent Delineation

Phase III tasks will be conducted based on the results of phases I and 11, [if deemed necessary]. Although the earlier phases are intended to identify and characterize areas and contaminants of primary concern as they extend laterally from the site source(s), Phase III activities will be geared toward further delineating the horizontal and vertical extents of contamination.

14.3.1 Biota Sampling

If deemed appropriate based on the findings of phases I and 11, biota sampling may be conducted in Phase 111. [If required, a separate biological sampling plan will be prepared. Hovever, basevide biota sampling will be conducted as part of the investigation of operable units (OUs) 15, 16, and 17.1

[Bold items enclosed in brackets denote changes to last version of document]

14.3.2 Soil Sampling

Soil sampling will be conducted in conjunction vith the installation of any nev shallov, intermediate and/or deep monitoring vells.

14.3.3 Shallov Monitoring Well Installation and Development

Additional shallov monitoring vells may be required to further determine the horizontal extent of any shallw groundwater contamination detected in phases I and 11.

14.3.4 Intermediate and Deep Monitoring Well Installation and Development

The installation of additional monitoring vells into deeper zones of the aquifer may be required to assess horizontal and vertical hydraulic gradients, aquifer physical characteristics, and the vertical extent of contamination. The number of vells and their locations and depths are dependent upon the results of phases I and 11.

14.3.5 Groundvater Sampling

All vells installed in Phase III will be sampled and the analytical requirements for the samples will be developed based on the results of the previous phases. Honitoring vells installed prior to Phase III will be resampled as required.

14.3.6 Hydrologic Assessment

All vells installed during Phase III will require a vellhead survey to obtain TOC elevations. Water level measurements will be made for all site monitoring vells and nearby surface water bodies. Eorizontal and vertical hydraulic gradients will be determined. Aquifer testing will be performed, as required, to determine aquifer physical characteristics. On sites where contamination is found in the surficial zone during phases I and/or 11, the low permeability zone will be further characterized during Phase III and any subsequent phases. It is intended that soil sample results, lithologic logs, isopach maps, permeability testing, aquifer testing, etc., will be utilized as required to determine the lateral extent and/or continuity of the low permeability

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zone, as well as the degree to which hydraulic connection exists between the surficial zone and the underlying main producing zone at each site.

14.3.7 Air Sampling

The need for formal air sampling and the techniques to be employed are dependent upon the findings of phases I and 11.

14.4 Phase IV--Extent Delineation

The following tasks, if required, will be performed as a continuation of the effort to delineate the extent of contamination:

- Soil sampling;
- Sediment sampling;
- Shallow monitoring well installation and development;
- Intermediate and deep monitoring well installation and development;
- Groundwater sampling; and
- Hydrologic assessment.

14.5 Topographic Survey and Base Hap

Following the completion of phases III and IV, a topographic survey of each site area will be conducted and a base map will be developed. Base map coverage, contour intervals, scale, and requirements for horizontal and vertical control will be established and approved by the Navy. The topographic base map will be developed for the requirements of remedial planning and will include the locations of surface features such as roads, structures, nearby surface waters, monitoring wells, and above-ground utilities. The location of subsurface utilities and drainage structures will be reflected on the base map as indicated on existing NAS Pensacola General Development and utilities maps and/or as located during field investigations.

14.6 Field Quality Assurance/Quality Control

14.6.1 Documentation

Field activities and sample management will entail certain strict documentation requirements as described in Section 7 of the GQAPP.

14.6.2 Field Quality Assurance/Quality Control Samples

Samples collected for laboratory analysis (both screening and non-screening) during all phases of fieldwork will require the preparation of field QA/QC samples as described in Section [11.1] of the GQAPP. The estimated numbers of required field QA/QC samples for phases I and II are shown in tables 14-1 and 14-2.

14.7 Decontamination and Vaste Management Procedures ,

14.7.1 Decontamination Procedures

All equipment decontamination procedures will be performed in accordance with Section 6.10 of the GQAPP.

14.7.2 Waste Management Procedures

[All investigation-derived waste handling will be performed in accordance with Section 6.11 of the GQAPP and EPA's guidance for investigation-derived waste.] All water generated during temporary monitoring well purging and development activities on each site will be containerized near each respective well and poured down the well prior to abandonment. All water generated during permanent monitoring well development will be drummed, labeled, and moved to a storage area on NAS Pensacola, as directed by the Navy.

Any excess soil cuttings generated by soil boring or monitoring well installation activities will be drummed, labeled, and moved to a storage area on NAS Pensacola, as directed by the Navy.

Other investigation-derived wastes, such as potentially contaminated clothing and disposable materials, will be drummed, labeled, and moved to a storage area on NAS Pensacola, as directed by the Navy.

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15. LABORATORY QUALITY ASSURANCE/QUALITY CONTROL

Laboratory QA/QC procedures are designed to ensure the accuracy, precision, completeness, representativeness, and comparability of all analytical data. Laboratory QA/QC has been addressed both in the GQAPP and GSMP. All phases of fieldwork will incorporate a different level of data quality and requisite laboratory QA/QC. These levels are discussed in detail in the GQAPP and GSHP.

16. GROUNDWATER MODELING

B & E will use the data generated in the previous field investigation phases to conduct limited computer modeling when applicable and appropriate. The following two scenarios will be considered to assess the potential for off-site contamination:

- Estimated future plume movement without any remedial action effects (i.e., no action); and
- Estimated total time periods required, for a total contaminant mass at variable pumping rates, to extract contaminants from the aquifer in order to meet previously established standards for drinking water (ARARs).

B & E will use the two-dimensional analytical RANDOMWALK model (Prickett et al. 1981) to arrive at these estimates. E & E will calculate flow velocity field input data for the solute transport simulation from a simplified model based on Darcy's Law. E & E will utilize parameters including transmissivity, storativity, and hydraulic conductivity determined from the previous phases of fieldwork.

To obtain a prediction of plume extent without remediation, E & E will illustrate organic and inorganic simulations for the current time and for one, five, and ten years into the future. Additional simulations will include different remedial pumping scenarios for both organic and inorganic contamination. E & E then will use information generated by these computer simulations for remedial alternative development. Other computer models that can be utilized to assess on-site groundwater conditions include: PLASH, a two-dimensional, finite-difference groundwater flow model; **GWTRANS**, a two-dimensional, finite-difference solute transport model; **FEMWATER**, a finite-element groundwater model; and **FEMWASTE**, a finite-element solute transport model.

17. TREATABILITY STUDY

As indicated in Table 14-2, a number of the analyses to be performed on the samples collected during phases II through IV are required in support of the treatability study. Characterization of samples in terms of parameters listed in Table 14-2, together with treatability tests, will provide the basic data required for the evaluation of physical, chemical, and biological remedial technologies. Some of the treatability tests that may be examined are incineration tests, solubility tests, soil leaching tests, and coagulation-flocculation jar tests.

18. BASELINE RISK ASSESSMENT

As part of the Remedial Activities Investigation, a baseline risk assessment will be conducted to determine the level of effort required in the FS for remedial actions. The baseline risk assessment will provide an evaluation of the potential threat to human health and the environment in the absence of any remedial action by providing the basis for determining whether or not remedial action is necessary and the justification for performing any remedial actions. [The risk assessment will be performed in accordance with EPA's 1989 document, Risk Assessment Guidance for Superfund: Volumes I and II.]

The baseline risk assessment identifies and characterizes 'the toxicity and levels of hazardous substances present in the media of concern (e.g., air, ground water, soil, surface water, sediment, or biota), the environmental fate and transport mechanisms within the media of concern (e.g., physical, chemical, biological degradation processes, and hydrogeological conditions), the potential human and environmental receptors, the potential exposure routes and the extent of actual or expected exposure, the extent of impact or threat (i.e., risk characterization), and the level or levels of uncertainty associated with all of the above. The complexity of the site will determine the level of effort required to conduct the baseline risk assessment. The conclusions of the baseline risk assessment will determine the level of effort required in the risk assessment to be conducted in the FS.

The baseline risk assessment can be divided into four tasks: contaminant identification, exposure assessment, toxicity assessment, and risk characterization.

18.1 Contaminant Identification

The main purpose of this step is to screen available information on the hazardous wastes present at the site and to identify contaminants of concern to focus on in subsequent efforts in the risk assessment process. It may be useful at some of the NAS Pensacola sites to select "indicator chemicals" to represent the most toxic, persistent, and/or mobile substances among those identified that are most likely to contribute significantly to the overall risk posed by the site. Sometimes this indicator chemical can be selected to represent a "class" of chemicals (e.g., trichloroethylene to represent all volatiles).

18.2 Exposure Assessment

In this subtask, actual or potential pathways are identified, populations potentially exposed are characterized, and the extent of exposure is determined. Identification of potential exposure pathways helps to conceptualize the migration of contaminants from an existing source to an existing or potential point of contact. An exposure pathway may be viewed as identifying four elements:

1) A source mechanism of chemical release into the environment;
2) An environmental transport medium (e.g., air, groundwater, and/or biota);
3) A point of potential contact with the medium of concern; and
4) An exposure route to the population from the contact point.

The purpose of this analysis is to provide decision makers with an understanding of both the current and potential future risks if no action is taken. Therefore, as part of this evaluation a reasonable maximum exposure scenario should be developed to reflect the type(s) and extent(s) of exposures that could occur based on the expected future use of the site.

The final step in the exposure assessment is to integrate the information and develop a quantitative estimate of the expected exposure levels resulting from the actual or potential release of contaminants from the site.

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18.3 Toxicity Assessment

This step considers: (1) the types of adverse human or environmental effects associated with contaminant exposure; (2) the relationship between the magnitude of exposure(s) and the adverse effects; and (3) related uncertainties such as the evidence for a chemical's potential carcinogenicity in humans. Typically, this process relies heavily on existing toxicity information and rarely involves the development of new data on toxicity or dose-response relationships. The Integrated Risk Information System (IRIS) will be utilized [during the toxicity **assessment .]**

18.4 Risk Characterization

In the final stages of the baseline risk assessment, a characterization of the potentially adverse effects to human health or environment of each scenario derived is developed and summarized. By integrating information developed during the exposure and toxicity assessments, estimates of risk can be developed to include carcinogenic risks, noncarcinogenic risks, and environmental risks. To characterize environmental risks, the potential exposures to the surrounding ecological receptors must be identified, and the potential effects associated with such exposure(s) must be determined. Important factors to examine include disruptive effects to populations (plant and animal) and the extent of perturbations to the ecological community.

The following data will be obtained €or each site as part of the baseline risk assessment:

- Distance to the closest residence (on or off NAS Pensacola);
- Type of barrier, if any, to prevent access;
- Approximate population within 0.25 mile of the site (including NAS Pensacola);
- Sensitive land uses in the vicinity of the site (e.g., schools, hospitals, and retirement homes);

- Activities (recreational and/or occupational) which take place near the sites and the estimated number of people involved;
- Records of any environmental and/or health complaints regarding the sites: and
- Log of any actions taken by a health unit regarding health Issues, complaints, and concerns.

The results of the baseline risk assessment may indicate that the site poses little or no threat to human health or the environment. In such cases, the PS should be appropriately scaled down or eliminated. The results of the Remedial Activities Investigation and baseline risk assessment will serve as the primary basis of documenting a no further action decision.

It should be emphasized that all the tasks conducted as part of the baseline risk assessment will be performed on an interactive basis between the various disciplines required (e.g., hydrogeologists, Chemists, and risk assessors), the Navy, and the revieving regulatory agencies (i.e., FDER and BPA) and that the goal of these tasks is to produce appropriate, sufficient, and high quality data to complete the baseline risk assessment.

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19. FEASIBILITY STUDY

Further details on the specific tasks to be performed as part of the PS will be described in detail during the update of this work plan after the initial phases of the fieldwork have been completed. Eowever, it is anticipated that if contamination of some degree is identified on site, the general approach described below will be followed.

As part of the initial scoping activities of the FS, E & E will prepare a summary of field data collected during the RI to compare and evaluate the concentration of the contaminants of concern with the cleanup criteria developed. E 6 E will prepare a qualitative and quantitative summary of contamination for the scenarios identified during the risk assessment evaluation. The results of this evaluation and summary will serve as a basis for screening applicable remedial technologies for the development and evaluation of remedial action alternatives.

19.1 Screening of Applicable Remedial Technologies

E & E will screen and develop applicable technologies for the remediation of any on-site contamination. In the process of screening applicable technologies, E & E will consider all ARARs, identify problems, and determine pathways of contamination using a receptor-oriented approach based on the threat to the public health, welfare, and the environment. In this summary, pathways will be outlined for each medium of concern. E & E then will identify applicable remedial technologies for each general response action such as contaminant removal, treatment, disposal, and so on. The identification of technologies will be based on technical selection criteria and E 6 E's engineering judgment.

19.2 Assessment of Applicable Remedial Technologies

During the assessment process, E & B will consider the relative applicability of *each* technology. In addition, criteria such as environmental, institutional, and public health impacts, and technical fusibility will be applied. A discussion of the applicable technologies will be provided for each general response action. The summary will include any appropriate comments concerning the reliability and implementability of the technology.

19.3 Risk Assessment

Based on the results of the baseline risk assessment conducted during the Remedial Activities Investigation, E 6 E will perform a detailed risk analysis to determine the acceptable levels of risk. This will allov the Navy to balance the increase in costs associated with each alternative against gains in safety. The risk analysis will include consideration of site contaminant toxicity, transport mechanisms, persistence in the environment, and impacts on human health and the environment.

19.4 Development and Evaluation of Remedial Action Alternatives

During the preceding task, remedial technologies will be assessed independently without considering potential advantages or disadvantages of technologies applied in combination. In this task, individual technologies will be assembled into remedial action alternatives for the site. During the assembly and evaluation of the action alternatives, criteria including technical feasibility, environmental and public health, institutional impacts, and comparative costs will be considered.

19.5 Selection of Recommended Remedial Action Alternatives

During this task, B 6 E will select a single remedial action alternative for the remediation of the site. The alternatives assembled during the preceding task will be compared wing technical, environmental, and economic criteria. B 6 B will consider present worth of total costs, environmental effects, technical aspects, the extent to which alternatives comply with ARARs, community effects, and other factors.

170056

E & E will apply these evaluation criteria uniformly to each alternative along with any additional criteria that may result from the Navy project coordination. E 6 E will discuss the selection of the chosen alternative by means of a statement of the relative advantages of the alternative over the other alternatives considered.

19.6 Feasibility Study Report

A draft and a final FS report will be provided to the Navy for review and comments.

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20. REPORT

Following the Phase I investigation, E & E will prepare a Phase I Interim Data Report for each site. The purpose of this report will be to summarize the findings of Phase I and provide recommendations for the Phase II investigation; the Phase I interim report will not be a formal report. (In general, during the proposed multi-phase investigation process, formal reports will be generated only when little or no additional assessment work appears required.) Following the Phase I interim report, the work plans for the Phase II work will be updated accordingly. If the results of Phase II indicate that no further action is warranted, a formal [RI] report will be produced. However, if the Phase II results indicate that additional investigation is required, the Phase II report will be produced as the Phase II Interim Data Report and will only summarize the Phase II results and provide recommendations for the Phase III investigation. Thus, the Phase II interim report will not be a formal document. Following production of the Phase II interim report, the work plans for the Phase III work will be updated. [Once the Phase III vork is complete, all results will be synthesized and presented in an RI report.]

[In addition, following any treatability studies and FS vork, formal reports will be produced for these efforts. These reports will include detailed narratives associated vith the respective tasks.

For all reports, E & E will prepare a 100% draft report for the Navy and Technical Review Committee (TRC) review. The TRC review comments will be incorporated into draft final reports which will be resubmitted to the TRC for final approval. The draft final report will then become final if no further comments are received from the TRC.]

Each report will be written as an independent document, complete in its own right, and fully supportive of the conclusions that it contains. Where appropriate, public participation issues will be summarized, as will interim remedial measures necessary to protect against continued degradation of conditions at the site(s). Information used in analyses, but supplemental to the analytical results, will be provided in a series of appendices.

Monthly progress reports during all field activities will be submitted to keep the Navy apprised of fieldwork status and site conditions. Current and planned activities as well as cost tracking will be provided.

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21. DOCUMENT REVISION

Periodic updating of all administrative documents (GQAPP, GSHP, GHSP, GPMP, and vork plans) will be necessary due to changes in site conditions and/or program conditions or requirements. The schedules shown in the GPHP and GSHP indicate document revisions approximately every two months for the GQAPP, GSHP, GHSP, and GPMP. Work plans will be revised after each phase of fieldwork, with phases III and IV, if required, fully developed after Phase II with separate cost estimations. Revised documents will undergo the same review process (e.g., Navy and TRC) as the original documents.

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22. PROJECT MANAGEMENT

Project management will be an ongoing process throughout this investigation. This process includes preparation of biweekly project status reports, coordination of schedules, mobilizations, and other project incidentals with the Navy, management of project staff, coordination with the E & E support groups (e.g., publications and laboratory), and ongoing project review by E & E technical managers and directors. These project management steps are described in detail in the GPMP submitted to the Navy.

23. PROJECT SCHEDULE

Figures 23-1, 23-2, *23-3*, and *23-4* show the project schedules for phases I, II, III, and IV, respectively. Given that the scopes of work for Phase II and beyond are dependent on the results of the preceding phases, the project schedules for phases II, III, and IV are tentative. In addition, the length of rime between phases is subject to the schedule in the Federal Facilities Agreement Site Management Plan (FFA SMP). The schedule in the FFA SMP will be updated yearly.

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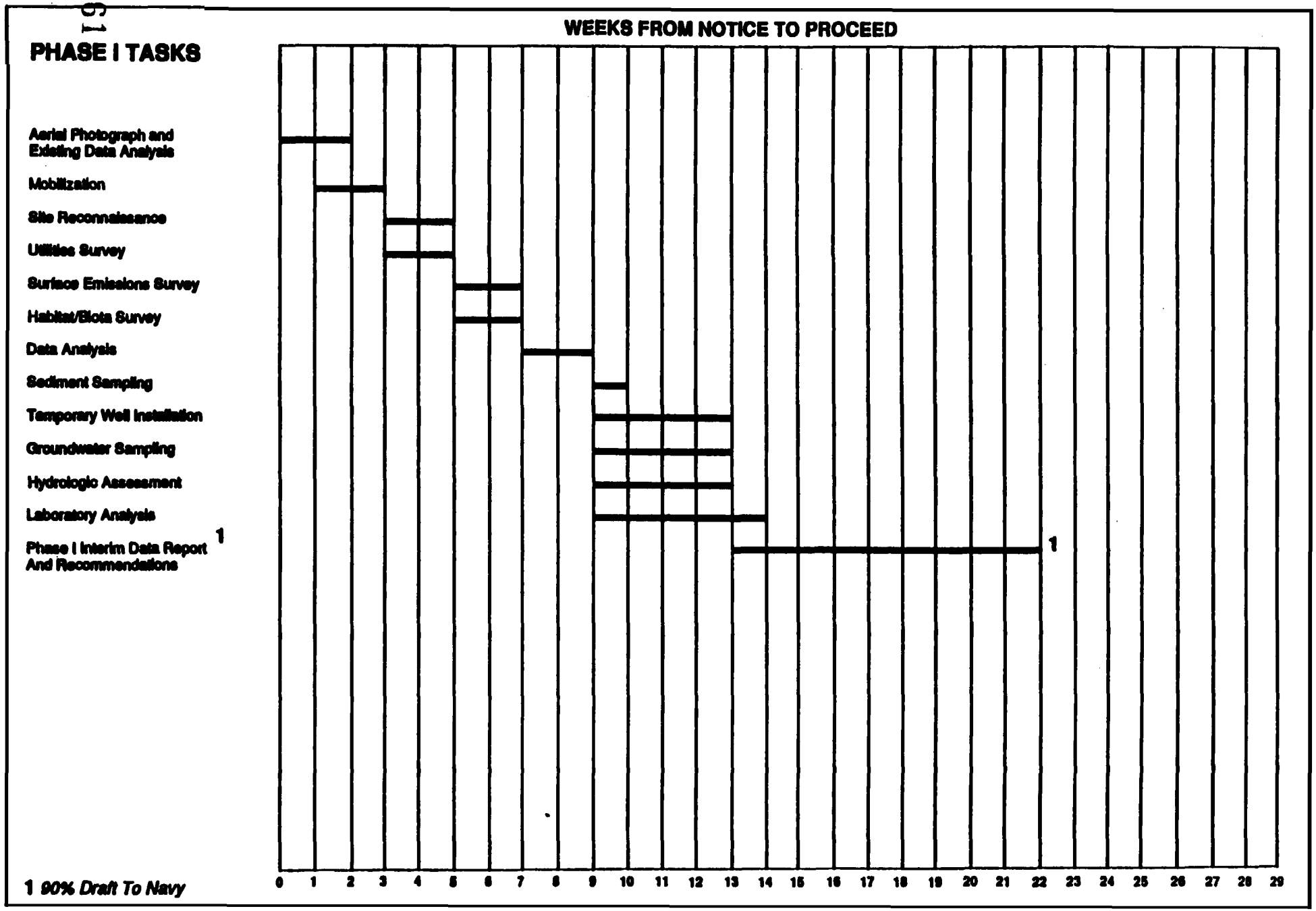

Figure 23-1 PHASE I PROJECT SCHEDULE — GROUP I

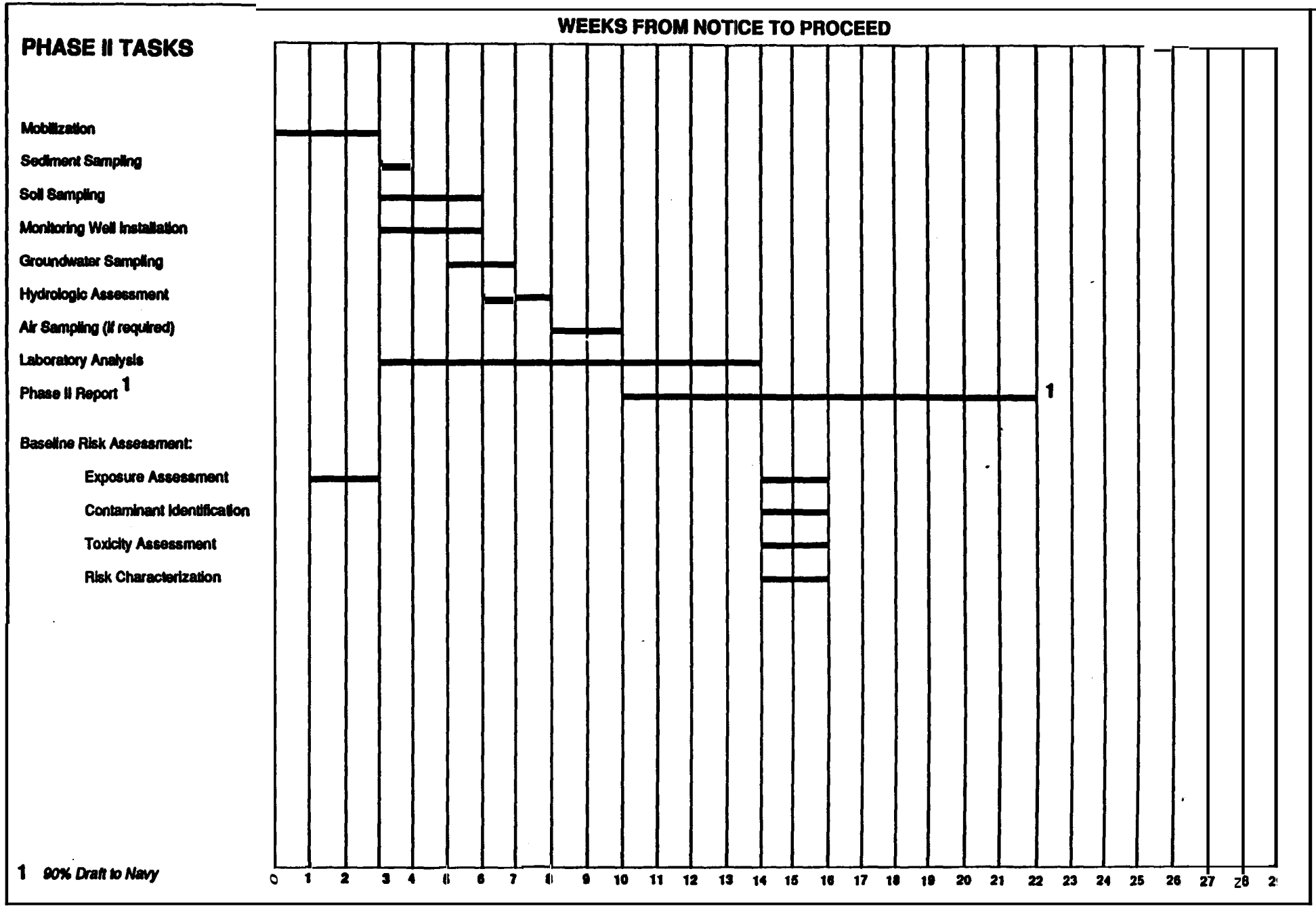

Figure 23-2 PHASE II PROJECT SCHEDULE — GROUP I

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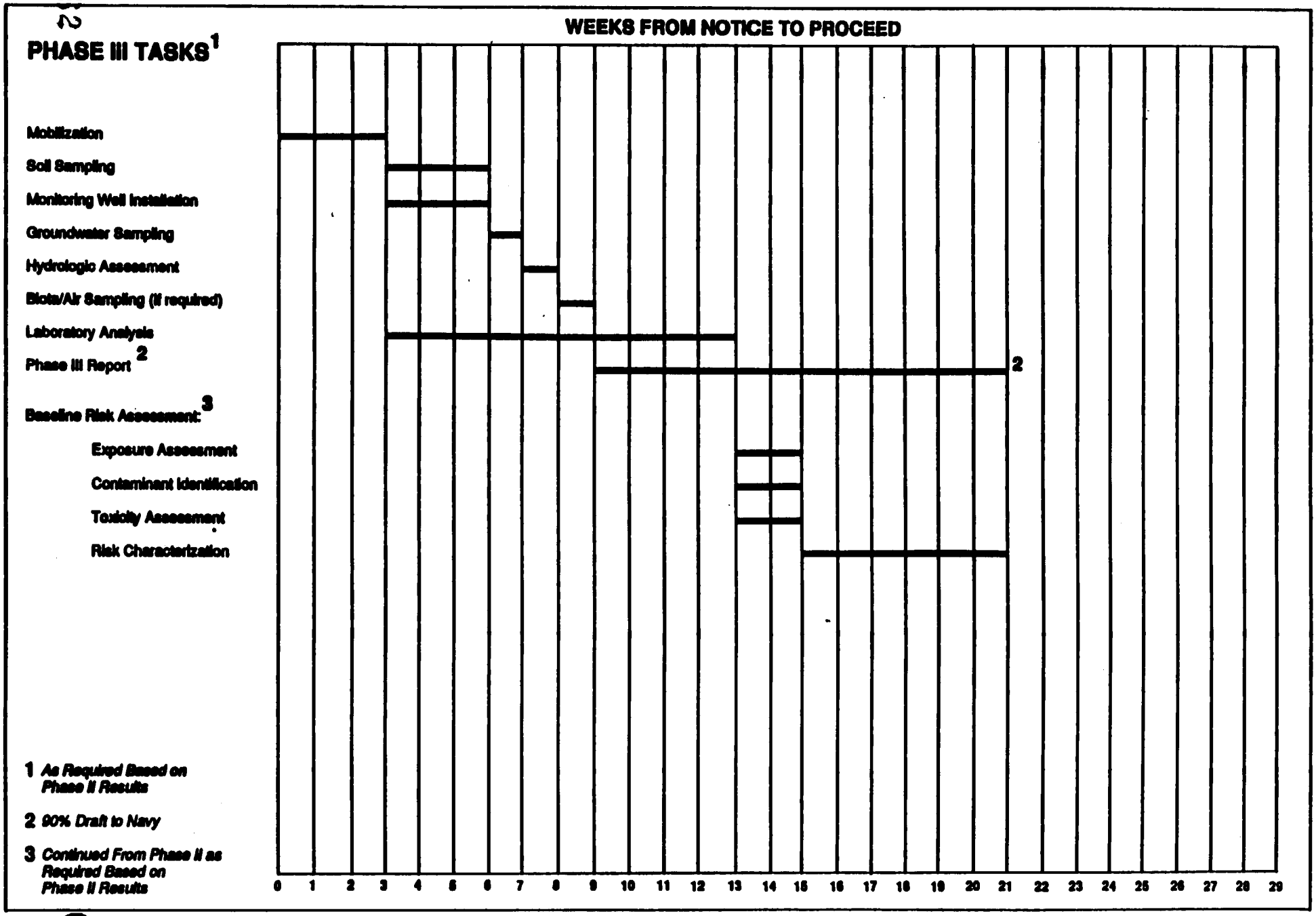

Figure 23-3 PHASE III PR ECT SCHEDULE — GROUP I

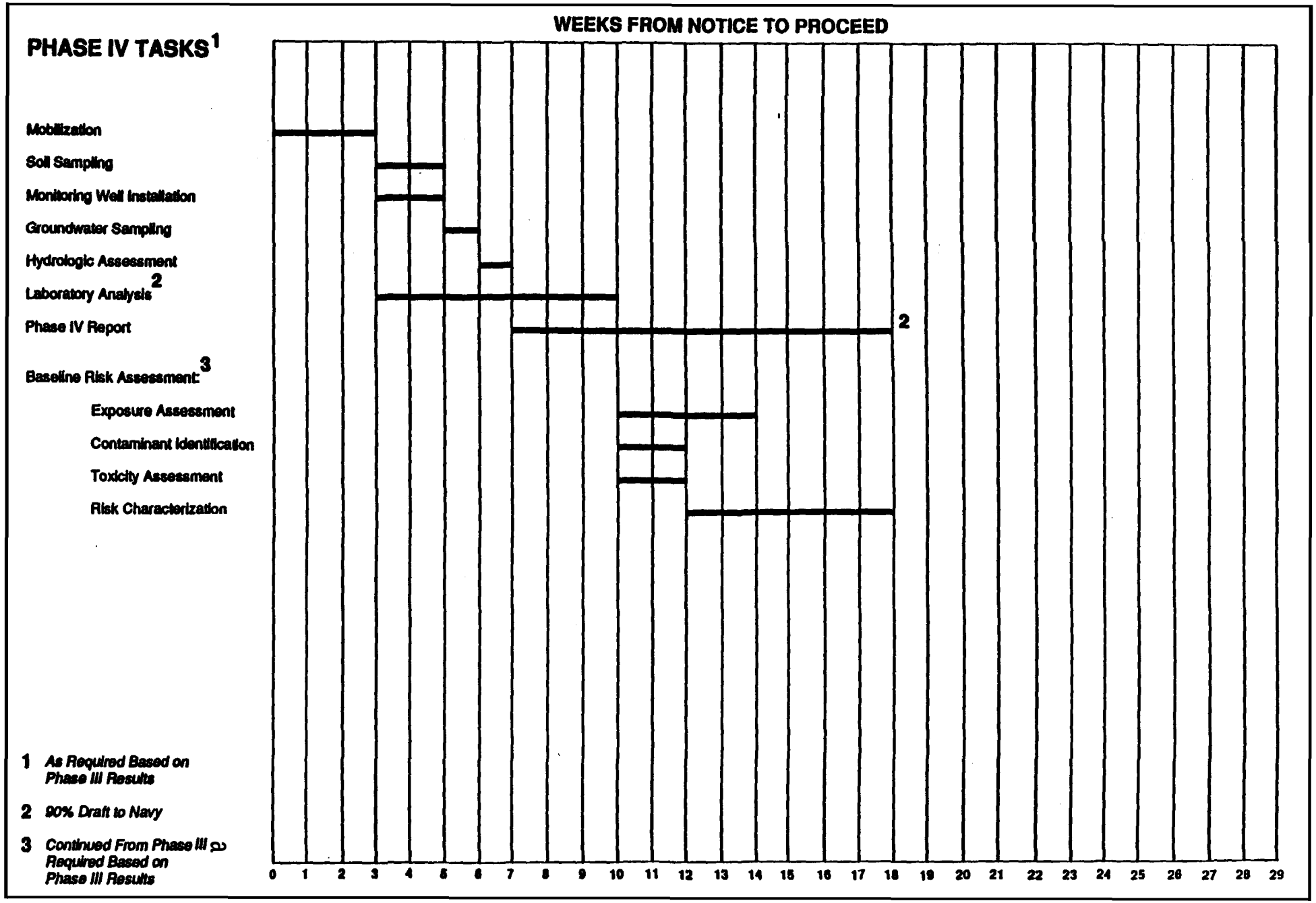

Figure 23-4 PHASE IV PROJECT SCHEDULE — GROUP I

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25. FLORIDA PROFESSIONAL GEOLOGIST SEAL

I hereby affix my seal to the Contamination Assessment/Remedial Activities Investigation Work Plan, Group I, Naval Air Station, Pensacola, Bscambia County, Florida, in accordance with Chapter 492 of the Florida Statutes and applicable rules and regulations developed pursuant thereto:

Name: John D. Barksdale

License Number: P.G. No. 1150

State: Florida

Expiration Date: July 31, '1992

John D. Barksdale

Date

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APPENDIX A

G & M (1984)
SITB 17 PCB ANALYSES AND SAMPLE LOCATIONS

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Table C-14. Chemical Analyses of Soil Samples From the Transformer Storage Yard.

Pioneer Laboratory, Inc.
11 East Olive Road
Pensacola, Florida 32514
Phone (904) 474-1001

To: Geraghty & Miller
P.O. Box 271173
Tampa, Florida 33688

Reports To Be Mailed To:
Ed Morse

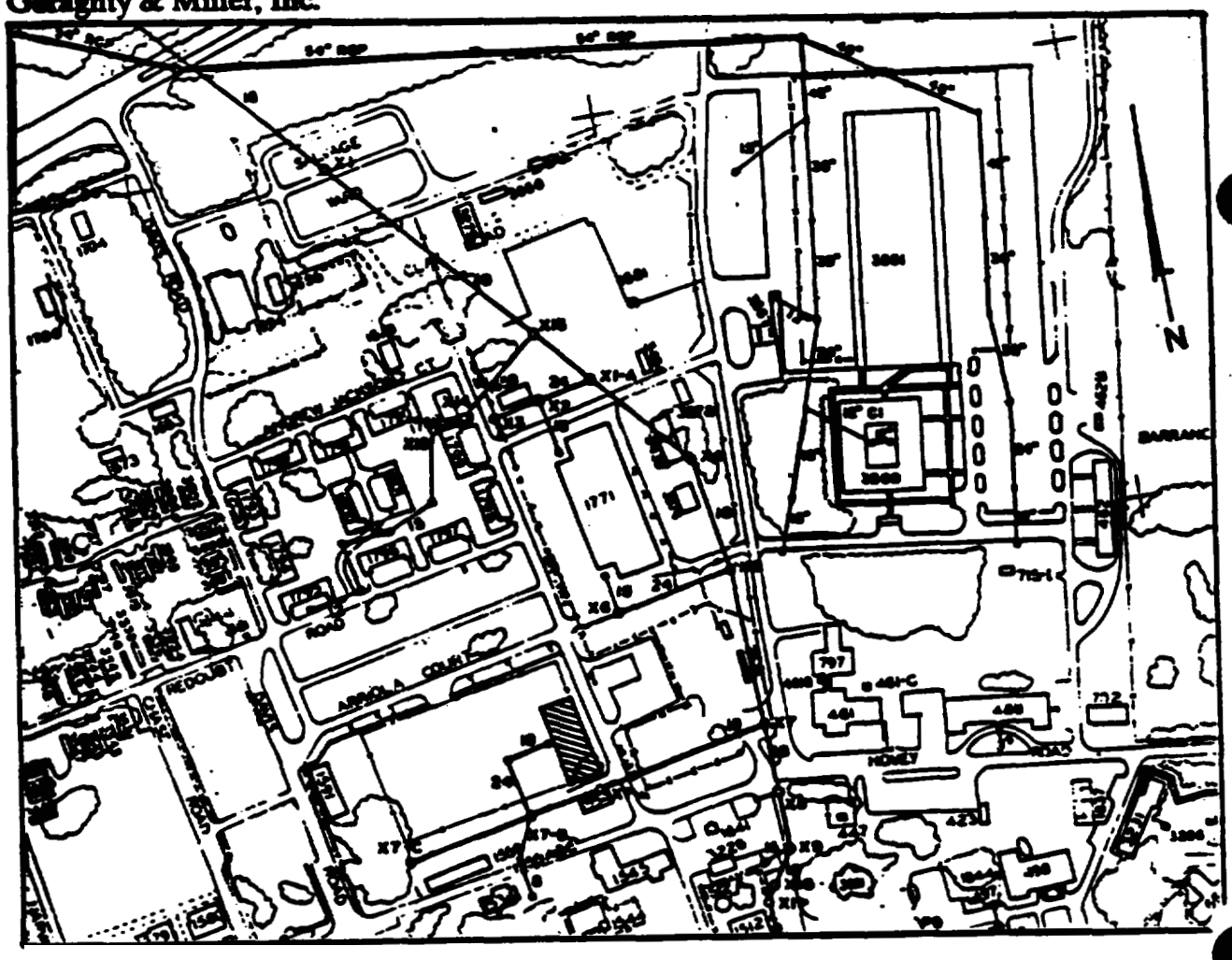
Lab ID # 720.
Date of Order April 4, 1984
Date Completed April 4, 1984
Sample Identification NAS Pensacola, Florida
Sediment Samples from Site 17

POLYCHLORINATED BIPHENYL ANALYSIS (PCB)

Sample Identification	Results
17-1 Surface	< 0.200 ppm
17-1 1 ft.	40.200 ppm Trace of Arochlor 1260
17-1 2 ft.	< 0.200 ppm
17-2 Surface	< 0.200 ppm Trace of Arochlor 1260
17-2 1 ft.	3.7 ppm of Arochlor 1260
17-2 2 ft.	9 ppm of Arochlor 1260
17-3 Surface	< 0.200 ppm
17-3 1 ft.	< 0.200 ppm
17-3 2 ft.	< 0.200 ppm

NOTE: Results are reported as micrograms per gram on as is basis. (ug/g = ppm)
< = Less Than
Samples 17-4 Surface, 1 ft. & 2 ft. were delivered to lab, but no analysis performed per Ed Morse.

Approved by W. F. Barnes



SITE 17

TRANSFORMER STORAGE **YARD**

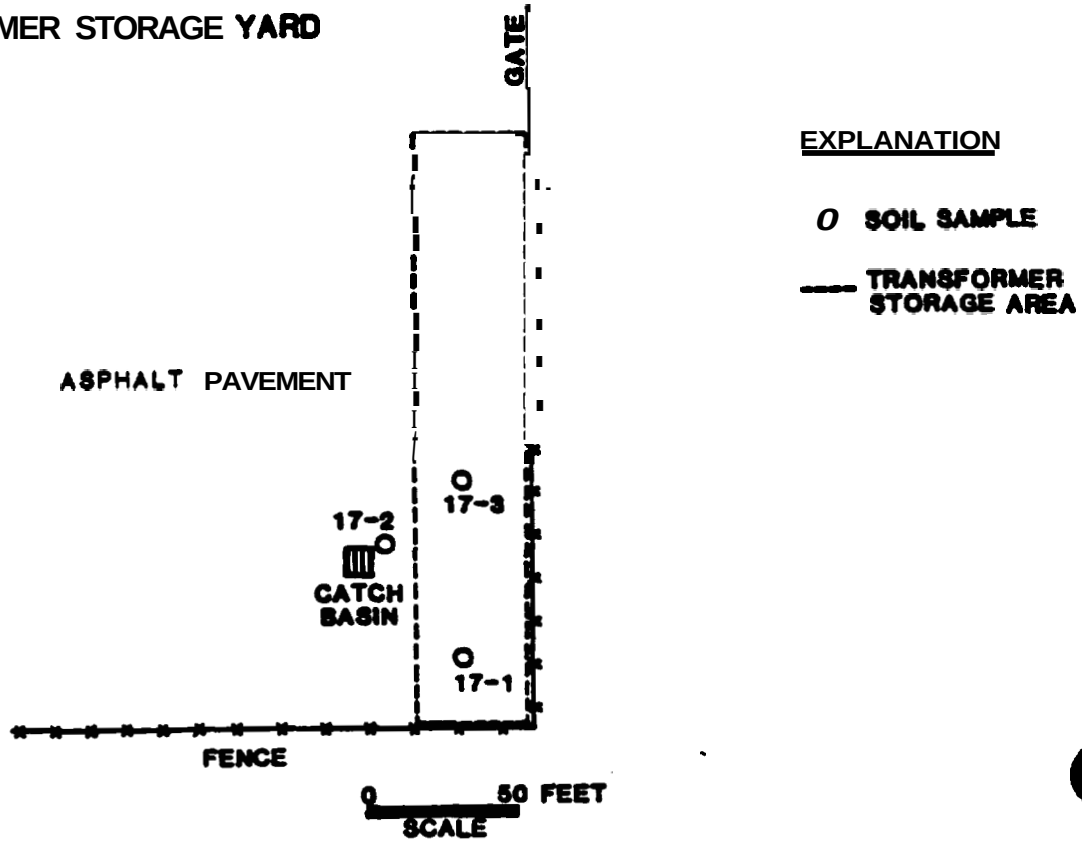


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Figure 22. Transformer Storage Yard Showing Locations of Soil Sampling Points.

Site 17 (I)

APPENDIX B

NEESA (1983)
GENERAL LOCATION OF SITE 18 SOIL SAMPLE

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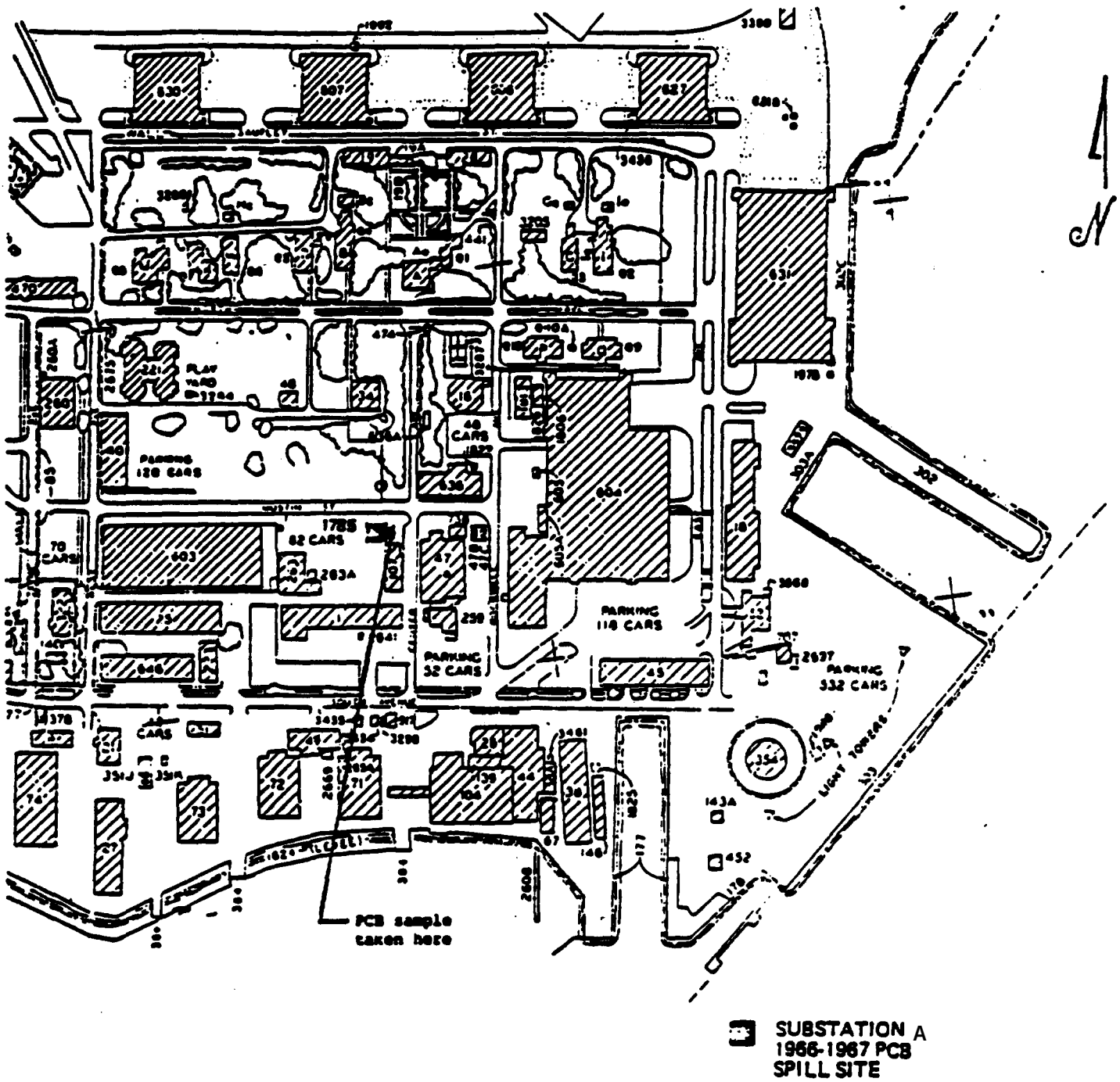

FIGURE 6-16 Transformer Oil Spill Site at Substation A. About 50 gallons of oil containing PCB's was spilled in 1966 or 1967.

APPENDIX C

GENERAL LOCATION OF PCB SPILL AT SITE 28
(NEESA 1983)

[Bold items enclosed in brackets denote
changes to last version of document]

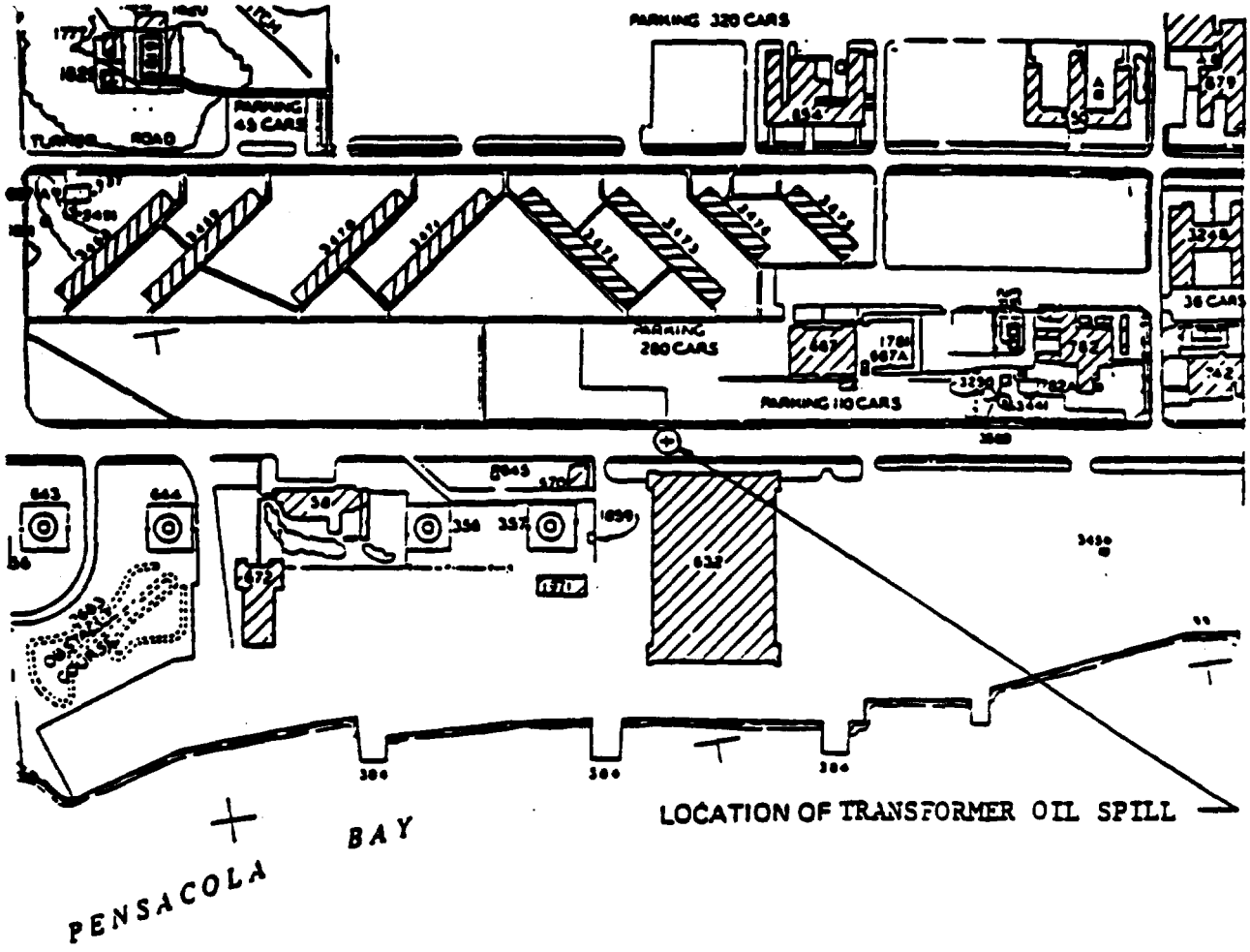

FIGURE 6-21 LOCATION OF TRANSFORMER OIL SPILL, (SITE 28). A TRANSFORMER FELL ONTO THE ROADWAY, AND BROKE OPW. THE OIL SPILLED IS SUSPECTED TO CONTAIN PCB COMPOUNDS.

APPENDIX D

SITE-SPECIFIC SAFETY PLANS

3

[Bold items enclosed in brackets denote changes to last version of document]

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SITE SAFETY PLAN

Version 988

A. GENERAL INFORMATION

Project Title: Site 17 - Transformer Storage Yard Sit. | Project no.: UH1302 | TDD/Pan No.:

Project Manager: John Barksdale | Project Dir.: Rick Rudy

Location(s): A fenced storage area at tho intersection of Brown Road and Arnola Court

Prepared by: Jon Schmidt | Date Prepared: 6-1-69

Approval by: Mary Miller | Date Approved: 6-10-89

Site Safety Officer Review: _____ | Date Reviewed: _____

Scope/Objective of Work: Field Screening will include physical surveys, soil sampling, sediment sampling, temporary well installation, groundwater sampling, and hydrologic assessment.

Proposed Date of Field Activities: July 1992 to June 1993

Background Info: Complete: [X] | Preliminary (No analytical data available) [ ]

Documentation/Summary:

Overall Chemical Hazard:	Serious [ ] LOW [X]	Moderate [ ] Unknown [ ]
Overall Physical Hazard	Serious [ ] LOW [ ]	Moderate [X] Unknown [ ]
Radioactive Hazard	Serious [ ] LOW [ ]	Moderate [ ] Unknown [X]

B. SITE/WASTE CHARACTERISTICS

Waste Type(s):

Liquid	[X]	Solid	[ ]	Sludge	[ ]	Gas/Vapor	[ ]

Characteristic(s):

Flammable/ Ignitable	[ ]	Volatile	[ ]	Corrosive	[ ]	Acutely Toxic	[ ]
Explosive	[ ]	Reactive	[ ]	Carcinogen	[X]	Radioactive*	[ ]

Other: Transformer oil

Physical Hazards:

Overhead	[X]	Confined* Space	[ ]	Below Grade	[ ]	Trip/Fall	[X]
Puncture	[ ]	Burn	[ ]	Cut	[ ]	Splash	[ ]
Noise	[X]	Other:	Vehicular traffic in site area, excavation equipment. Heat/cold stress.				

*Requires completion of additional form and special approval from tho Corporato Health/Safety group. Contact RSC or HQ.

[NASP]UH1101:T0312:1

Site History/Description and Unusual Features (see Sampling Plan for detailed description): An area 50 by 200 foot within a paved storage yard along Brown load and Arnold Court was used to store transformers from 1964 to 1976, some of which leaked. A sample of oil taken from tho asphalt surface indicated PCB levels of 70,000 pp samples of tho soil underneath tho paved storage area were taken in 1984 and revealed PCB concentrations of 9 ppm.

Locations of Chemicals/Wastes: Unknown.

Estimated Volume of Chemicals/Wastes: Unknown.

Site Currently in Operation **Yes:** [X] **No:** [ ]

[redacted]

C.

List and by Task (i.e., drum sampling, drillinq, etc.) and number thorn. (Task numbers are cross-referenced in Section D)

Physical Hazard Evaluation:

1) **Physical** Surveys – Automobile hazards

2) **Temporary** Monitoring **Well** Installation – Using portable drill rig

3) Soil Sampling – Using portable drill rig

4) Decontamination Procedures – Using solvents

5) Hydrologic Assessment – Splash, personal contamination, automobiles

Chemical Hazard Evaluation:

Compound	PEL/TWA	lout. of Exposure	Acute Symptoms	Odor Threshold	Odor Description
Isopropyl Alcohol	440 ppm	Inh, Ing, Derm, Eye	Drowsiness, head.	7.5-200 ppm	Rubbing alcohol
Nitric Acid	2 ppm	Inh, Ing, Derm, Eye	Corrosive	0.3-1 ppm	Acrid
Sulfuric Acid	1 mg/m^3	Ing, Derm, Inh	Corrosive	N/A	Acrid
Hydrochloric Acid	5 ppm	Inh, Ing, Derm	Corrosive	Unknown	Acrid
Sodium Hydroxide	2 mg/m^3	Id, Ing, Con	Corrosive	N/A	Odorless
PCB	0.5 mg/m^3	Inh, Ing	Nausea, Vomit., Dia		Hydrocarbon odor

Note: Complete and attach a Hazard Evaluation Sheet for each major known contaminant.

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D. SITE SAFETY WORK PLAN

Site Control: Attach map, use back of this page, or sketch of site shoving hot zone, Contamination reduction, zone, etc.

Perimeter identified? [yes] Site secured? [no]

Work Areas Designated? [yes] Zone(s) of Contarination Identified? [no]

Personnel Protection (TLD badges required for all field personnel):

Anticipated Level Of Protection (Cross-reference task numbers to Section C):

	A	B	C	D
Task 1				X
Task 2				X
Task 3				X
Task 4				X
Task 5				X

(Expand if necessary)

Modifications: Modified level D with tyvock, neoprene gloves and boots, safety glasses, APR available when level C upgrade is necessary based on OVA readings.

Action Levels for Evacuation of Work Zone Pending Reassessment of Conditions: See Allowable Radiation Dose Attachment

- o Level D: O_2 <19.5% or >25%, explosive atmosphere >10% LEL, organic vapors above background levels, particulates >_____ mg/m^3, other _____
- o Level C: O_2 <19.5% or >25%, explosive atmosphere >25% LEL, California-20%), unknown organic vapor (in breathing zone) >1 ppm, particulates >_____ mg/m^3 other _____
- o Level B: O_2 <19.5% or >25%, explosive atmosphere >25% LEL, California-20%), unknown organic vapors (in breathing zone) >5 ppm, particulates >_____ mg/m^3 other _____
- o Level A: O_2 <19.5% or >25%, explosive atmosphere >25% LEL California-2021, unknown organic vapors >500 ppm, particulates >_____ mg/m^3, other _____

Air Monitoring (daily calibration unless otherwise noted):

Contaminant of Interest	Type of Sample (area, personal)	Monitoring Equipment	Frequency of Sampling
VOCs	Area	OVA/HNu	Continuous
Explosive Gases	Area	02/Explosimeter	Continuous
Radiation--Exposure	Area	Micro-R-Meter	Continuous

Decontamination Solutions and Procedures for Equipment, Sampling Gear, etc.:

Trisodium phosphate wash, tap water rinse, deionized water rinse, isopropanol rinse (twice), final organic-free water rinse, and allow to air dry am long am possible. Note: Every effort will bo made not to generate mixed waste.

Personnel Decon Protocol: Boot and glove wash - trisodium phosphate wash with clean water rinse. Expendables will k double bagged and drummed for disposal. Field personnel will take a hygienic shower, off-sit., following each day's field work.

Decon Solution Monitoring Procedures, if Applicable: Decontamination will k performed in a well-ventilated area upwind of tho sampling zone.

Special Site Equipment, Facilities, or Procedures (Sanitary Facilities and Lighting Must Meet 29 CFR 1910.120):

All drilling safety procedures will bo strictly adhered to as outlined in Attachment A.

Site Entry Procedures and Special Considerations: E & E's "Buddy System" will bo employed at a11 times during fieldwork activities. Personnel will exercise caution in tho vicinity of the site and along nearby roadways.

Work Limitations (time of day, weather conditions, etc.) and Heat/Cold Stress Requirements:

All fieldwork activities will be performed during daylight hours. Team members will take breaks as necessary to avoid heat stress and replace fluids. Cooling vests may be used to prevent heat stress.

General Spill Control, if applicable: N/A

Investigation-Derived Material Disposal (i.e., expendables, decon waste, cuttings):

All fieldwork waste materials will bo double bagged, drummed, labeled and transported to a designated location for final disposal by tho Navy.

Sample Handling Procedures Including Protective Wear:

During a11 handling of samples, a11 field team members will wear surgical gloves. Goggles will bo worn during sample preservation with acids.

Team Member*	Responsibility
Team members to be determined	Team Leader
	Site Safety Officer/Sampler
	Geologist/Sampler
	Sampler

*All entries into exclusion zone require Buddy System use. All E & E field staff participate in medical monitoring program and have completed applicable training per 29 CFR 1910.120. Respiratory protection program meets requirements of 29 CFR 1910.134, and ANSI Z88.2 (1980).

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E. EMERGENCY INFORMATION

(Use supplemental sheets, if necessary)

LOCAL RESOURCES

(Obtain a local telephone book from your hotel, if possible.)

Ambulance On Base: 904-452-4138; Off Base: 911

Hospital Emergency Room NAS Dispensary - Building 3600: 904-452-2733; Baptist Hospital: 904-434-4811 (Life Flight)*

poison Control Center

Police (include local, county sheriff, state) 911

Fire Department 911

Airport

U.S. Coast Guard Emergency: 904-453-8178: General Information: 904-453-8282

Laboratory E & E ASC: 1-716-631-0360

Fed. Express 1-800-238-5355

Client Contact U.S. Navy Southern Division, Engineer-In-Charge, Suzanne D. Sanborn: 1-803-743-0574

Site Contact NAS Pensacola Enviromental Coordinator, Ron Joyner: 904-452-4515

*Baptist Hospital is prepared to handle radioactively contaminated personnel.

SITE RESOURCES

Site Emergency Evacuation Alarm Method N/A

water Supply source On site

Telephone Location, Number To be determined on site

Cellular Phone, if available To be determined on site

Radio

Other On-site warehouse number to be determined

EMERGENCY CONTACTS

1. Dr. Raymond Harbison (Univ. of Florida) ..... (501) 221-0465 or 904) 462-3277, 3211
   Alachua, Florida (501) 370-1263 (24 hours)

2. Ecology and tnvironrent. Inc.. Safety Director
   Paul Jonmaire ..... (716) 684-8060 (of-ice)
   (716) 655-1260 (home)

3. Regional Safety Coordinator, Sybil Nowchurch ..... (904) 877-1971 (office)
   (904) 878-2336 (home)

4. Regional Office Manager, Rick Rudy ..... (904) 877-1978 (office)
   (904) 893-7245 (home)

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MEDTOX HOTLINE

1. Twenty-four hour answering service: (501) 370-8263

   What to report:

   - State: "this is an emergency."
   - Your name, region, and site.
   - Telephone number to reach you.
   - Your location.
   - Name of person injured or exposed.
   - Nature of emergency.
   - Action taken.

2. A toxicologist, (Drs. Raymond Harbison or associate) will contact you. Repeat the information given to the answering service.

3. If a toxicologist does not return your call within 15 minutes, call tho following persons in order until contact is made:

   a. 24 hour hotline - (716) 684-8940
   b. Corporate Safety Director - Paul Jonmaire - home # (716) 655-1260
   c. Assistant Corp. Safety Officer - Steven Sherman - home # (716) 688-0084

EMERGENCY ROUTES

(NOTE: Field Team must Know Route(s) Prior to Start of Work)

Directions to hospital (include map) from Site 17

NAS Dispensary - Follow Novoy Road east to Duncan Road. Turn right onto Duncan Road and continuo to its intersection with Turner Stroot. Turn loft onto Turner Stroot. The NAS Dispensary is located at Building 3600 on Turner Stroot.

Baptist Hospital - Take Duncan Road (Navy Blvd.) north to exit tho base. Navy Blvd. becomes HWY 98 and curves to tho east. Follow Navy Blvd./Hwy. 98 east approx. 3mi to Pace Blvd. Turn loft (north) on Pace Blvd. and proceed approx. 1mi to Cervantes It. (Hwy. 90). Turn right on Cervantes/Hwy. 90 and follow this road for about 8 blocks and turn loft (north) onto E street. The hospital is about 6 blocks north on tho loft.

Emergency Egress Routes to Got Off-Site Emergency egress routes will be located if emergency exit routes become blocked by construction, etc.

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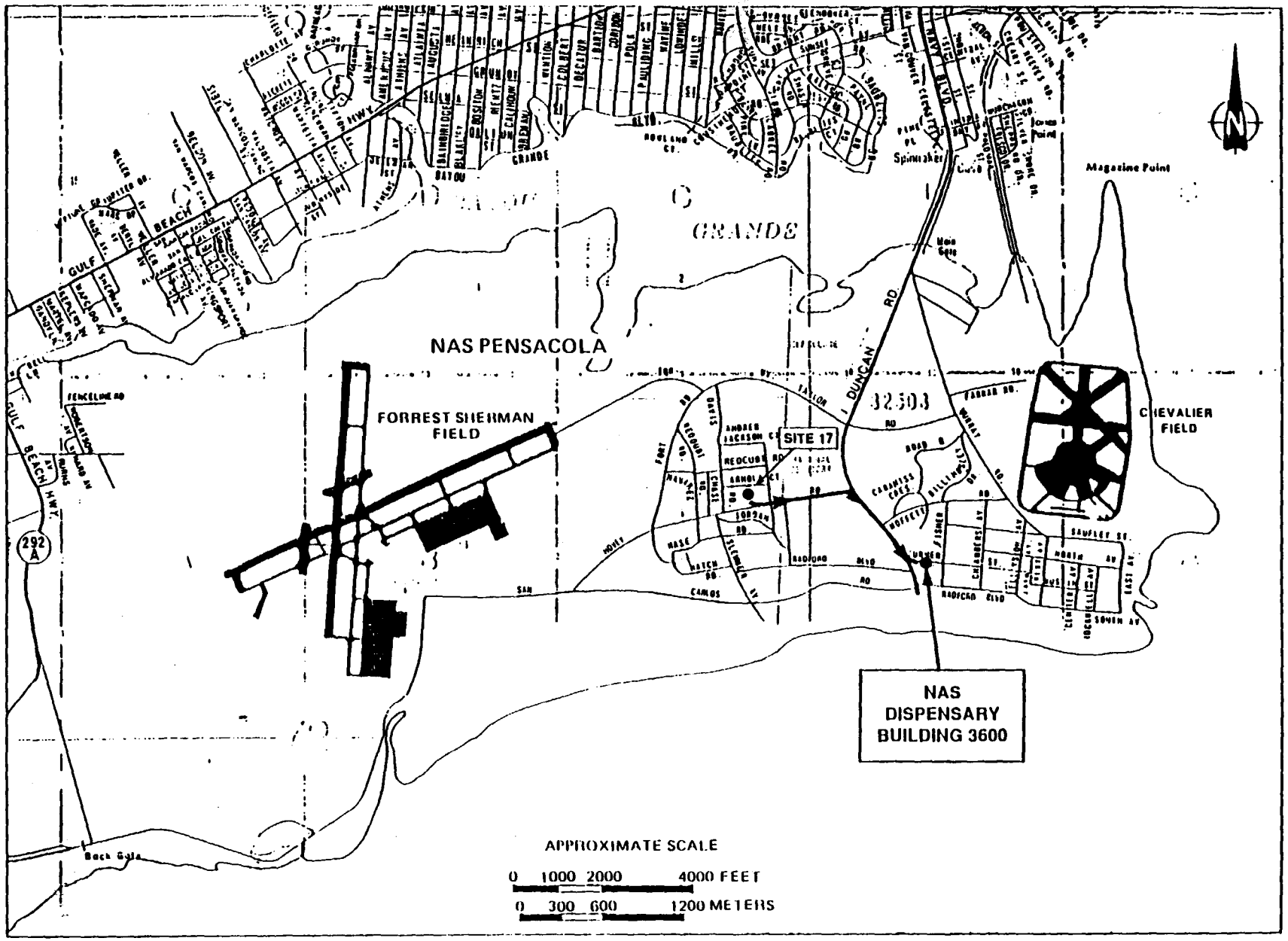
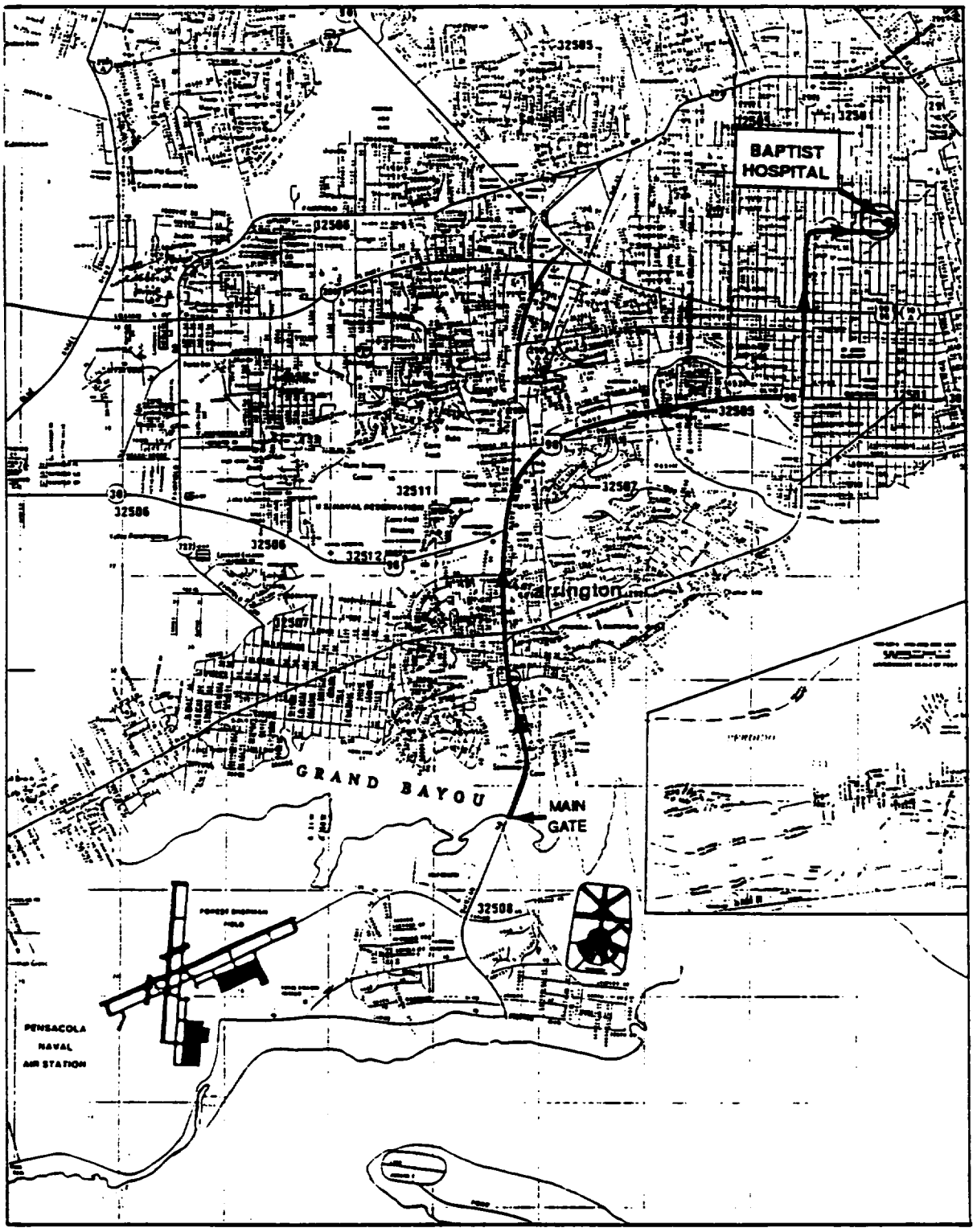


Figure D-1 LOCATION OF NAS DISPENSARY



SOURCE: Ecology and Environment, Inc., 1992

APPROXIMATE SCALE IN FEET

0 2000 4000 6000 8000

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Figure D-2 LOCATION OF BAPTIST HOSPITAL

DRILL,RIG SAFETY

* Hard hats must be worn.
* All team members must be know the procedure to shut the rig off and the location of the "kill" switch.
* When moving a rig off the road, pay attention to obstacles in route of travel. Walk the intended route first.
* Have someone guide the rig driver when clearance is at a minimum or when hazards are in close proximity.
* Set rig brakes and block the wheels when rig is set up at the desired drilling location.
* The mast must be lowered when the rig is moved.
* Always consider overhead wires to be live, watch for sagging lines and do not operate rig within 15 feet of overhead lines.
* Make sure the site, platforms and walkways are free of obstructions.
* Make sure proper housekeeping is practiced around and on the rig at all times. Tools should be stored in a manner that permits convenient access and provides for adequate safety.
* Store gasoline in approved containers that have a spark arrestor and keep them clear of the drilling work area.
* Check rig equipment prior to starting work. Repair or replace faulty and worn items.
* Handle augers with care. Use proper lifting techniques when picking up samplers and augers. Use a tool hoist if possible and stay clear of rotating augers. Keep cables and ropes secured when not in use.
* Level and stabilize the drill rig prior to raising the mast.
* Watch for slippery ground when working in the area of the rig.
* All unattended boreholes must be properly covered.
* Do not drill during an electrical storm.
* Maintain a safe distance from the rig mechanisms during drive sampling and auger removal operations.

STANDARD OPERATING PROCEDURE
FOR
EMERGENCIES DUE TO HEAT AND HEAT STRESS MONITORING

REVISED JANUARY 1990

Prepared by

Ecology and Environment, fnc.
368 Pleasantview Drive
Lancaster, New York 14006

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CONTENTS

Section | Page

1 INTRODUCTION 1

2 SCOPE 1

3 OBJECTIVES 1

4 EFFECTS OF HEAT 1

4.1 HEAT CRAMPS 2
4.1.1 Symptoms 2
4.1.2 Emergency Care 2
4.2 HEAT EXHAUSTION 2
4.2.1 Symptoms 3
4.2.2 Emergency Care 3
4.3 HEAT STROKE. 3
4.3.1 Symptoms 4
4.3.2 Emergency Cue 4

5 PREVENTION OF HEAT STRESS 4

5.1 GUIDELINES FOR USE OF PROTECTIVE CLOTHING. 5
5.2 HEARTRATE MONITORING 5
5.3 MONITORING PERSONNEL BODY TEMPERATURE AND BLOOD PRESSURE 6
5.4 MONITORING THE WORK AREA FOR HEAT STRESS CONDITIONS 6

6 DECONTAMINATION 6

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1 INTRODUCTION

Field operations present a variety of hazards to the employee. During hot days or when vearing protective clothing, heat stress can be experienced and, if not remedied, can threaten the health or life of field personnel. Therefore, it is important that all employees are able to recognize the symptoms of heat stress as well as perform first aid vithout delay.

2 SCOPE

This standard operating procedure (SOP) describes the symptoms and treatment for the three classical types of heat stress presented here in ascending order of severity: heat cramps, heat exhaustion, and heat stroke. Field personnel should take immediate action to prevent a less severe form of heat stress from escalating into one requiring hospital treatment.

In addition, this SOP recommends vays to avoid heat stress, such as frequent rest periods, carefully timed excursions in protective clothing, and monitoring heartrate and body temperature. The Site Safety Officer (SSO) has overall responsibility for seeing that these guidelines are followed in the field. Hovever, each individual must be cautious vhen vorking in conditions vhere heat stress is possible.

3 OBJECTIVES

The prevention of heat stress is of paramount importance for field personnel, particularly when they must wear heavy or confining protective clothing. The SSO must ensure that all personnel monitor themselves for possible heat stress, and know what to do in a heat emergency. For example, a person vho recognizes the symptoms of heat stroke can provide lifesaving first-aid to another, while medical assistance is summoned.

4 EFFECTS OF HEAT

Normal oxidation processes vithin the body produce a predictable amount of heat. If the heat is liberated as it is formed, there is no change in body temperature. If the heat is liberated slightly more rapidly, the body cools to a point at vhich the production of heat is accelerated and the excess is available to bring the body temperature back to normal.

Interference vith the elimination of heat leads to its accumulation and thus to the elevation of body temperature. As a result, the person is said to have a fever. Such a condition produces a cycle in vhich certain body processes speed up and generate additional heat. Then the body must eliminate not only the normal but also the additional quantities of heat.

Rut produced vithin the body is brought to the surface largely by the bloodstream and escapes to the cooler surroundings by conduction and radiation. If air movement such as a breeze strikes the body, additional hut is lost by convection. Bovever, vhen the temperature of the surrounding air becomes equal to or rises above that of the body, all of the hut must be lost by vaporization of the moisture (sveat) from the skin surface. As the air becomes more humid (contains more moisture), vaporization from the skin slovs dovn. Thus, on a day vhen the temperature is 95°F to 100°F, vith high humidity and little or no breeze, hut is retained within the body. It is on such a day or, more commonly, after a succession of such days (a heat vave) that medical emergencies due to hut are likely to occur. Such emergencies are classified in three categories: hut cramps, heat exhaustion, and hut stroke.

4.1 HEAT CRAMPS

Heat cramps usually affect people vho vork in hot environments and perspire a great deal. Loss of salt from the body causes painful cramps of the leg, arm, or abdominal muscles. Heat cramps also may result from drinking iced vater or other drinks either too quickly or in too large a quantity. Heat cramps generally occur during vork, but may appear hours later in some cases.

4.1.1 Symptoms

The symptoms of hut cramps include the following:

- Muscle cramps in legs, arms, or abdomen;
- Pain accompanying the cramps;
- Profuse perspiration; and
- Faintness.

4.1.2 Emergency Care

Place the victim in a cool location, observing safety and decontamination considerations (see Section 6) if the victim is coming from the hot zone. Give the person sips of vater or an electrolyte liquid such as Gatorade or its equivalent. Apply manual pressure to the cramped muscle. The victim should not require medical treatment but be alert for any indication of a more serious problem.

4.2 HEAT EXHAUSTION

Heat exhaustion occurs in individuals working in hot environments and may be associated with hut cramps. Heat exhaustion is caused by the pooling of blood in the vessels of the skin. The hut is

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transported from the interior of the body to the surface by blood. The blood vessels in the skin become dilated and a large amount of blood is pooled in the skin. This condition, plus the blood pooled in the lover extremities vhen an individual is in an upright position, may lead to an inadequate return of blood to the heart and eventually to physical collapse.

4.2.1 Symptoms

The symptoms of heat exhaustion are as follovs:

- o Pale clammy skin,
- o Profuse perspiration,
- o Generalized weakness,
- o Dizziness,
- o Weak pulse,
- o Rapid and usually shallow breathing,
- o Unconsciousness, and
- o Appearance of having fainted (the patient will respond to the same treatment that is administered in cases of fainting).

4.2.2 Emergency Care

Place the victim in a cool location and remove as much clothing as possible vhile observing proper decontamination procedures. Administer cool water, Gatorade, or its equivalent. If possible, fan the patient continually to remove heat by convection, but do not allov chilling or overcooling. Treat for shock, and take the victim to a medical facility if there is any indication of a more serious problem.

4.3 HEAT STROKE

Heat stroke is a profound disturbance of the heat-regulating mechanism, associated vith high fever and collapse. Sometimes this condition results in convulsions, unconsciousness, and even death. Direct exposure to sun, poor air circulation, poor physical condition, and advanced age (over 40) bear directly on the tendency to heat stroke. It is a serious threat to life and carries a 20-percent mortality rate. Alcoholics are extremely susceptible.

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4.3.1 Symptoms

Following are the symptoms of heat stroke (note the absence of perspiration):

- Dry, hot, and flushed skin:
- Sudden onset:
- Full and fast pulse;
- Dilated pupils:
- Early loss of consciousness;
- Body (core) temperature's exceeding 105°F;
- Muscle tvitching, groving into convulsions: and
- Breathing deeply 8t first, later shallovly or even almost absent.

4.3.2 Care

Remember that this is a true emergency, therefore, transportation to a medical facility should not be delayed. In the meantime, place the victim in a coal environment and remove as much clothing as possible. Ensure an open airvay. Reduce body temperature promptly, preferably by vrapping the victim in a vet sheet or dousing the body with water. If cold packs are available, place them under the arms, around the neck, on the ankles, or any place where blood vessels located close to the skin can be cooled. Protect the victim from injury during convulsions, especially tongue biting.

5 PREVENTION OF HEAT STRESS

Please note that in the case of heat cramps or heat exhaustion, G.tor.de or its equivalent is suggested as part of the treatment regime. The reason for this type of liquid refreshment is that such beverages will return much-needed electrolytes to tbe body's system. Vithout these electrolytes, body systems cannot function properly, and the represented health hazard will be increased. Therefore, when personnel are working in situations where the ambient temperatures and humidity are high, and especially in situations where levels A, B, and C of protective apparel are required, the SSO must follow the procedures listed below:

- Ensure that all employees have sufficient quantities of fluids (Gator.de or its equivalent). Personnel should prepare ahead of time for field work in heat stress environments by consuming extra fluid.;

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- o Ensure that frequent breaks are scheduled so that overheating is less likely to occur:
- o Revise vork schedules, vhen necessary, to take advantage of the cooler parts of the day (i.e., 5:00 a.m. to 1:00 p.m., and 6:00 p.m. to nightfall); and
- o Cooling vests should be vorn if available.
- o NOTE: Taking salt tablets is NOT currently recommended.

5.1 GUIDELINES FOR USE OF PROTECTIVE CLOTHING

If protective clothing must be vorn, especially levels A and B, the suggested guidelines for ambient temperature and maximum vearing time per excursion are as follows:

Ambient Temperature (°F)	Maximum Vearing Time per Excursion (min)
Above 90	15
85 to 90	30
80 to 85	.60
70 to 80	90
60 to 70	120
SO to 60	180

5.2 HEARTRATE MONITORING

One method of measuring the effectiveness of an employee's rest-recovery regime is by monitoring the heartrate. The "Brouha guideline" is one such method:

- o During a 3-minute period, count the pulse rate for the last 30 seconds of the first minute, the last 30 seconds of the second minute, and the last 30 seconds of the third minute.
- o Double the count.

If the recovery pulse rate during the last 30 seconds of the first minute is at 110 beats/minute or less and the deceleration between the first, second, and third minutes is at least 10 beats/minute, the vork-recovery regime is acceptable. If the employee's rate is above. that specified, a longer rest period is required, accompanied by an increased Intake of fluids.

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5.3 MONITORING PERSONNEL BODY TEMPERATURE AND BLOOD PRESSURE

When personnel are in respiratory protective gear for extended periods, or when air temperatures are very high, the monitoring of body temperature and blood pressure is another way of checking for symptoms of heat stress. Careful adherence to existing medical guidelines could identify an individual who may not have fully stabilized and therefore, is not ready to continue working in the hot zone.

5.4 MONITORING THE WORK AREA FOR HEAT STRESS CONDITIONS

Air temperature and relative humidity are the two most important measurements for determining the likelihood that a heat stress situation will occur. The reading can be achieved using both a dry and vet bulb thermometer.

6 DECONTAMINATION

As in ocher medical emergencies, decontamination should proceed as normally as possible without contributing unduly to the victim's stress or injury. At a minimum, he protective clothing should be removed as he or she is taken from the hazardous zone. The "buddy system" is always in effect and backup personnel should be available 8t the decontamination station to either suit up and assist in extraction or to help decontaminate and undress the victim. If otkr serious injuries or more life-threatening conditions exist, and the victim cannot be disrobed or decontaminated completely, the victim (or contaminated portions) should be vrapped in plastic (or other protective material) for his or her ovn safety as well as the safety of ambulance and hospital personnel. Carefully avoid action that would result in the victim's being further overheated.

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Title: SOP-HEALTH AND SAFETY ON DRILLING RIG OPERATIONS	
Category: H & S, Training 2.7	Revised: JANUARY 1990
	H. Van Cleave

STANDARD OPERATING PROCEDURES
FOR
HEALTH *AND* SAFETY ON
DRILLING RIG OPERATIONS

REVISED: JANUARY 1990

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CONTENTS

Section		Page
1	INTRODUCTION.. . . , ...	1
2	OPERATION OF DRILL RIG BY E & E PERSONNEL	1
2.1	RESPONSIBILITIES AND AUTHORITY OF SITE SAFETY OFFICER	1
2.2	RESPONSIBILITIES AND AUTHORITY OF E 6 E DRILLER . . .	1
2.3	RESPONSIBILITIES AND AUTHORITY OF OTHER E 6 E PERSONNEL	3
3	TRAINING REQUIREMENTS FOR SITE PERSONNEL	3
3.1	E 6 E SITE SAFETY OFFICER	3
3.2	E 6 E DRILLER AND HELPER	4
3.3	OTHER E & E DRILLING PERSONNEL	4
3.4	SUBCONTRACT DRILLER AND OTHER SUBCONTRACT DRILLING PERSONNEL	4
4	SUPERVISION OF SUBCONTRACT DRILLERS	5
4.1	RESPONSIBILITIES AND AUTHORITY OF SITE SAFETY OFFICER	5
4.2	RESPONSIBILITIES AND AUTHORITY OF OTHER E 6 B PERSONNEL.	7
5	GENERAL DRILLING SITE SAFETY CHECKLISTS	8
5.1	SAFETY CHECKLISTS FOR SPECIFIC DRILLING ACTIVITIES .	8
5.1.1	General Drilling Site Safety Checklist	8
5.1.2	Rotary and Core Drilling	9
5.1.3	Cathead Usage	10
5.1.4	Continuous-Flight or Hollov-Stem Augers . . .	12
5.1.5	Use of Wire Line Hoists, Wire Rope, and Hoisting Equipment	13
6	REFERENCES	16

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1 INTRODUCTION

This document is meant to be used in conjunction vith B & E SOPs for field operations and hazardous vaste site operations, and incorporates by reference all the safety precautions required therein. It specifically addresses the functions and responsibilities of personnel vorking on or around drilling operations.

E & E personnel are frequently required to vork in the field vith drill rigs, taking soil and rock samples, installing piezometers, and monitoring vells. Tvo general situations discussed separately are the supervision of Subcontract Drillers by B 6 E, and the direct operation of B & E's own drill rig by our personnel.

2 OPERATION OF DRILLING EQUIPMENT BY B & B

2.1 RESPONSIBILITIES AND AUTHORITY OF SITE SAFETY OFFICER

The duties of the Site Safety Officer (SSO) on drilling sites are the *sua* as in other types of operations vith the exception of the Increased emphasis on the hazards unique to drilling vork. This section details specific drilling concerns of an SSO.

B & E personnel are restricted from the borehole area during active drilling. When E & B personnel are doing drilling; they will be restricted from the borehole area by means of a "super exclusion zone" delineated by placing a 4- by 8-foot sheet of plywood over the borehole.

2.2 RESPONSIBILITIES AND AUTHORITY OF E & E DRILLER

At the beginning of each vork day, the E & E driller must inspect the rig to ensure the following components have been properly inspected, maintained, or replaced, or procedures have been performed:

- Kill svitches tripped and operation verified;
- Chain guards in place;
- Belt guards in place;
- Belts set to proper tension (rid);
- Loose belts:
- Presence of any fluid leaks;
- Any damaged hoses, cables, ropes, chins;
- Control panel is clean;
- Control lever functions labeled;
- Pressure relief valves function;
- Cathead free of rust and grease;
- Cathead grooves less than 1/8 inch in depth;
- All tools in proper vorking order;
- Rig leveled and stabilized;
- Check for veld cracks in mast; and
- Safety hooks operational.

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The Driller will report items needing attention to the SSO; however, it is the Driller's responsibility to make sure that these items are corrected prior to drilling.

During the drilling operations, the following safety practices will be in effect:

- All wheels will be blocked.
- Rig will be leveled using jacks or stabilizers.
- Rig engine will be in neutral when not actively turning augers.
- Plywood (or suitable substitute material) "super exclusion zone" pad will be in place over borehole.
- Rig engine key will be properly labeled.
- Rig equipment will be kept in an orderly manner within drilling work zone.
- All equipment will be properly lubricated.
- Tools will be used only for their intended purpose.
- Safety glasses, hearing protection will be worn when hammers are operated.
- Jaws of all wrenches will be clean and free of mud to prevent slippage.
- All lift hooks will have jaw clasps.
- Fire extinguisher will be staged at rear of rig.
- Rig will not be moved when mast is in raised position.
- Cables and ropes will be tied back or secured on stabilizer posts.
- All unattended drill holes will be covered.
- Check for overhead obstructions vhen raising rig mast, boom will not be raised within 25 feet of overhead utilities.
- No refueling will be permitted while equipment is running.

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The Driller has authority to direct personnel within the area while drilling operations are in progress. Access to the hazardous area around the auger and borehole is restricted by the "super exclusion zone" delineated by the 4- by 8-foot sheet of plywood centered over the borehole before drilling. A large hole cut in the plywood allows penetration of the augers. No personnel are allowed in this zone pad at any time while drilling is actively underway.

Housekeeping around the rig is the responsibility of the Driller, but all team members must participate in this effort as well.

23 RESPONSIBILITY AND AUTHORITY OF OTHER E 6 E PERSONNEL

E & E personnel working at a drilling site must act as support to the Drilling Team by providing any necessary support functions; however, it is important that personnel are careful not to interfere vith the drilling process. Personnel are restricted from approaching the "super exclusion zone" while drilling is underway. If an E 6 E crew member recognizes an unsafe condition in the vork a r u or on the rig, he should bring it to the attention of the SSO and Team Leader, if it is not resolved in a timely manner. If conditions are still deemed to be hazardous, team members have the option to contact their Regional Safety Coordinator (RSC) or Corporate Health and Safety in Buffalo.

It is the responsibility of all E 6 E personnel to carry their issued nondisposable gear, iacluding hard hat, face shield, respirator, steel-toed boots, eyepiece inserts, safety glasses, and appropriate outervear for the expected climate.

All personnel should be aware of emergency facilities, egress routes, and special medical conditions of their team members. As vith all E & E field vork, the buddy system is to be enforced.

3 TRAINING REQUIREMENTS FOR SITE PERSONNEL

3.1 E & E SITE SAFETY OFFICER

In addition to Basic Health and Safety Training and other OSHA mandated training, first aid, CPR, and necessary training in field monitoring of personnel, an SSO should have previously worked as a team member on field drilling projects in order to have a working knovledge of the drill rig and its inherently hazardous nature. Where monitoring instrumentation is to be used, the SSO must be properly trained prior to field vork. The SSO must have an understanding of the hazards of heat and cold stress, their associated symptoms, and proper vork modifications to protect field staff from potential injury.

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3.2 E 6 E DRILLER AND HELPER

The E 6 E driller and helper shall have taken and passed the basic 40-hour Eealth and Safety Training as prescribed by E 6 E and mandated by OSHA. They shall also meet the other minimum requirements for field vork including medical approvals and respirator fit test. Based on previous experience and training, the Driller will be critiqued by the E & E Drilling Team upon employment with E & E, by performing various types of drilling. This reviev will be the basis for determining whether additional training or apprenticeship will be required before allowing this employee to act as Driller. An existing E 6 E employee shall have a minimum of 1 year experience as a Driller's Helper on an assortment of field projects before he or she can be reviewed for advancement to the position of Driller. If a Driller is uninvolved in drilling efforts for 1 year or more, he or she will be required to act as a Driller's Helper on a project, as well as receive rig-specific training on the equipment, before being permitted to act as a Driller again. The Driller's Helper position requires prior attendance at a drilling training school program. Following successful completion of such a course, the Driller's Helper will be observed on sites for a period of approximately 6 months, during which time he or she will work on several drilling projects performing assorted types of drillihg. The E 6 E Drilling Team will determine, based on these field observations, whether additional training is required for this individual.

3.3 *OTHER* E 6 E DRILLING PERSONNEL

All E & E personnel shall have taken the basic 40-hour Eealth and Safety Training course. Field personnel must meet medical and respiratory fit test requirements established by E 6 E and OSHA, as well.

3.4 SUBCONTRACT DRILLER AND OTHER SUBCONTRACT DRILLING PERSONNEL

Subcontract Drillers and their support personnel must, at a minimum, have passed basic 40-hour Health and Safety Training as prescribed by OSHA 29 CFR1910.120. They shall be medically approved and trained to use the level(s) of respiratory protection required onsite. Certification of training by the Subcontractor shall be required as a deliverable included in E & E's contractual documentation. This training shall be verbally verified and logged onsite by the SSO or Team Leader before starting work.

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4 SUPERVISION OF SUBCONTRACT DRILLERS

4.1 RESPONSIBILITIES AND AUTHORITY OF SITE SAFETY OFFICER

The responsibilities of the SSO at a drilling site where subcontracted drillers are used include the following: rig inspections, personnel monitoring, and personnel protection.

A rig inspection starts vith, but is not limited to, verifying each item on the following checklist:

- The mast must be located at least 25 feet from any overhead or underground utility lines.
- The location and operation of operational and unencumbered kill svitches must be reiterated to all site personnel.
- Outriggers, stabilizers, or jacks are in place, and the rig is lml.
- A geophysical survey (electromagnetic or ground-penetrating radar) or a reliable site history must be obtained to verify absence of buried obstacles, tanks, or drums.
- A first aid kit and filled eyewash must be readily available.
- A fire extinguisher should be charged to the proper pressure and staged at rear of rig during drilling.
- The condition of ropes, chains, and cables must be *checked.*
- A lifeline or safety belt must be available if mast climbing is necessary.
- The Site Safety Plan (SSP) must be posted vith emergency phone list and map of hospital route.
- A "super exclusion zone" must be established around the borehole, using a 4- by 8-foot sheet of plywood. This defined area will be entered during active drilling only by the Driller, except in emergency situations.

If any of these items need replacement or repair, the SSO must make necessary arrangements and later verify that repair or replacement is sufficient before actual drilling begins. Working together, the SSO and the driller should verify that the rig has been checked against the Operator's checklist.

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The SSO's monitoring duties include calibration and setup of the appropriate monitoring devices, as specified in the SSP. At a minimum, this generally includes an O_2/explosimeter and realtime organic vapor monitoring capabilities (e.g., HNU, OVA). Noise monitoring, like heat stress monitoring, is employed where appropriate. If the SSO believes additional monitoring devices beyond the directive of the SSP should be employed (e.g., Rad Mini, Mini Ram), it is his or her responsibility to obtain this equipment vith the cooperation of the RSC or the Corporate Health and Safety Group, from the nearest E 6 E office.

It is the responsibility of the SSO to ensure that all safety equipment is in good working order. Day-to-day operations, as well as calibration data, must be recorded in the equipment log or SSO log. Adequate supplies such as breathing air, drinking liquids, and calibration gas must be maintained.

E 6 E personnel are forbidden from entering the "super exclusion zone" around the borehole vhile the rig is actively drilling. The SSO must not attempt to take air readings in or around the auger vhile in use, nor are cutting samples taken vhile the auger is in motion. An O_2/explosimeter should be set up if possible for unmanned (alarmed) operations at the rig using an extension hose to continuously drav samples from the borehole area during drilling operations.

The SSO has the ultimate authority over the Subcontractor vith regard to vhether work practices meet the requirements of the SSP. Shutdovn of vork or restriction of personnel are options available to the SSO. The SSO should hold informal site safety briefings at the start of both field work and daily vork shifts throughout the course of the project. Although E 6 E contractually requires Subcontractors to provide properly trained and outfitted staff, the SSO should verify verbally at the start-up meeting that the field staff has necessary respiratory approval and OSHA-mandated training, especially on hazardous waste sites. Site safety briefing topics, as well as attendees, will be recorded in the site safety log.

If the SSO has reason to believe either E & E or Subcontractor personnel are under the influence of alcohol or drugs, or are othervise ill before or during vork onsite, he or she should consider restricting those team members from site vork. Personnel arriving for work requiring level C protection vho are not cleanly shaved may also be restricted at the discretion of the SSO.

The folloving is a list of basic topics to be covered at site safety meetings:

- o Personnel responsibilities;
- o Planned investigation and presumed potential hazards:
- o Levels of protection, monitoring plan, and equipment;
- o Emergency scenario plans, including kill switch use;

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- o Location and operation of kill switches, fire extinguisher, and first aid kit:
- o Rut ami cold stress hazards;
- o "Super exclusion zone" around borehole: and
- o Warnings to Subcontractors about hazards of climbing the mast vithout safety belt and other equipment.

Because heat stress is a constant threat during varm veather, the SSO is responsible for determining whether conditions are unsuitable for work. Where workers cannot work vith the assistance of work modifications, cooling vests, and other cooling means, the SSO may decide that vork should not continue. The need for worker monitoring through blood pressure and oral temperature checks will be determined by the SSO vith assistance from the RSC and Buffalo Health and Safety staff, if necessary.

The SSO will be responsible for shutdown of the drilling operation if electrical storms are in the site area.

No refueling operations will be performed until rig engines are shut down. Motor fuels should be stored and dispensed from spring-loaded, OSHA/FM-approved gas cans constructed of metal or polyethylene.

The SSO should *ensure* and document that no boreholes are left open or unfilled after drilling equipment is moved. In'instances where a hole must be left open and unattended, suitable barricades, or the equivalent, will be staged around the hole to prevent personnel and equipment from falling in.

4.2 RESPONSIBILITIES AND AUTHORITY OF OTHER E 6 E PERSONNEL

All E 6 E personnel on site are required to follov the terms of the SSP and the direction of the SSO. Because the SSO cannot be in all places at all times, the crew should observe the subcontractors and condition of their equipment at all times, and report immediately to the Team Leader and SSO any safety-related issues that are unresolved. Included are such details as dressout, site functions, and decontamination. It is important tht the SSO be involved so that proper log entries can be made.

E & B, as policy, does not provide safety equipment or monitoring instrumentation to subcontractors. Some projects, hovever, may be set up so that E & B personnel and subcontractors share the same expendable supplies.

E & B personnel are forbidden f r a approaching augers during drilling. Activities at the borehole, such as sampling, require that equipment be stopped.

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5 GENERAL DRILLING SITE SAFETY CHECKLISTS

5.1 SAFETY CHECKLISTS FOR SPECIFIC TYPES OF DRILLING ACTIVITIES

5.1.1 General Drilling Site Safety Checklist

- All E 6 E drilling personnel will have read and understood the terms of the E & E drilling SOP.
- Obvious or questionable safety conditions that arise during daily inspection of the rig and its components will be cause for vork interruption.
- Only approved Drillers will remain in proximity to the borehole during drilling, and an approximate 4- by 8-foot "super exclusion area" will be established around the moving auger at all times. No personnel, except the Driller and the Driller's Helper, will enter this zone during drilling. The SSO will issue warnings to those personnel vho breach this zone.
- Continuous O_2/explosimeter monitoring at borehole using remote sampling hose will exist at all times.
- All field team members will be briefed on planned drilling operations and possible problems before work begins on day 1. All will be shown the location and operation of "kill switches," vhich will be operationally checked each morning.
- Fire extinguisher(s) will be staged next to the rig before drilling and refueling operations.
- Velding and cutting activities will only be performed avay from ignition sources at a distance approved by the SSO or Team Leader.
- Appropriate personnel protective equipment (based on hazards associated with assumed well contaminants) will be worn as directed by the SSO and the SSP. At a minimum, steel-toed boots, hard hats, and face shields will be vorn during any active drilling.
- Outrigger stabilizers must be in place before drilling commences, and the rig must also be leveled.
- The drill rig mast must be horizontal during movement of rig and should not be erected within 25 feet of overhead lines.

- Electrical storms vithin hearing range of the job site vill signal vork termination until the SSO and Team Leader notify personnel otherviseı

- The local utilities should be contacted prior to drilling so that their lines can be located and flagged. Situations of close proximity may involve isolating utility lines (i.e., shutdown and inerting of gas lines).

- When buried drums or other material are suspected, a full survey of the drilling zone is required wing appropriate instrumentation prior to ground breaking.

- Only trained, experienced staff vho have studied proper drilling methods and served as a Helper under an experienced Driller vill operate the cathead.

- Only properly licensed staff vill drive the drill rig. A daily safety *check* of the vehicle, following E & S protocol, vill be carried out by the driver.

- Climbing on the vertical mast is not permitted by E 6 E staff. Because the boom is not equipped vith a ladder, it should be lowered for repairs.

5. .2 Rotary and Core Drilling

The folloving precautionary measures should be taken during rotary and core drilling:

- Rotary drilling tools should be safety *checked* prior to drilling:
  - Rods and bit should be open and clear.
  - Water swivels and hoisting plugs should be lubricated and checked for "frozen" bearings before use.
  - Drill rod chuck jaws should be *checked* periodically and replaced when necessary.
  - The capacities of hoists and sheaves should be checked against the anticipated weight of the drill rod string, in addition to other expected hoisting loads.
  - All hoses to and fr a the pump should be *checked* for properly installed couplings: couplings should be secured vith locking devices on "quick connect" fittings or vire on "Chicago-Style" couplings.

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- Hoses should be inspected daily for deterioration and leakage, and replaced if needed.

o Special precautions that should be taken for safe rotary or core drilling involve chucking, joint break, hoisting, and lowering of drill rods:

- Only the Operator of the drill rig should brake or set a manual chuck so that rotation (of the chuck) will not occur before removing the wrench from the chuck.

- Drill rods should not be braked while being lowered into the hole vith chuck jaws.

- Drill rods should not be held or lowered into the hole with pipe vrenches.

- If a string of drill rods are accidentally or inadvertently released into the hole, do not attempt to grab the falling rods with hands or a wrench.

- In the event of a plugged bit or other circulation blockage, the high pressure in the piping and hose between the pump and the obstruction should be relieved or bled down before breaking the first tool joint.

- When drill rods are hoisted from the hole, they should be cleaned for safe handling vith rubber or other suitable rod wiper. Do not use your hands to clean drilling fluids from drill rods.

- If work must progress over a portable drilling fluid (mud) pit, do not attempt to stand on narrov sides or cross members. The mud pit should be equipped vith rough-surfaced, fitted, cover panels strong enough to hold drill rig personnel.

- Drill rods should not be lifted and leaned unsecured against the mast. Either provide some method of securing the upper ends of the drill rod sections for safe vertical storage, or lay the rods down. As previously stated, hardhats, steel-toed boots, safety glasses, and work gloves are to be worn during such work, vith impervious gear and respiratory protection added as required by the SSP.

5.1.3 Cathead Usage

o Keep the cathead clean and free of rust, oil, and grease. If it becomes rusty, clean vith a wire brush.

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- Check the cathead periodically, when the engine is not running, for rope wear grooves. If a rope groove forms to a depth greater than 1/8 inch (3 mm), the cathead should be replaced.

- Always use a clean, dry, sound rope. A wet or oily rope may "grab" the cathead and cause drill tools or other items to be rapidly hoisted to the top of the mast.

- Should the rope "grab" the cathead or otherwise become tangled in the dram, release the rope and sound an appropriate alarm for all personnel, including the Operator, to rapidly back amy and stay clear. If the rope "grabs" the cathead and tools are hoisted to the sheaves at the top of the mast, the rope will often break, releasing the tools. If the rope does not break, stay clear of the drill rig until the Operator can turn off the drill rig engine and initiate other appropriate actions to release the tools. The Operator should carefully watch the suspended tools, quickly backing away after turning off the engine.

- Chemicals can cause deterioration of the rope that my not be visibly detectable, thus the rope should always be protected from any chemical contact.

- Never wrap the rope from the cathead (or any other rope, vire rope, or cable on the drill rig) around a hand, wrist, arm, foot, ankle, leg, or any other part of the body.

- Always maintain a minimum of 18 inches of clearance between the operating hand and the cathead drum when driving samplers, casing, or other tools vith the cathead and rope method. Be aware that the rope advances toward the cathead vith each hammer blow as the sampler or other drilling tool advances into the ground.

- Do not use more rope wraps than are required to hoist a load.

- Do not leave a cathead unattended with the rope wrapped on the drum.

- Position all other hoist lines to prevent contact vith the operating cathead rope.

- When using the cathead and rope for driving or back-driving, make sure that all threaded connections are tight, while staying as far away as possible from the hammer impact point.

- The cathead Operator must be able to operate the cathead standing on a level surface vith sound, firm-footing conditions, without distraction or disturbance.

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5.1.4 Continuous-Flight or Hollow-Stem Augers

- Prepare to start an auger boring with the drill rig level, the clutch or hydraulic rotation control disengaged, the transmission in low gear, and the engine running at low RPM.
- Apply an adequate amount of down pressure before rotation to seat the auger head below the ground surface.
- Check auger flights for nicks or burrs that could catch clothing during rotation, and file them dovn.
- Vatch the auger head vhile slowly engaging the clutch or rotation control, and start rotation. Stay clear of the auger.
- Slowly rotate the auger and auger head while continuing to apply down pressure. Keep one hand on the clutch or the rotation control at all times until the auger has penetrated about 1 foot or more belov ground surface.
- If the auger head slides out of alignment, disengage the clutch or hydraulic rotation control, and repeat the starting process.
- An auger guide should be considered to facilitate the starting of a straight hole through hard ground or pavement.
- The Operator and tool handler should establish a system of responsibility for the various activities required for auger drilling, such as connecting and disconnecting auger sections and inserting and removing the auger fork. The Operator must ensure that the tool handler is well avay from the auger column and that the auger fork is removed before starting rotation.
- Only use the manufacturer's recommended method of securing the auger to the povar coupling. Do not touch the coupling or the auger with your hands, a wrench, or any other tool during rotation.
- Whenever possible, use tool hoists to handle auger sections.
- Never place hands or fingers under the bottom of an auger section when hoisting the auger over the top of the auger section in the ground or other hard surfaces such as the drill rig platform.
- Never allov feet to get under the auger section that is being hoisted.

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- When rotating augers, stay clear of the rotating auger and other rotating components of the drill rig. Never reach behind or around a rotating auger.

- Use a long-handled shovel to move auger cuttings away from the auger. Never use your hands or feet to move cuttings away from the auger.

- Do not use hands to clean rotating augers when removing augers from the ground.

- The use of wire line hoists, wire rope, and hoisting hardware should conform to stipulations developed by the American Iron and Steel Institute Wire Rope Users Manual.

5.1.5 Use of Wire Line Hoists, Vire Rope, and Hoisting Equipment

- All wire ropes and fittings should be visually inspected during use and thoroughly inspected 8t least once a week for abrasion, broken wires, wear, reduction in rope diameter, reduction in wire diameter, fatigue, corrosion, damage from heat, improper waving, jamming, crushing, bird caging, kinking, core protrusion, and damage to lifting hardware. All related equipment must conform to standards as established by the American Iron and Steel Institute Vire Rope Users Hand. Vire ropes should be replaced when inspection indicates excessive damage according to the Vire Rope Users Manual. All wire ropes which have not been used for a period of 1 month or more should be thoroughly inspected before being returned to service.

- End fittings and connections consist of spliced eyes and various manufactured devices. All manufactured end fittings and connections should be installed according to the manufacturer's instructions and lorded according to the manufacturer's specifications.

- If a ball-bearing type hoisting swivel is used to hoist drill rods, svivel bearings should be inspected and lubricated daily to ensure that the svivel freely rotates under load.

- If a rod slipping device is used to hoist drill rods, do not drill through or rotate drill rods through the slipping device, and do not hoist the drill rod column higher than one-half the mast height above the top of the mast (derrick). Do not hoist a rod column vith loose tool joints and do not make up, tighten, or loosen tool joints while the rod column is king supported by a rod slipping device. If drill rods should slip back into the borehole, do not attempt to brake the fall of the rods vith hands or by tensioning the slipping device.

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- Host sheaves on exploration drill rigs are stationary with a single part line. The number of parts of line should never be increased without first consulting with the manufacturer of the drill rig.

- Vire ropes must be properly matched with each sheave--if the rope is too large, the sheave will pinch the vire rope--if the rope is too small, it will groove the sheave. Once the sheave is grooved, it will severely pinch and damage larger wire ropes.

- Use tool handling hoists only for vertical lifting of tools (except when angle hole drilling). Do not use tool handling hoists to pull objects away from the drill rig; hovever, drills may be moved using the main hoist if the wire rope is spooled through proper sheaves according to the manufacturer's recommendations.

- When stuck tools or similar loads cannot be raised vith a hoist, disconnect the hoist line and connect the stuck tools directly to the feed mechanism of the drill. Do not use hydraulic leveling jacks for added pull to the hoist line or the feed mechanism of the drill.

- When attempting to free a mired vehicle or drill carrier, use only a winch on the front or rear of the vehicle, and stay as far as possible away from the wire rope. Do not attempt to use tool hoists to pull out a mired vehicle or drill rig carrier.

- Minimize shock loading on a wire rope--apply loads smoothly and steadily.

- Avoid sudden loading in cold weather.

- Never use frozen ropes.

- Protect vire rope from sharp corners or edges.

- Do not operate the rig vith damaged or faulty guides, rollers, sheave bearings, or latches on safety hooks.

- Clutches and brakes on hoists should be periodically tested.

- Know and do not exceed the rated capacity of hooks, rings, links, swivels, shackles, and other lifting aids.

- Always vear gloves when handling vire rope.

- Following the installation of a new vire rope, first lift a light load to allow the vire rope to adjust.

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- Never carry out hoisting operations when weather conditions are such that hazards to personnel, the public, or property are created.
- Never leave a load suspended in the air when the hoist is unattended.
- Never hoist a load over the head, body, or front of personnel.
- Never use a hoist line to "ride" up the mast (derrick) of a drill rig.
- Replacement of wire ropes should conform to the drill rig manufacturer's specifications.

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6 REFERENCES

Health and safety sections of the folloving operation manuals are incorporated by reference in this SOP:

Dicdrich D-50 Safety Hanual.

Drilling Safety Guide, Diamond Core Drill Hanufacturers Association and National Drilling Contractors Association.

Wire Rope Users Hanual, American Iron and Steel Institute.

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MALLINCKRODT

Material Safety Data Sheet

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Mallinckrodt, Inc. Science Products Division, P.O. Box M Paris, KY 40361

Emergency Telephone Number: 314-982-5000

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HYDROCHLORIC ACID, 37%

PRODUCT IDENTIFICATION:

Synonyms: Muriatic acid

Formula CAS No.: 7647-01-0

Molecular Weight: MY (HCl)

Chemical Formula: HCl

Hazardous Ingredients: Hydrogen chloride

PRECAUTIONARY MEASURES

DANGER! CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED. HARMFUL IF INHALED. INHALATION MAY CAUSE LUNG DAMAGE.

Do not get in eyes, on skin, or on clothing.
Avoid breathing mist.
Use only with adequate ventilation.
Wash thoroughly after handling.
Store in a tightly closed container.
Remove and wash contaminated clothing promptly.
This substance is classified as a POISON under the Federal Caustic Poison Act.

EMERGENCY/FIRST AID

In case of contact, immediately flush skin or eyes with plenty of water for at kart 15 minutes. If swallowed, DO NOT INDUCE VOMITING! Give large quantities of water or milk if available. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In all cases call a physician.
SEE SECTION 5.

DOT Hazard Class: Corrosive Material

SECTION 1 Physical Data

Appearance: Clear, colorless fuming liquid.

Odor: Pungent odor of hydrogen chloride.

Solubility: Infinite in water with slight evolution of heat.

Boiling Point: 53°C (127°F); Azeotrope (20.2%) boils at 109°C (228°F)

Melting Point: -74°C (-101°F)

Specific Gravity: 1.18

Vapor Density (Air = 1): No information found.

Vapor Pressure (mm Hg): 190 @ 25°C (77°F)

Evaporation Rate: No information found.

SECTION 2 Fire and Explosion Information

Fire:
Can react with metals to release flammable hydrogen gas.

Explosion:
Not considered to be an explosion hazard.

Fire Extinguishing Media:
If involved in a fire, use water spray.

Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

SECTION 3 Reactivity Data

Stability:
Stable under ordinary conditions of use and storage. Containers may burst when heated.

Hazardous Decomposition Products:
When heated to decomposition, emits toxic hydrogen chloride fumes and will react with water or steam to produce heat and toxic and corrosive fumes.

Hazardous Polymerization:
Will not occur.

Incompatibilities:
A strong mineral acid, concentrated hydrochloric acid is highly reactive with strong bases, metals, metal oxides, hydroxides, amines, carbonates and other alkaline materials. Incompatible with materials such as cyanides, sulfides, sulfites, and formaldehyde.

SECTION 4 Leak/Spill Disposal Information

Clean-up personnel should wear protective clothing and respiratory equipment suitable for toxic or corrosive fluids or vapors. Isolate or enclose the area of the leak or spill. Small Spills: Flush with water and neutralize with alkaline material (soda ash, lime, etc.). Sewer neutralized material with excess water. Larger spills and lot sizes: Neutralize with alkaline material, pick up with absorbent material (sand, earth, vermiculite). Provide forced ventilation to dissipate fumes. Dispose in a RCRA-approved waste facility or sewer the neutralized slurry with excess water if local ordinances allow.

Reportable Quantity (RQ)(CWA/CERCLA): 5000 lbs.

Ensure compliance with local, state and federal regulations.

AD

NFPA Ratings: Health: 3 Flammability: 0 Reactivity: 0

SECTION 5 Health Hazard Information

A. EXPOSURE / HEALTH EFFECTS

Inhalation:
Corrosive! Inhalation of vapors can cause coughing, choking, inflamation of the nose, throat, and upper respiratory tract. Inhalation of higher **concentrations** may cause lung damage.

Ingestion:
Corrosive! Swallowing hydrochloric acid can cause immediate pain and burns of the **mouth,** throat, esophagus and gastrointestinal **tract.** May cause nausea, vomiting, and diarrhea.

Skin Contact:
Corrosive! Can cause redness, pain, and severe skin burns. **Concentrated solutions cause** deep ulcers and discolor skin.

Eye **Contact:**
Corrosive! Vapors **are** irritating **and** may cause damage to **the eyes. Splashes may** cause severe burns **and** permanent eye damage.

Chronic Exposure:
Long-term exposure to concentrated vapors may cause erosion of teeth. Long term exposures seldom occur due to the corrosive properties of the acid.

Aggravation of **Pre-existing** Conditions:
Persons with pre-existing **skin** disorders or eye disease may be more susceptible to the effects of this substance.

B. FIRST AID

Inhalation:
Remove to fresh air. **If not breathing, give** artificial respiration. **If breathing is difficult,** give omen. **Call** a physician.

Ingestion:
DO NOT INDUCE VOMITING! **Give large** quantities of water or milk if available. **Never give** anything by mouth to an unconscious person. **Get medical** attention immediately.

Skin Exposure:
In case of contact, immediately flush skin **with** plenty of water for at least 15 minutes while removing contaminated clothing **and** shoes. Wash clothing before reuse. Thoroughly **clean** shoes before **reuse.** Get medical attention immediately.

Eye **Exposure:**
Wash eyes with **plenty of water for at least 15** minutes, lifting **lower** and upper eyelids occasionally. Get medical attention immediately.

C. TOXICITY DATA (RTECS, 1986)

Oral rat LD50 900 **mg/kg** (Hydrochloric acid concentrated) Mutation references cited.

SECTION 6 Occupational Control Measures

Airborne Exposure Limits:
-OSHA Permissible **Exposure** Limit (PEL):
5 ppm Ceiling
-ACGIH Threshold **Limit** Value **(TLV):**
5 ppm Ceiling

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recomme Practices", most recent edition, for details.

Personal Respirators: (NIOSH Approved)
If the TLV is exceeded a full facepiece chemical cartridge respirator may be worn, in general, up to 100 times the TLV or the maximum use concentration specified by the respirator supplier, whichever is less. Alternatively, a supplied air full facepiece respirator or airlined hood may be worn.

Skin Protection:
Rubber or neoprene gloves and additional protection including impervious boots, apron, or coveralls, as needed in areas of unusual exposure to prevent skin contact.

Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Contact lenses should not be worn when working with this material. Maintain eye wash fountain and quick-drench facilities in work area.

SECTION 7 Storage and Special Information

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect from physical damage and direct sunlight. Isolate from incompatible substances. Protect from moisture.

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Material Safety Data

Emergency Phone Number: 314-982-5000

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ISOPROPYL ALCOHOL

PRODUCT IDENTIFICATION:

Synonyms: 2-propanol; sec-propyl alcohol; isopropanol

Formula CAS No.: 67-63-0

Molecular Weight: 60.10

Chemical Formula: $(CH_3)_2CHOH$

Hazardous Ingredients: Not applicable.

PRECAUTIONARY MEASURES

WARNING! FLAMMABLE LIQUID. HARMFUL IF SWALLOWED OR INHALED. AFFECTS CENTRAL NERVOUS SYSTEM. CAUSES IRRITATION.

Keep away from heat, sparks and flame.
Keep container closed.
Use with adequate ventilation.
Avoid breathing vapor.
Wash thoroughly after handling.
Avoid contact with eyes, skin and clothing.

EMERGENCY/FIRST AID

If swallowed, give water to drink. Induce vomiting if medical help is not immediately available. **Never give** anything by mouth to an unconscious person. **If** inhaled, remove to fresh air. **If not** breathing, **give** artificial respiration. **If** breathing is difficult, **give** oxygen. **In** case **of contact,** immediately flush skin or **eyes with plenty of water** for at least 15 minutes. In all cases **call** a physician.
SEE SECTION 5.

DOT **Hazard Class:** **Flammable** Liquid

SECTION 1 Physical Data

Appearance: Clear, **colorless** liquid.

Odor: Rubbing alcohol.

Solubility: Infinite in water.

Boiling Point: 82°C (180°F).

Melting Point: -89°C (-128°F).

Specific gravity: 0.79

Vapor Density **(Air = 1):** 2.1

Vapor Pressure (mm **Hg):** 33 **@ 20°C (68°F)**

Evaporation Rate: (n-BUAC = 1) **2.83**

SECTION 2 Fire and Explosion Information

Fire:
Flammable Liquid
Flashpoint: 12°C (53°F). (closed cup).
Autoignition temperature: 399°C **(750°F).**
Flammable limits in air, % by volume:
lel: 2.0; **uel:** 12.0.

Explosion:
Above flash **point,** vapor-air mixtures are explosive within flammable limits noted **above.** Contact with strong oxidizers **may cause** fire or **explosion.**

Fire Extinguishing **Media:**
Water spray, dry chemical, **alcohol** foam, or carbon dioxide. Water spray may **be used** to keep **fire exposed** containers cool.

Special Information:
In the event of a fire, **wear** full protective clothing and **NIOSH-approved self-contained** breathing **apparatus** with **full** facepiece **operated** in the pressure demand or other positive pressure mode. Water may be used to flush spills **away from** exposures and to dilute **spills** to non-flammable mixtures. **Vapors** can **flow** along **surfaces** to distant **ignition source** and flash back.

SECTION 3 Reactivity Data

Stability:
Stable under ordinary conditions of use and storage. Heat and sunlight can contribute to instability.

Hazardous Decomposition Products:
Toxic gases and vapors such as carbon monoxide may be released a fire involving isopropyl alcohol.

Hazardous Polymerization:
Will not occur.

Incompatibilities:
Heat, flame, strong oxidizers, acetadehyde, chlorine, ethylene oxide, hydrogen-palladium combination, hydrogen peroxide-sulfu acid combination, potassium tert-butoxide, hypochlorous acid, isocyanates, nitroform, phosgene, oleum and perchloric acid.

SECTION 4 Leak/Spill Disposal Information

Remove all sources of ignition. Ventilate area of leak or spill. Clean-up personnel require protective clothing and respiratory protection from vapors. Small spills may be absorbed on paper towels and evaporated in a fume hood. Allow enough time for fumes to clear hood, then ignite paper in a suitable location away from combustible materials. Contain and recover liquid for reclamation when possible. Larger spills and lot sizes can be collected as hazardous waste and atomized in a suitable RCRA approved combustion chamber, or absorbed with vermiculite, dry sand, earth or similar material for disposal as hazardous waste in a RCRA approved facility.

Ensure compliance with local, state and federal regulations.

NFPA Ratings: Health: 2 Flammability: 3 Reactivity: 0

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Material Safety Data

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ISOPROPYL ALCOHOL

PRODUCT IDENTIFICATION;

Synonyms: **2-propanol;** sec-propyl alcohol; isopropanol

Formula CAS **No.:** 67-63-0

Molecular Weight: **60.10**

Chemical Formula: $(CH_3)_2$ CHOH

Hazardous **Ingredients: Not** applicable.

PRECAUTIONARY MEASURES

WARNING! FLAMMABLE LIQUID. HARMFUL IF SWALLOWED OR INHALED. AFFECTS CENTRAL NERVOUS SYSTEM. CAUSES IRRITATION.

Keep away from heat, sparks and flame.
Keep container closed.
Use with adequate ventilation.
Avoid breathing vapor.
Wash thoroughly **after** handling.
Avoid contact with eyes, skin and clothing.

EMERGENCY/FIRST AID

If swallowed, give water **to** drink. Induce vomiting il medical help is not immediately available. Never give **anything** by mouth to an unconscious person. If inhaled, remove **to** fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case **of** contact, immediately flush **skin or eyes with** plenty **of** water **for** at least 15 minutes. In all cases call a physician.
SEE SECTION 5.

DOT Hazard Class: Rammable Liquid

SECTION 1 Physical Dam

Appearance: Clear, colorless liquid.

Odor: Rubbing alcohol.

Solubility. Infinite in **water.**

Boiling Point: 82°C (180°F).

Melting Point: -89°C (-128°F).

Specific gravity: 0.79

Vapor Density (Air=1): **2.1**

Vapor Pressure (mm **Hg):** 33 @ 20°C (68°F)

Evaporation Rate: (n-BUAC = 1) 2.83

SECTION 2 Fire and Explosion Informatinn

Fire:
Flammable Liquid
Flashpoint: 12°C (53°F). (closed cup).
Autoignition temperature: 399°C (750°F).
Flammable limits in air, % by volume:
lel: 2.4 uel: 12.0.

Explosion:
Above flash point, vapor-air mixtures are explosive within flammable limits noted above. Contact **with** strong oxidizers ***may*** cause **fire or** explosion.

Fire Extinguishing Media:
Water spray, dry chemical, alcohol **form, or** carbon dioxide. **Water** spray may be used **to** keep **fire** exposed containers cool.

Special Information:
In the event **of a fire,** wear lull protective clothing and **NIOSH-approved** self-contained breathing apparatus with lull facepiece operated in the pressure demand or other positive pressure mode. **Water** may be used to flush spills away **from** exposures and to dilute spills **to** non-flammable mixtures. Vapors can flow along surfaces **to** distant ignition source and flash **hack.**

SECTION 3 Reactivity Data

Stability:
Stable under ordinary conditions of use and storage. Heat and sunlight can contribute **to** instability.

Hazardous Decomposition Products:
Toxic gases and vapors such **as** carbon monoxide may be released in **a fire** involving isopropyl alcohol.

Hazardous Polymerization:
Will not occur.

Incompatibilities:
Heat, flame, strong oxidizers, acetadehyde, chlorine, ethylene oxide, hydrogen-palladium combination, hydrogen peroxide-sulfuric **acid** combination, potassium tert-butoxide, hypochlorous acid, isocyanates, nitroform, phosgene, oleum and perchloric **acid.**

SECTION 4 Leak/Spill Disposal Information

Remove all sources **of** ignition. Ventilate area **of** leak **or** spill. Clean-up personnel require protective clothing and respiratory protection from vapors. Small spills may **be** absorbed on paper towels and evaporated in a fume hood. **Allow** enough time **lor** fumes **to dear hood,** then ignite paper in a suitable location **away from combustible materials. Contain** and recover liquid **lor** reclamation when possible. Larger spills and lot sizes can be collected as **hazardous** waste and atomized in a suitable RCRA approved combustion chamber, **or absorbed with** vermiculite, dry sand, **earth or** similar material lor disposal **as** hazardous **waste in a** RCRA approved facility.

Ensure compliance with local, state and federal regulations.

NFPA Ratings: Health: 1 Flammability: 3 Reactivity: 0

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Material Safety Data

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NITRIC ACID, 70%

PRODUCT IDENTIFICATION:

Synonyms: Aqua Fortis; Azotic Acid; Nitric Acid 70%

Formula CAS No.: 7697-37-2

Molecular Weight: 63.00

Chemical Formula: HNO_3

Hazardous Ingredients: Not Applicable

PRECAUTIONARY MEASURES

DANGER! STRONG OXIDIZER. CONTACT WITH OTHER MATERIAL MAY CAUSE FIRE.
CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED. HARMFUL IF INHALED. INHALATION MAY CAUSE LUNG DAMAGE.

Do not get in eyes, on skin, or on clothing.
Avoid breathing mist.
Use only with adequate ventilation.
Wash thoroughly after handling.
Keep from contact with clothing and other combustible materials.
Do not store near combustible materials.
Store in a tightly closed container.
Remove and wash contaminated clothing promptly.
This substance is classified as a POISON under the Federal Caustic Poison Act.

EMERGENCY/FIRST AID

In case of contact, immediately flush skin or eyes with plenty of n t c r for at least 15 minutes. If swallowed, DO NOT **INDUCE VOMITING! Give large quantities of** n t c r or milk **if available. Never** give anything by mouth to an unconscious person. If inhaled, **remove** to fresh air. If not breathing, give artificial **respiration.** If breathing is difficult, **give** oxygen. In all cases call a physician.
SEE SECTION 5.

DOT Hazard Class: Oxidizer

SECTION 1 Physical Data

Appearance: Clear, colorless to slightly yellow liquid.

Odor: Suffocating acrid.

Solubility: Infinite in water.

Boiling Point: 122°C (252°F)

Melting Point: -34°C (-29°F)

Specific Gravity: 1.41

Vapor Density (Air=1): 2-3 approximately

Vapor Pressure (mm Hg): 62 @ 20°C (68°F)

Evaporation Rate: No information found.

SECTION 2 Fire and Explosion Information

Fire:
Not combustible, but substance is a strong oxidizer and its heat of reaction with reducing agents or combustibles may cause ignition. Can react with metals to release flammable hydrogen gas.

Explosion:
Reacts explosively with combustible organic or readily oxidizable materials such as: alcohols, turpentine, charcoal, organic refuse, metal powder, hydrogen sulfide, etc.

Fire Extinguishing Media:
If involved in a fire, use water spray.

Special Information:
Increases the flammability of combustible, organic and readily oxidizable materials. In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

SECTION 3 Reactivity Data

Stability:
Stable under ordinary conditions of use and storage. Containers may burst when heated.

Hazardous Decomposition Products:
When heated to decomposition, emits toxic nitrogen oxides fumes and hydrogen nitrate. Will react with water or steam to produce heat and toxic and corrosive fumes.

Hazardous Polymerization:
Will not occur.

Incompatibilities:
A dangerously powerful oxidizing agent, concentrated nitric acid is incompatible with most substances, especially strong bases, metallic powders, carbides, hydrogen sulfide, turpentine, and combustible organics.

SECTION 4 Leak/Spill Disposal Information

Isolate or enclose the area of the leak or spill. Clean-up personnel should wear protective clothing and respiratory equipment suitable for toxic or corrosive fluids or vapors.
Small Spills: Flush with water and neutralize with alkaline material (soda ash, lime, etc.). Sewer with excess water.
Larger spills and lot sizes: Neutralize with alkaline material, pick up with absorbent material (sand, earth, vermiculite) and dispose in a RCRA-approved waste facility or sewer the neutralized slurry with excess water if local ordinances allow. Provide forced ventilation to dissipate fumes.

Reportable Quantity (RQ)(CWA/CERCLA) : 1000 lbs.

Ensure compliance with local, state and federal regulations.

AD

NFPA Ratings: Health: [illegible] Flammability: 0 Reactivity: 0 Other: Oxidizer

SECTION 5 Health Hazard Information

A. EXPOSURE / HEALTH EFFECTS

Inhalation:
Corrosive! Inhalation of vapors can cause breathing difficulties and lead to pneumonia and pulmonary edema, which may be fatal. Other symptoms may include coughing, choking, and irritation of the nose, throat, and respiratory tract.

Ingestion:
Corrosive! Swallowing nitric acid can cause immediate pain and burns of the mouth, throat, esophagus and gastrointestinal tract.

Skin Contact:
Corrosive! Can cause redness, pain, and severe skin burns. Concentrated solutions cause deep ulcers and stain skin a yellow or yellow-brown color.

Eye Contact:
Corrosive! Vapors are irritating and may cause damage to the eyes. Splashes may cause severe burns and permanent eye damage.

Chronic Exposure:
Long-term exposure to concentrated vapors may cause erosion of teeth. Long term exposures seldom occur due to the corrosive properties of the acid.

Aggrevation of Pre-existing Conditions:
Persons with pre-existing skin disorders or eye disease may be more susceptible to the effects of this substance.

B. FIRST AID

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

Ingestion:
DO NOT INDUCE VOMITING! Give large quantities of water or milk if available. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Skin Exposure:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Eye Exposure:
Wash eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

C. TOXICITY DATA (RTECS, 1982)

Inhalation (Rat) LC50: 244 ppm
(NO_2)/30M

SECTION 6 Occupational Control Measures

Airborne Exposure Limits:
-OSHA Permissible Exposure Limit (PEL):
2 ppm (TWA)
-ACGIH Threshold Limit Value (TLV):
2 ppm (TWA); 4ppm (STEL)

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators: (NIOSH Approved)
If the TLV is exceeded, wear a supplied air, full-facepiece respirator, airlined hood, or self-contained breathing apparatus. Nitric acid is an oxidizer and should not come in contact with cartridges and cannisters that contain oxidizable materials, such as activated charcoal.

Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls to prevent skin contact.

Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Contact lenses should not be worn when working with this material. Maintain eye wash fountain and quick-drench facilities in work area.

SECTION 7 Storage and Special Information

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect from physical damage and direct sunlight. Isolate from incompatible substances. Protect from moisture.

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Material Safety Data

Emergency Phone Number: 314-982-5000

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SODIUM HYDROXIDE

PRODUCT IDENTIFICATION:

Synonyms: Caustic soda; lye; radium hydroxide solid; radium hydrate

Formula CAS No.: 1310-73-2

Molecular Weight: 40.00

Chemical Formula: NaOH

Hazardous Ingredients: None.

PRECAUTIONARY MEASURES

DANGER! MAY BE FATAL IF SWALLOWED. CAUSES SEVERE BURNS.

Do not get in eyes, on skin, or on clothing.
Avoid breathing dust.
Keep container closed.
Use with adequate ventilation.
Wash thoroughly after handling.
This substance is classified as a POISON under the Federal Caustic Poison Act.

EMERGENCY/FIRST AID

If swallowed, do NOT induce vomiting. Give large quantities of water. Never give anything by mouth to an unconscious person. Call a physician immediately. In case of contact, immediately flush skin or eyes with plenty of water for at least 15 minutes. In all cases call a physician.
SEE SECTION 5.

DOT Hazard Class: Corrosive Material

SECTION 1 Physical Data

Appearance: White, deliquescent pellets.

Odor: Odorless.

Solubility: 111 g/100 g of water.

Boiling Point: 1390°C (2534°F)

Melting Point: 318°C (604°F)

Specific Gravity (water = 1): 2.13

Vapor Density (Air = 1): No information found.

Vapor Pressure (mm Hg): Negligible.

Evaporation Rate: No information found.

SECTION 2 Fire and Explosion Information

Fire:
Not considered to be a fire hazard. Hot or molten material can react violently with water.
Can react with certain metals, such as aluminium, to generate flammable hydrogen gas.

Explosion:
Not considered to be an explosion hazard.

Fire Extinguishing Media:
Use any means suitable for extinguishing surrounding fire.
Adding water to caustic solution generates large amounts of heat.

Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

SECTION 3 Reactivity Data

Stability:
Stable under ordinary conditions of use and storage. Very hygroscopic. Can slowly pick up moisture from air and react with carbon dioxide from air to form sodium carbonate.

Hazardous Decomposition Products:
Sodium oxide.

Hazardous Polymerization:
This substance does not polymerize.

Incompatibilities:
Contact with water, acids, flammable liquids, and organic halogen compounds, especially trichloroethylene, may cause fire or explosion. Contact with nitromethane and other similar nitro compounds causes formation of shock-sensitive salts. Contact with metals such as aluminum, tin, and zinc causes formation of flammable hydrogen gas.

SECTION 4 Leak/Spill Disposal Information

This is a test line. 1000°C. Clean-up personnel require protective clothing and respiratory protection from dust. Sweep, scoop or pick up spilled material. Avoid dusting. Collected waste may be transferred to a closed, preferably metal, container and sent to a RCRA-approved waste disposal facility. Do not flush to the sewer. Caution! Floor and other surfaces may be slippery. Do not contact with water. Neutralize traces with dilute acid.

Ensure compliance with local, state and federal regulations.

NFPA Ratings: Health: 3 Flammability: 0 Reactivity: 1

SECTION 5 Health Hazard Information

A. EXPOSURE / HEALTH EFFECTS

Inhalation:
Severe irritant. Effects from inhalation of dust or mist vary from mild irritation to serious damage of the upper respiratory tract, depending on severity of exposure. Severe pneumonitis may occur.

Ingestion:
Corrosive! Swallowing may cause severe burns of mouth, throat, and stomach. Severe scarring of tissue and death may result.

Skin Contact:
Corrosive! Contact of skin can cause irritation or severe burns and scarring with greater exposures.

Eye Contact:
Corrosive! May cause irritation of eyes, and with greater exposures, severe burns with possibly blindness resulting.

Chronic Exposure:
Prolonged contact with dilute solutions or dust has a destructive effect upon tissue.

Aggrevation of Pre-existing Conditions:
Persons with pre-existing skin disorders or eye problems or impaired respiratory function may be more susceptible to the effects of the substance.

B. FIRST AID

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

Ingestion:
DO NOT INDUCE VOMITING! Give large quantities of water or milk if available. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Skin Exposure:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Call a physician immediately.

Eye Exposure:
Wash eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

C. TOXICITY DATA (RTECS, 1982)

No LD50/LC50 information found relating to normal routes of occupational exposure. Irritation data: Skin, rabbit: 50 mg/24H Severe Eye, rabbit: 50 mg/24H Severe

SECTION 6 Occupational Control Measures

Airborne Exposure Limits:
-OSHA Permissible Exposure Limit (PEL):
2 mg/m^3 (TWA)
-ACGIH Threshold Limit Value (TLV):
2 mg/m^3 (Ceiling)

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators: (NIOSH Approved)
If the TLV is exceeded, a dust/mist respirator with chemical goggles may be worn, in general, up to ten times the TLV. Consult respirator supplier for limitations. Alternatively, a supplied air full facepiece respirator or airlined hood may be worn.

Skin Protection:
Wear impervious protective clothing, Including boots, gloves, lab coat, apron or coveralls to prevent skin contact.

Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Contact lenses should not be worn when working with this material. Maintain eye wash fountain and quick-drench facilities in work area.

SECTION 7 Storage and Special Information

Keep in a tightly closed container. Protect from physical damage. Store in a cool, dry, ventilated area away from sources of heat, moisture and incompatibilities. Always add the caustic to water while stirring; never the reverse.

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Material Safety Data

Emergency Phone Number: 314-982-5000

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SULFURIC ACID *96%*

PRODUCT IDENTIFICATION:

Synonyms: Oil of Vitriol

Formula CAS No.: 7664-93-9

Molecular Weight: 98.07

Chemical Formula: H_2SO_4

Hazardous Ingredients: Not applicable.

PRECAUTIONARY MEASURES

DANGER! CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED. HARMFUL IF INHALED. INHALATION MAY CAUSE LUNG DAMAGE.

Do not get in eyes, on skin, or on clothing.
Do not breathe mist.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.
This substance is classified as a POISON under the Federal Caustic Poison Act.

EMERGENCY/FIRST AID

In all cases call a physician. In case of contact, immediately flush skin or eyes with plenty of water for at least 15 minutes. If swallowed, DO NOT INDUCE VOMITING! Give large quantities of water. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.
SEE SECTION 5.

DOT Hazard Class: Corrosive Material

SECTION 1 Physical Data

Appearance: Colorless, oily liquid.

Odor: Odorless.

Solubility: Infinite @ 20°C.

Boiling Point: ca. 310°C (590°F)

Melting Point: ca. -14°C (6°F).

Specific Gravity: 1.84

Vapor Density (Air = 1): < 0.3 @ 25°C (77°F)

Vapor Pressure (mm Hg): 1 @ 146°C (250°F).

Evaporation Rate: No information found.

SECTION 2 Fire and Explosion Information

Fire:
Not combustible, but substance is a strong oxidizer and its heat of reaction with reducing agents or combustibles may cause ignition. Reacts with most metals releasing flammable, potentially explosive hydrogen gas.

Explosion:
Not combustible, but substance b a strong oxidizer and its heat cl reaction with reducing agents or combustibles may cause ignition.

Fire Extinguishing Media:
Dry chemical, foam or carbon dioxide. Water spray n a y be used lo keep fire exposed containers *mol.*

Special Information:
In the event cla fire, wear lull protective clothing and NIOSH-approved self-contained breathing apparatus with lull facepiece operated in the pressure demand or other positive pressure mode.

SECTION 3 Reactivity Data

Stability:
Strbk under ordinary conditions of use and storage.

Hazardous Decomposition Products:
Toxic fumes of oxides of sulfur. Will react with water or steam to produce toxic and corrosive fumes. Reacts with carbonates to generate carbon dioxide gas, and with cyanides and sulfides to form poisonous hydrogen cyanide and hydrogen sulfide respectively.

Hazardous Polymerization:
Will not occur.

Incompatibilities:
Water, bases, organic material, halogens, metal acetylides, oxides and hydrides, strong oxidizing and reducing agents and many other reactive substances.

SECTION 4 Leak/Spill Disposal Information

Dike and cover leaking or spilled liquid with dirt, vermiculite, kitty-litter or other inert absorbent. Cover spill with sodium bicarbonate or soda ash and mix. Clean-up personnel require protective clothing and respiratory protection from vapors and mists. Neutralized waste may be containerized and disposed in a RCRA approved waste disposal facility. Flush area of spill with dilute soda ash solution and discard to sewer.

Reportable Quantity (RQ)(CWA/CERCLA): 1000 lbs.

Ensure compliance with local, state and federal regulations.

NFPA Ratings: Health: 3 [illegible]nability: 0 Reactivity: 2 Other: Water reactive

SECTION 5 Health Hazard Information

A. EXPOSURE / HEALTH EFFECTS

Inhalation:
Inhalation produces damaging effects on the mucous membranes and upper respiratory tract. May cause lung edema. Symptoms may include irritation of the nose and throat, and labored breathing.

Ingestion:
Corrosive. Swallowing can cause severe burns of the mouth, throat, and stomach, leading to death. Can cause sore throat, vomiting, diarrhea.

Skin Contact:
Corrosive. Symptoms of redness, pain, and severe burn can occur.

Eye Contact:
Corrosive. Splashes can cause blurred vision, redness, pain and severe tissue burns.

Chronic Exposure:
Long-term exposure to mist or vapors may cause damage to teeth.

Aggrevation of Pre-existing Conditions:
Persons with pre-existing skin disorders or eye problems or impaired respiratory function may be more susceptible to the effects of the substance.

B. FIRST AID

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

Ingestion:
If swallowed, DO NOT induce vomiting. Give large quantities of water or milk if available. Call a physician immediately. Never give anything by mouth to an unconscious person.

Skin Exposure:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Call a physician.

Eye Exposure:
Wash eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

C. TOXICITY DATA (RTECS, 1982)

Oral rat LD50: 2140 mg/kg. Inhalation Guinea Pig LC50: 18 mg/m^3.

SECTION 6 Occupational Control Measures

Airborne Exposure Limits:
-OSHA Permissible Exposure Limit (PEL):
1 mg/m^3 (TWA).
-ACGIH Threshold Limit Value (TLV):
1mg/m^3 (TWA).

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators: (NIOSH Approved)
If the TLV is exceeded a full facepiece chemical cartridge respirator may be worn. In general, up to 100 times the TLV or the maximum use concentration specified by the respirator supplier, whichever is less. Alternatively, a supplied air full facepiece respirator or airlined hood may be worn.

Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls to prevent skin contact.

Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Contact lenses should not be worn when working with this material. Maintain eye wash fountain and quick-drench facilities in work area.

SECTION 7 Storage and Special Information

Store in a cool, dry, ventilated storage area with acid resistant floors and good drainage. Protect from physical damage. Keep out of direct sunlight and away from heat, water, and incompatible materials. Do not wash out container and use it for other purposes. When diluting, always add the acid to water; never add water to the acid.

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HAZARD EVALUATION OF CHEMICALS

Chemical Name PCBs Date 3/23/92

DOT Name/U.N. No. UN2315 Job No. UN8000

CAS Number 1336-36-3

References Consulted (circle):

NIOSH/OSHA Pocket Guide Verschueren Merck Index Hazardline Chris (Vol. II)

Toxic and Hazardous Safety Manual ACGIH Other: Chemtox data

Rad Health Handbook RCRA 65 10 CFR 20 Handbook of Chemistry and Physics

Chemical Properties: (Synonyms: Aroclor 1254, 1221, 1232, 1242, 1245, etc.)

Chemical Formula $C_{12}H_5C_{12}$ (Approx) Molecular Weight 326

Physical State Liquid Solubility (H2O) Insoluble Boiling Point 617° to 691°F

Flash Point 431.3°F Vapor Pressure/Density 0.001 mm Freezing Point -2°F

Specific Gravity 1.3 - 1.8 Odor Characteristic Flammable Limits

Incompatabilities Stroag oxidizers

Biological Properties:

TLV-TWA 1.0 $\mu g/m^3$ PEL 0.5 mg/m^3 Odor/Odor Threshold mild hydrocarbon

IDLH 5 mg/m^3 Fumes Aquatic Rat/Mouse

Route of Exposure

Carcinogen X Teratogen Mutagen Suspect

Radiological Properties:

Handling Recommendations: (Personal protective measures)

Impermeable clothing, gloves, face shields. Use neoprene, butyl rubber, saranex.

Monitoring Recommendations:

Disposal/Waste Treatment:

Store contaminated clothing in closed container until discarded or laundered.

Health Hazards and First Aid:

Skin or eye contact - flush with water for at least 15 minutes.

Symptoms: Acute: Irritates eyes and skin; jaundice, dark urine; chloracne; nausea; vomiting.

Chronic: Liver damage.

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SITE SAFETY PLAN

Version 988

A. GENERAL INFORMATION

Project Title: Site 18 - PCB Spill at Substation A Site

Project No.: UH1302

TDD/Pan No.:

Project Manager: John Barksdale

Project Dir.: Rick Rudy

Location(s): Northeast side of Substation A, which is near the corner of Mustin Street and Cantor Avenue.

Prepared by: Jon Schmidt

Date Prepared: 6-2-89

Approval by: Mary Miller

Date Approved: 6-10-89

Site Safety Officer Review:

Date Reviewed:

Scope/Objective of Work: Field Screening will include physical surveys, soil sampling, temporary well installation, groundwater sampling, and hydrologic assessment.

Proposed Date of Field Activities: July 1992 to June 1993

Background Info: Complete: [X] Preliminary (No analytical data available) [ ]

Documentation/Summary:

Overall Chemical Hazard:	Serious [ ] LOW [X]	Moderate [ ] Unknown [ ]
Overall Physical Hazard	Serious [ ] LOW [ ]	Moderate [X] Unknown [ ]
Radioactive Hazard	Serious [ ] LOW [ ]	Moderate [ ] Unknown [X]

B. SITE/WASTE CHARACTERISTICS

Waste Type(s):

Liquid [X]	Solid [ ]	Sludge [ ]	Gas/Vapor [ ]

Characteristic(s):

Flammable/ Ignitable [X]	Volatile [ ]	Corrosive [ ]	Acutely Toxic [ ]
Explosive [ ]	Reactive [ ]	Carcinogen [X]	Radioactive* [ ]

Other: Transformer oil

Physical Hazards:

Overhead [X]	Confined* Space [ ]	Below Grade [X]	Trip/Fall [X]
Puncture [ ]	Burn [ ]	Cut [ ]	Splash [ ]
Noise [X]	Other: Vehicular traffic in site area, excavation equipment. Heat/cold stress.		

*Requires completion of additional form and special approval from the Corporate Health/Safety group. Contact RSC or HQ.

[NASP]UH1101:T0312:2

Site History/Description and Unusual Features (see Sampling Plan tor detailed description): In 1966 a transformer at Substation A reportedly failed, spilling approximately 50 gallons of transformer oil onto tho unpaved area along tho northeast side of tho substation platform. A sample of oily residue within tho unpaved area in 1983 revealed PCB concentrations ot 4 ppm. The unpaved area is approximately 20 by 40 foot.

Locations of Chemicals/Wastes: Northeast side of Substation A.

Estimated Volume of Chemicals/Wastes: Approximately 50 gallons.

Site Currently in Operation Yes: [X] No: [ ]

C. HAZARD EVALUATION

List Hazards by Task (i.e., drum sampling, drilling, etc.) and number them. (Task numbers are cross-referenced in Section D)

Physical Hazard Evaluation:

1) Physical Surveys - Automobile hazards

2) Temporary Monitoring Well Installation - Using portable drill rig

3) Soil Sampling - Using portable drill rig

4) Decontamination Procedures - Using solvents

5) Hydrologic Assessment - Splash, personal contamination, automobiles

Chemical Hazard Evaluation:

Compound	PEL/TWA	Route of Exposure	Acute Symptoms	Odor Threshold	Odor Description
Isopropyl Alcohol	440 ppm	Inh,Ing,Derm,Eye	Drowsiness,head.	7.5-200 ppm	Rubbing alcohol
Nitric Acid	2 ppm	Inh,Ing,Derm,Eye	Corrosive	0.3-1 ppm	Acrid
Sulfuric Acid	1 mg/m^3	Ing, Derm, Inh	Corrosive	N/A	Odorless
Hydrochloric Acid	5 ppm	Inh, Ing, Derm	Corrosive	Unknown	Acrid
Sodium Hydroxide	2 mg/m^3	Inh, Ing, Con	Corrosive	N/A	Odorless
PCB	0.5 mg/m^3	Inh, Ing	Nausea,Vomit.,Dia		Hydrocarbon odor

Note: Complete and attach a Hazard Evaluation Sheet Lor each major known contaminant.

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[HASP]UH1101:T0312:2

D. SITE SAFETY WORK PLAN

Site Control: Attach up, use back of this page, or sketch of site shoving hot sono, contamination reduction, zone, etc.

Perimeter identified? [yes] Site secured? I no 1

Work Areas Designated? [yes] Zone(s) of Contamination Identified? [no]

Personnel Protection (TLD badges required for a11 field personnel):

Anticipated Level of Protection (Cross-reference task numbers to Section C):

	A	B	C	D
Task 1				X
Task 2				X
Task 3				X
Task 4				X
Task 5				X

(Expand if necessary)

Modifications: Modified level D vith tyvmck, neoprene gloves and boots, safety glasses, APR available when level C upgrade is necessary based on OVA readings.

Action Levels for Evacuation of Work Zone Pending Reassessment of Conditions: See Allowable Radiation Dose Attachment

- o Level D: O_2 <19.5% or >25%, explosive atmosphere >10% LEL, orqanic vapors above background levels, particulates >_____ mg/m^3, othor _____
- o Level C: O_2 <19.5% or >25%, explosive atmosphere >25% LEL_3(California-20%), unknown organic vapor (in breathing sono) >1 ppm, particulates >_____ mg/m^3, othor _____
- o Level B: O_2 <19.5% or >25%, explosive atmosphere >25% LEL_3(California-20%), unknown orqanic vapors (in breathing zone) >5 ppm, particulates >_____ mg/m^3, othor _____
- o Level A: O_2 <19.5% or >25%, explosive atmosphere >25% LEL (California-20%), unknown organic vapors >500 ppm, particulates >_____ mg/m^3, other _____

Air Monitoring (daily calibration unless otherwise noted):

Contaninant of Interest	Type of Sample (area, personal)	Monitoring Equipment	Frequency of Sampling
VOCs	Area	OVA/HNu	Continuous
Explosive Gases	Area	02/Explosimeter	Continuous
Radiation--Exposure	Area	Micro-R-Meter	Continuous

Decontamination Solutions and Procedures for Equipment, Sampling Gear, etc.:

Trisodium phosphate wash, tap water rinse, deionized water rinse, isopropanol rinse (twice), final organic-free water rinse, and allow to air dry as long as possible. Note: Every effort will bo made not to generate mixed waste.

Personnel Decon Protocol: boot and glove wash - trisodium phosphate wash with clean water rinse. Expendables will bo double bagged and drummed tor disposal. Field personnel will take a hygienic shower, off-site, following each day's field work.

Decon Solution Monitoring Procedures, it Applicable: Decontamination will be performed in a well-ventilated area upwind of tho sampling zone.

Special Site Equipment, Facilities, or Procedures (Sanitary Facilities and Lighting Must Meet 29 CFR 1910.120):

All drilling safety procedures will be strictly adhered to as outlined in Attachment A.

Site Entry Procedures and Special Considerations: E & E's "Buddy System" will k employed at a11 times during fieldwork activities. Personnel will exercise caution in tho vicinity of the site and along nearby roadways.

Work Limitations (time of day, weather conditions, etc.) and Heat/Cold Stress Requirements:

All fieldwork activities will k performed during daylight hours. Team members will take breaks as necessary to avoid heat stress and replace fluids. Cooling vests *may* bo used to prevent boat stress.

General Spill Control, it applicable: N/A

Investigation-Derived Material Disposal (i.e., expendables, decon waste, cuttings):

All fieldwork waste materials will be double bagged, drummed, labeled and transported to a designated location for final disposal by tho Navy.

Sample Handling Procedures Including Protective Wear:

During all handling of samples, all field team members will wear surgical gloves. Goggles will bo worn during sample preservation with acids.

Team Member*	Responsibility
Team members to bo determined	Team Leader
	Site Safety Officer/Samplor
	Geologist/Sampler
	Sampler

*All entries into exclusion zone require Buddy System use. All I & E field staff participate in medical monitoring program and have completed applicable training per 29 CFR 1910.120. Respiratory protection program meets requirements of 29 CFR 1910.134, and ANSI Z88.2 (1980).

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[HASP]UN1101:T0312:2

E. EMERGENCY INFORMATION

(Use supplemental sheets, if necessary)

LOCAL RESOURCES

(Obtain a local telephone book from your hotel, it possible.)

Ambulance On Base: 904-452-4138; Off Base: 911

Hospital Emergency Room NAS Dispensary - Building 3600: 904-452-2733; Baptist Hospital: 904-434-4811 (Life Flight)*

Poison Control Center

Police (include local, county sheriff, state) 911

Fire Department 911

Airport

U.S. Coast Guard Emergency: 904-453-8178: General Information: 904-453-8282

Laboratory E & E ASC: 1-716-631-0360

Fed. Express 1-800-238-5355

Client Contact U.S. Navy Southern Division, Enpinoor-In-Chargo, Suzanne D. Sanborn: 1-803-743-0574

Site Contact NAS Pensacola Enviromental Coordinator, Ron Joyner: 904-452-4515

'Baptist Hospital is prepared to handle radioactively contaminated personnel.

SITE RESOURCES

Site Emergency Evacuation Alarm Method N/A

Water Supply Source On site

Telephone Location, Number To bo dotorminod on site

Cellular Phone, if available To bo dotorminod on site

Radio

Other On-sit. warehouse number to bo dotorminod

EMERGENCY CONTACTS

1. Dr. Raymond Harbison (Univ. of Florida) ..... (501) 221-0465 or (904) 462-3277, 3281
   Alachua, Florida (501) 370-8263 (24 hours)

2. Ecology and Environment, Inc., Safety Director
   Paul Jonmaire .....(716) 684-8060 (office)
   (716) 655-1260 (home)

3. Regional Safety Coordinator, Sybil Newchurch ..... (904) 877-1978 (office)
   (904) 878-2336 (homo)

4. Regional Office Manager, Rick Rudy ..... (904) 877-1978 (office)
   (904) 893-7245 (homo)

[NASP]UH1101:T0312:2

1. Twenty-four hour answering service: (501) 370-8263

What to report:

- State: "this is an emergency."
- Your name, region, and site.
- Telephone number to roach you.
- Your location.
- Name of person injured or exposed.
- Nature of emergency.
- Action taken.

2. A toxicologist, (Drs. Raymond Harbison or associate) will contact you. Repeat the information given to the answering service.

3. If a toxicologist does not return your call within 15 minutes, call tho following persons in order until contact is made:

a. 24 hour hotline - (716) 684-8940
b. Corporate Safety Director - Paul Jenmaire - home # (716) 655-1260
c. Assistant Corp. Safety Officer - Steven Sherman - home # (716) 688-0084

EMERGENCY ROUTES

(NOTE: Field Team must Know Route(s) Prior to Start of Work)

Directions to hospital (include map) from Site 18

NAS Dispensary - Follow Mustin Street west to Turner Street. Follow Turner Street west. The NAS Dispensary is located on Turner Street in Building 3600.

Baptist Hospital - Take Duncan Road (Navy Blvd.) north to exit tho base. Navy Blvd. becomes HWY 98 and curves to tho east. Follow Navy Blvd./Hwy. 98 east approx. 3mi to Pace Blvd. Turn loft (north) on Pace Blvd. and proceed approx. 1mi to Cervantes St. (Hwy. 90). Turn right on Cervantes/Hwy. 90 and follow thio road for about 0 blocks and turn left (north) onto E street. The hospital is about 6 blocks north on the left.

Emergency Egress Routes to Get Off-Site Emergency egress routes will bo located if emergency exit routes become blocked by construction, etc.

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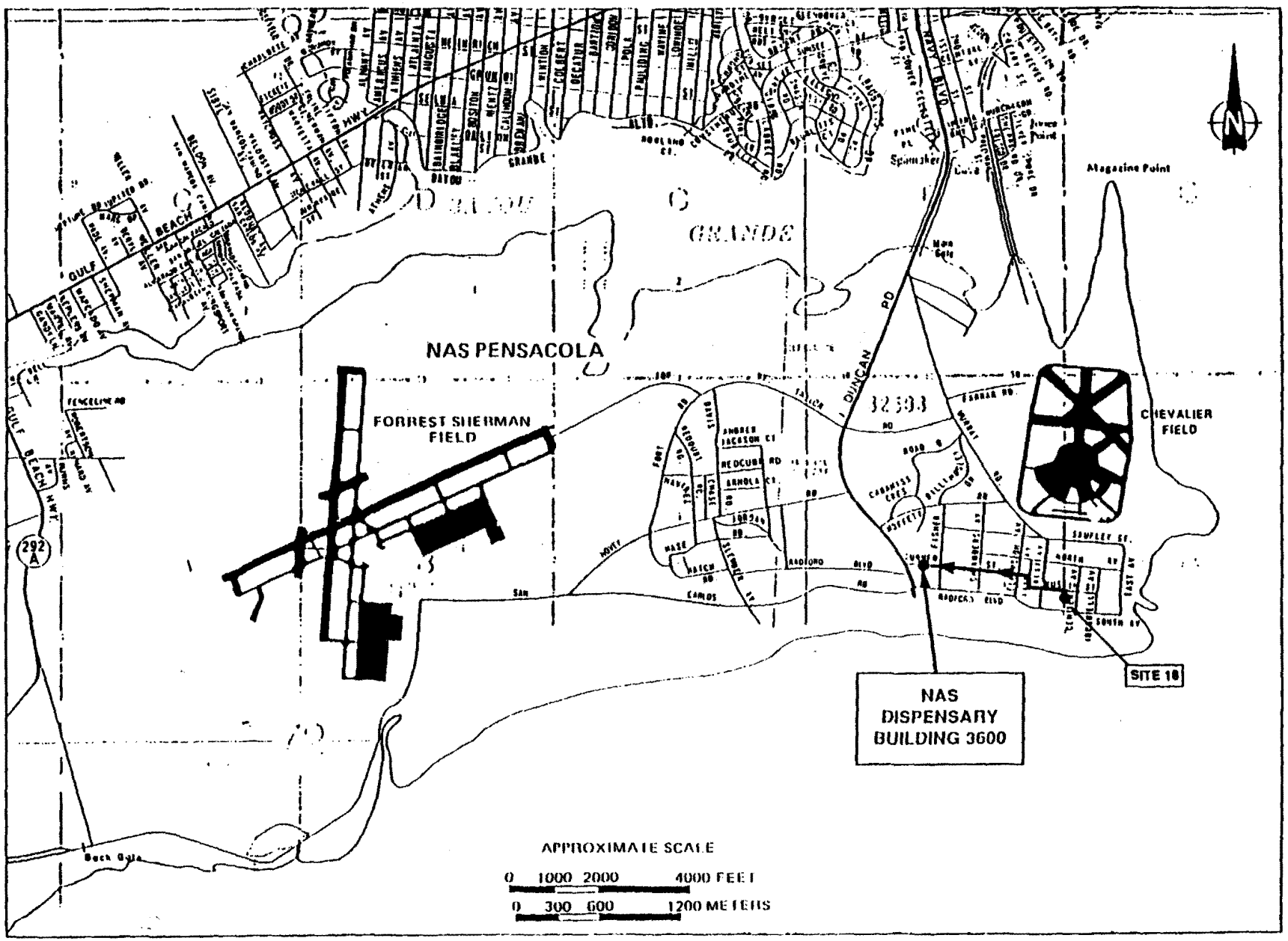

Figure D-3 LOCATION OF NAS DISPENSARY

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SITE SAFETY PLAN

Version V88

A. GENERAL INFORMATION

Project Title: Site 28 - Transformer Accident.

Project lo.: UH1302

TDD/Pan No.:

Project Manager: John Barksdale

Project Dir.: Rick Rudy

Location(s): Southern side of Radford Boulevard near Building 632.

Prepared by: Jon Schmidt

Dato Prepared: 6-2-89

Approval by: Mary Miller

Date Approved: 6-10-89

Site Safety Officer Review:

Dato Reviewed:

Scope/Objective of Work: Field Screening will include physical surveys, soil sampling, sediment sampling, temporary well installation, groundvator sampling, and hydrologic assessment.

Proposed Dato of Field Activities: July 1992 to June 1993

background Info: Complete: [X] Preliminary (No analytical data available) [ ]

Documentation/Summary:

Overall Chemical Hazard:	Serious [ ] Low [X]	Moderate [ ] Unknown [ ]
Overall Physical Hazard	Serious [ ] Low [ ]	Moderate [X] Unknown [ ]
Radioactive Hazard	Serious [ ] Low [ ]	Moderate [ ] Unknown [X]

B. SITE/WASTE CHARACTERISTICS

Waste Type(s):

Liquid [X]	Solid [ ]	Sludge [ ]	Gas/Vapor [ ]

Characteristic(s):

Flammable/ Ignitable [X]	Volatile [ ]	Corrosive [ ]	Acutely Toxic [ ]
Explosive [ ]	Reactive [ ]	Carcinogen [X]	Radioactive* [ ]

Other: Transformer oil

Physical Hazards:

Overhead [X]	Confined* Space [ ]	Below Grade [X]	Trip/Fa11 [X]
Puncture [ ]	Burn [ ]	Cut [ ]	Splash [ ]
Noise [X]	Other: Vehicular traffic in site area, excavation equipment. Heat/cold stress.		

*Requires completion of additional form and special approval from tho Corporate Health/Safety group. Contact RSC or HQ.

[NASP]UH1101:T0312:3

Site History/Description and Unusual Features (see Sampling Plan for detailed description): In 1969. a transformer reportedly fell off of a truck onto Radford Boulevard near Building 632. Transformer oil spilled onto the asphalt, but it is not known if the oil contained PCBs. The road bas since boon repaved. No sample were taken of tho spilled oil, and it is not known if cleanup occured or tho oil was washed into storm drain

Locations of Chemicals/Wastes: Along Radford Boulevard near Building 632.

Estimated Volume of Chemicals/Wastes: Approximately 50 gallons.

Site Currently in Operation Yes: [X] No: [ ]

C. HAZARD EVALUATION

List Hazards by Task (i.e., drum sampling, drilling, etc.) and number them. (Task numbers are cross-referenced in Section D)

Physical Hazard Evaluation:

1) Physical Surveys - Automobile hazards

2) Temporary Monitoring Well Installation - Using portable drill rig

3) Soil Sampling - Using portable drill rig

4) Decontamination Procedures - Using solvents

5) Hydrologic Assessment - Splash, personal contamination, automobiles.

Chemical Hazard Evaluation:

Compound	PEL/TWA	Route of Exposure	Acute Symptoms	Odor Threshold	Odor Description
Isopropyl Alcohol	440 ppm	Inh,Ing,Derm,Eye	Drowsiness,head.	7.5-200 ppm	Rubbing alcohol
Nitric Acid	2 ppm	Inh,Ing,Derm,Eye	corrosive	0.3-1 ppm	Acrid
Sulfuric Acid	1 mg/m^3	Ing, Derm, Inh	Corrosive	N/A	Odorless
Hydrochloric Acid	5 ppm	Inh, Ing, Derm	Corrosive	Unknown	Acrid
Sodium Hydroxide	2 mg/m^3	Inh, Ing, Con	Corrosive	N/A	Odorless
PCB	0.5 mg/m^3	Inh, Ing	Nausea,Vomit.,Dia		Hydrocarbon odor

Note: Complete and attach a Hazard Evaluation Shoot tor each major known contaminant.

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[NASP]UH1101:T0312:3

D. SITE SAFETY WORK PLAN

Site Control: Attach up, use back of this page, or sketch of site showing hot zone, contamination reduction, zone, etc.

Perimeter identified? [yes] Site secured? [no]

Work Areas **Designated?** [yes] Zone(s) of Contamination Identified? [no]

Personnel Protection (TLD badges required for all field personnel):

Anticipated Level of Protection (Cross-reference task numbers to Section C):

	A	B	C	D
Task 1				X
Task 2				X
Task 3				X
Task 4				X
Task 5				X

Modifications: Modified level D with tyvock, neoprene gloves and boots, safety glasses, APR available **when** level C upgrade is necessary based on OVA readings.

Action Levels for Evacuation of Work Zona Pending Reassessment of Conditions: **See** Allowable Radiation Dose Attachment

- o Lovol D: O_2 <19.5% or >25%. explosive atmosphere >10% LEL, organic vapors above background levels, particulates >____ **mg/m3**, other _____
- o Lovol C: O_2 <19.5% or >25%, explosive atmosphere >25% **LEL** (California-20%), unknown organic vapor (in breathing zone) >1 ppm, particulates >____ **mg/m3**, other _____
- o Lovol B: O_2 <19.5% or >25%, explosive atmosphere >25% LEL (California-20%), unknown organic vapors (in breathing zone) >5 ppm, particulates >____ mg/m3, other _____
- o Lovol A: O_2 <19.5% or >25%, oxploaivo atmosphere >25% LEL **(California-20%)**, unknown organic vapors >500 ppm, particulates >____ **mg/m3**, other _____

Air Monitoring (daily calibration unless otherwise noted):

Contaminant of Interest	**Type** of **Sample** (area, personal)	Monitoring Equipment	Frequency of sampling
VOCs	**Area**	**OVA/HNu**	Continuous
Explosive Gases	Area	02/Explosimeter	Continuous
Radiation — Cxposuro	Area	Micro-R-Meter	Continuous

(Expand if necessary)

Dmcontamination Solutions and Procedures tor Equipment, Sampling Gear, etc.:

Trisodium phosphate wash, tap water rinao, deionized water rinao, isopropanol rinao (twice), final organic-free water rinse, and **allow** to air dry as long as possible. Note: Every effort will bo made not to generate mixed waste.

Personnel Decon Protocol: Boot and glove wash - trisodium phosphate wash with clean water rinse. Expendables will bo double bagged and drummed for disposal. Field personnel will take a hygienic shower, off-sit., following each day's field work.

Decon Solution Monitoring Procedures, if Applicable: Decontamination will be performed in a well-ventilated area upwind of tho sampling zone.

Special Site Equipment, Facilities, or Procedures (Sanitary Facilities and Lighting Must Meet 29 CFR 1910.120):

All drilling safety procedures will bo strictly adhered to as outlined in Attachment A.

Site Entry Procedures and Special Considerations: E & E's "Buddy System" will bo employed at all tins during fieldwork activities. Personnel will exercise caution in the vicinity of the site and along nearby roadways.

Work Limitations (time of day, weather conditions, etc.) and Heat/Cold Stress Requirements:

All fieldwork activities will be performed during daylight hours. Team members will take breaks as necessary to avoid heat stress and replace fluids. Cooling vests may bo used to prevent heat stress.

General Spill Control, if applicable: N/A

Investigation-Derived Material Disposal (i.e., expendables, decon waste, cuttings):

All fieldwork waste materials will be double bagged, drummed, labeled and transported to a designated location for final disposal by tho Navy.

Sample Handling Procedures Including Protective Wear:

During a11 handling of samples, a11 field team members will wear surgical gloves. Goggles will bo worn during sample preservation with acids.

TOM Member*	Responsibility
Team members to be determined	Team Leader
	Sit. Safety Officer/Sampler
	Geologist/Sampler
	Sampler

*All entries into exclusion zone require Buddy System use. All E & E field staff participate in medical monitoring program and have completed applicable training per 29 CFR 1910.120. Respiratory protection program meets requirements of 29 CFR 1916.134, and ANSI Z88.2 (1980).

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[HASP]UH1101:T0312:3

E. EMERGENCY INFORMATION

(Use supplemental sheets, if necessary)

LOCAL RESOURCES

(obtain a local telephone book from your hotel, if possible.)

Ambulance On Base: 904-452-4138: Off Base: 911

Hospital Emergency Room MAS Dispensary - Building 3600: 904-412-2733: Baptist Hospital: 904-434-4811 (Life Flight)*

Poison Control Center

Police (include local, county sheriff, state) 911

Fire Department 911

Airport

U.S. Coast Guard Emergency: 904-453-8178: General Information: 904-453-8282

Laboratory E & E ASC: 1-716-631-0360

Fed. Express 1-800-238-5355

Client Contact U.S. Navy Southern Division, Engineer-In-Charge, Suzanne D. Sanborn: 1-803-743-OS74

Site Contact NAS Pensacola Enviromental Coordinator, Ron Joyner: 904-452-4515

*Baptist Hospital is prepared to handle radioactively contaminated personnel.

SITE RESOURCES

Site Emergency Evacuation Alarm Method N/A

Water Supply Source On site

Telephone Location, Number To bo dotorminod on site

Cellular Phone, if available To bo dotorminod on site.

Radio

Other On-sit. warehouse number to bo determined

EMERGENCY CONTACTS

1. Dr. Raymond Harbison (Univ. ot Florida) ..... (501) 221-0465 or (904) 462-3277, 3281
   Alachua, Florida (501) 370-8263 (24 hours)

2. Ecology and Environment, Inc., Safety Director
   Paul Jonmaire ..... (716) 684-8060 (office)
   (716) 655-1260 (homo)

3. Regional Safety Coordinator. Sybil Nowchurch ..... (904) 877-1978 (office)
   (904) 878-2336 (homo)

4. Regional Office Manager, Rick Rudy ..... (904) 877-1971 (office)
   (904) 893-7245 (home)

[NASP]UH1101:T0312:3

1. Twenty-four hour answering service: (Sol) 370-8263

What to report:

- State: "this is an emergency."
- 'lour name, region, and site.
- Telephone number to roach you.
- Your location.
- Name ot person injured or exposed.
- Nature of emergency.
- Action taken.

2. A toxicologist, (Drs. Raymond Harbison or associate) will contact you. Repeat tho information given to tho answering service.

3. It a toxicologist does not return your call within 15 minutes, call tho following persons in order until contact is made:

a. 24 hour hotline - (716) 684-8940
b. Corporate Safety Director - Paul Jonmaire - home # (716) 655-1210
c. Assistant Corp. Safety Officer - Steven Sherman - how # (716) 688-0084

EMERGENCY ROUTES

(NOTE: Field Team must Know Route(s) Prior to Start of Work)

Directions to hospital (include map) from Site 28

NAS Dispensary - Follow Radford Boulevard east to Fisher Stroot. Turn left onto Fisher Street and continuo one block to Turner Stroot. Turn loft onto Turner Stroot: tho NAS Dispensary is located on Turner Stroot in Building 3600.

Baptist Hospital - Take Duncan Road (Navy Blvd.) north to exit tho base. Navy Blvd. becomes HWY 98 and curves to tho east. Follow Navy Blvd./Hwy. 90 east approx. 3mi to Pace Blvd. Turn left (north) on Pace Blvd. and proceed approx. 1mi to Cervantes St. (lug. 90). Turn right on Cervantes/Hwy. 90 and follow this road for about 8 blocks and turn left (north) onto E street. The hospital is about 6 blocks north on tho loft.

Emergency Egress Routes to Get Off-Site Emergency egress routes will bo located it emergency exit routes become blocked by construction, etc.

170105

[NASP]UH1101:T0312:3

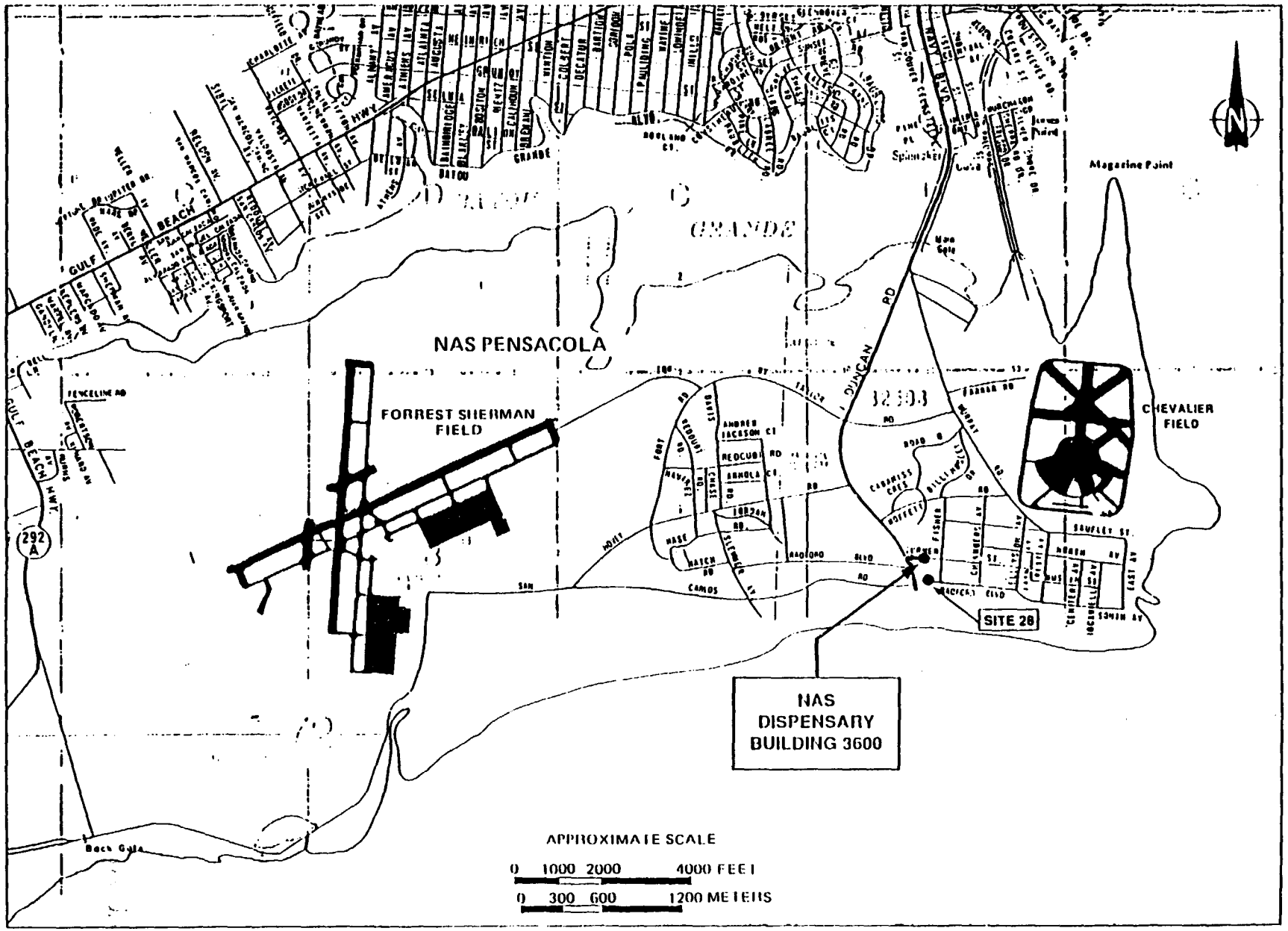

Figure D-4 LOCATION OF NAS DISPENSARY

APPENDIX E

SITE-SPECIFIC QUALITY ASSURANCE PROJECT PLANS

[Bold items enclosed in brackets denote changes to last version of document]

Section 1.0 — Title Page

Work Plan Group: I
Site No. : 17
Site Name: Transformer Storage Yard Site

Prepared by: Jon A. Schmidt
Ecology and Environment, Inc.
1203 Governor's Square Boulevard, Suite 401
Tallahassee, Florida 32301

Prepared for: Department of the Navy
Southern Division
Naval Facilities Engineering Command
2155 Eagle Drive, P.O. Box 10068
Charleston, South Carolina 29411-0068
Contract Number N62467-88-C-0200

Signature Approvals:

E & E Project Manager: _____
J. Barksdale

E 6 E Regional QA/QC Coordinator: _____
K. Walker

E & E ASC Director: _____
A. Clifton

E & E QA/QC Project Officer: _____
M. Meredith

Section 2.0 Table of Contents

		Page	Date
Section 1.0	Title Page	1	5-19-92
Section 2.0	Table of Contents	2	5-19-92
Section 3.0	Project *Summary*	3	5-19-92
Section 4.0	Project Organization and Responsibility	5	4-24-89
Section 5.0	QA/QC Objectives for Measurement Data	5	5-19-92
Section 6.0	Pieldvork and Sampling Procedures	8	4-24-89
Section 7.0	Sample Custody	8	4-24-89
Section 8.0	Calibration Procedures and Frequency	8	4-24-89
Section 9.0	Analytical Procedures	8	4-24-89
Section 10.0	Data Reduction, Validation, and Reporting	9	4-24-89
Section 11.0	Internal Quality Control Checks	9	4-24-89
Section 12.0	Performance and Systems Audits	9	4-24-89
Section 13.0	Preventive Maintenance	10	4-24-89
Section 14.0	Procedures Used to Assess Accuracy, Precision, and Completeness of Data	10	4-24-89
Section 15.0	Corrective Action	10	4-24-89
Section 16.0	Quality Assurance Reports to Management	10	4-24-89
Appendix A	Additional Personnel Biographies	11	4-24-89

170108

Section 3.0 -- Project *Summary*

Vork Plan Group: I

Site No.: 17

Site Name: Transformer Storage Yard Site

Site Description: A complete site description and history are presented in Sections 2.0 and 3.0 of the attached work plan.

Phase I -- Field Screening
Physical Survey (check all that apply):

- X Overall Physical Reconnaissance
- X HNu/OVA Surface Emission Survey
- ___ Radiation Survey
- X Habitat/Biota Survey
- ___ Asbestos Survey (in Rubble)
- X Hydrologic Assessment

Geophysical Survey (check all that apply):

- ___ Electromagnetic Conductivity:
  - ___ EM-31 ___ EM-34
- ___ Magnetometry
- ___ Very Low Frequency
- ___ Ground Penetrating Radar
- ___ Seismic Refraction
- ___ Seismic Reflection

Analytical Screening (check all that apply):

- ___ Field Analyses:
- ___ Soil Headspace Analyses: Planned Number of Samples ___
- ___ Soil Gas Analyses : Planned Number of Samples ___
- X Laboratory Analyses:

PLANNED NUMBER OF SAMPLES		CATEGORIES OF ANALYSES
Surface Water	___	X Volatile Organic Compounds
Sediment	1	X Polynuclear Aromatic Hydrocarbons
Soil	75	X Phenols
Groundwater	5	___ Organophosphorus Pesticides
Duplicates	6	___ Chlorinated Herbicides
Trip Blanks	___	___ Carbamates
Field Blanks	___	X Pesticides/Polychlorinated Biphenyls
Rinsate Blanks	___	X Total Recoverable Petroleum Hydrocarbons
Other		X Metals
		___ Gross Alpha

Section 3.0 — Project Summary (Continued)

Phase II -- Characterization

PLANNED NUMBER OF SAMPLES

Surface Water	___	Air	___	Duplicates	5
Sediment	1	Biota:		Trip Blanks	4
Soil	25	Flora	___	Field Blanks	1
Groundwater	3	Fauna	___	Rinsate Blanks	4

CATEGORIES OF ANALYSES

- X Purgeable Aromatics
- X Purgeable Halocarbons
- X Base/Neutral Extractables
- X Acid Extractables
- ___ Polynuclear Aromatic Eydrocarbons
- X Pesticides
- X Polychlorinated Biphenyls
- X Total Recoverable Petroleum Eydrocarbons
- X Metals
- X Cyanide

Additional analytical categories are identified below:

- X Gross Alpha
- X Gross Beta
- X Gamma Scan
- X Total Organic Carbon
- X Hardness (water only)
- X Alkalinity
- X Total Suspended Solids (water only)
- X Total Kjeldahl Nitrogen
- X Ammonia Nitrogen
- X Orthophosphate Phosphorus
- X Dissolved Oxygen (in field)
- X 5-day Biological Oxygen Demand
- X Chemical Oxygen Demand
- X pH
- X Percent Moisture
- X Grain Size
- X BTU Content
- X Ash Content
- X Total Organic Halogens
- X Sulfur
- X Ignitability
- X Cation Exchange Capacity

170109

Section 4.0 -- Project Organization and Responsibility

The overall organizational structure for this site is discussed in Section 4.0 of the GQAPP. Site-specific designated personnel and their responsibilities are listed below:

Site Manager:
Team/Task Leader(s): To Be Determined
Field Support Personnel:

Biographies for those personnel listed above which are not included in the GQAPP are included in Appendix A of this document.

Section 5.0 -- QA/QC Objectives for Measurement Data

Criteria for reporting the accuracy, precision, and completeness of data are presented in Section 5.0 of the GQAPP. Detection limits for screening and quantitative analyses are presented in Section 9.0 of the GQAPP. Procedures used to assess data accuracy, precision; and completeness are presented in Section 14.0 of the GQAPP. All analytes (including field parameters), sample media, and method numbers relevant to the investigation of this site are listed in the following table, which also identifies any modifications to the accuracy (A), precision (P), completeness (C), and detection limit (DL) criteria specified in the above-referenced GQAPP sections.

Analyte	Media	Method No.	A	P	C	DL
Laboratory Screening Analyses*						
Volatile Organic Compounds	S/W	--	N/M	N/M	N/M	N/M
Polynuclear Aromatic Bydrocarbons	S/W	--	N/M	N/M	N/M	N/M
Pesticides	S/W	--	N/M	N/H	N/M	N/M
Polychlorinated Biphenyls	S/W	--	N/M	N/M	N/M	N/M
Total Recoverable Petroleum Hydrocarbons	S/W	EPA 418.1	N/M	N/H	N/M	TBD
Phenols	S/W	--	N/M	N/H	N/M	N/M
Arsenic	S/W	--	N/M	N/M	N/M	N/M
Cadmium	S/W	--	N/M	N/M	N/M	N/M
Chromium	S/W	--	N/M	N/M	N/M	N/M
Copper	S/W	--	N/M	N/M	N/M	N/M
Lead	S/W	--	N/M	N/M	N/M	N/M
Nickel	S/W	--	N/M	N/M	N/M	N/M
Silver	S/W	--	N/M	N/H	N/M	N/M
Zinc	S/W	--	N/M	N/M	N/M	N/M
Laboratory Analyses						
Gross Alpha	W	EPA 900.0	N/M	N/M	N/M	N/M
Gross Beta	W	EPA 900.0	TBD.	TBD	TBD	TBD
Gamma Scan	V	EPA 901.1	TBD	TBD	TBD	TBD
TCL Purgeables + xylene	S/W	EPA 8240/624	N/M	N/M	N/M	N/M
TCL BNAs	S/W	EPA 8270/625	N/M	N/M	N/M	N/M
TCL Pesticides 6 PCBs	S/W	EPA 8080/608	N/M	N/M	N/M	N/M
Total Recoverable Petroleum Eydrocarbons	S/W	EPA 418.1	N/M	N/M	N/M	N/M
TAL Metals:						
Aluminum	S/W	EPA 6010	N/M	N/M	N/M	N/M
Antimony	S/W	EPA 6010	N/M	N/M	N/M	N/M
Arsenic	S/W	EPA 7060	N/H	N/M	N/M	N/M
Barium	S/W	EPA 6010	N/M	N/M	N/M	N/M
Beryllium	S/W	EPA 6010	N/M	N/M	N/M	N/M
Boron	S/W	EPA 6010	N/M	N/M	N/M	N/M
Cadmium	S/W	EPA 6010	N/M	N/M	N/M	N/M
Calcium	S/W	EPA 6010	N/H	N/M	N/M	N/M
Chromium	S/W	EPA 6010	N/M	N/M	N/M	N/M
Cobalt	S/W	EPA 6010	N/M	N/M	N/M	N/M
Copper	S/W	EPA 6010	N/M	N/M	N/M	N/M
Iron	S/W	EPA 6010	N/M	N/H	N/M	N/M
Lead	S/W	EPA 7421	N/M	N/M	N/M	N/M
Magnesium	S/W	EPA 6010	N/M	N/M	N/M	N/M
Manganese	S/W	EPA 6010	N/H	N/M	N/M	N/M

170110

Analyte	Media	Method No.	A	P	C	DL
Mercury	S/W	EPA 747117470	N/M	N/M	N/M	N/M
Nickel	S/W	EPA 6010	N/M	N/M	N/M	N/M
Selenium	S/W	€PA 7740	N/M	N/M	N/M	N/M
Silver	S/W	EPA 6010	N/M	N/M	N/M	N/M
Sodium	S/W	EPA 6010	N/M	N/M	N/M	N/M
Thallium	S/W	EPA 7841	N/M	N/M	N/M	N/M
Vanadium	S/W	EPA 6010	N/M	N/M	N/M	N/M
Zinc	S/W	EPA 6010	N/M	N/M	N/M	N/M
Cyanide	S/W	EPA 9010/335.2	N/M	N/M	N/M	N/M
TOC	S/W	EPA 415.1	N/M	N/M	N/M	N/M
Hardness	W	EPA 130.2	N/M	N/M	N/M	N/M
Alkalinity	W	EPA 310.1	N/M	N/M	N/M	N/M
Total Suspended Solids	W	EPA 160.2	N/M	N/M	N/M	N/M
Total Kjeldahl Nitrogen	S/W	EPA 351.3	N/M	N/M	N/M	N/M
Nitrogen-Ammonia	S/W	EPA 350.3	N/M	N/M	N/M	N/M
Orthophosphate Phosphorus	S/W	EPA 365.2	N/M	N/M	N/M	N/M
5-day Biological Oxygen Demand	W	SM 5210	N/M	N/M	N/M	N/M
Chemical Oxygen Demand	W	EPA 410.4	N/M	N/M	N/M	N/M
pH	W	EPA 150.1	N/M	N/M	N/M	N/M
Percent Moisture	S	ASTM D-2216-80	N/M	N/M	N/M	N/M
Grain Size	S	ASTM D-422-63	N/M	N/M	N/M	N/M
BTU Content	S	ASTM D-2015-77	N/M	N/M	N/M	N/M
Ash Content	S	ASTM D-482	N/M	N/M	N/M	N/M
Total Organic Halogens	S	SW 9020	TBD	TBD	TBD	TBD
Sulfur	S	ASTM D-129-64	N/M	N/M	N/M	N/M
Ignitability	S/W	EPA 1010	N/M	N/M	N/M	N/H
Cation Exchange Capacity	S	EPA 9081	75-125	35	95%	100 mg/kg
Field Parameters						
pH	W	150.1	N/M	N/M	N/M	N/M
Specific Conductance	W	120.1	N/M	N/M	N/M	N/M
Temperature	W	170.1	N/M	N/M	N/M	N/M
Dissolved Oxygen	W	EPA 360.1	N/M	N/M	N/M	N/M

Notes: S = Soil and/or sediment
W = Groundwater
N/M = No Modifications from GQAPP
TBD = To Be Determined.

*
With the exception of Total Recoverable Petroleum Hydrocarbons, the laboratory screening analyses do not have EPA method numbers.

Section 6.0 -- Fieldwork and Sampling Procedures

Fieldwork and sampling procedures are presented in Section 6.0 of the GOAPP. Modifications to these procedures are described belov:

No Modifications

Section 7.0 — Sample Custody

Sample custody procedures are presented in Section 7.0 of the GQAPP. Modifications to these procedures are described below:

No Modifications

Section 8.0 -- Calibration Procedures and Frequency

Calibration procedures and frequency are presented in Section 8.0 of the GOAPP. Modifications to these procedures are described belov:

No Modifications

Section 9.0 -- Analytical Procedures

Screening and quantitative analytical procedures are presented in Section 9.0 of the GOAPP. Site-specific accuracy, precision, completeness, and detection limit criteria are presented in Section 5.0 of this SOAPP. Modifications to any other of the analytical procedures are described below:

170111

No Modifications

Section 10.0 -- Data Reduction, Validation, and Reporting

Data reduction, validation, and reporting procedures are presented in Section 10.0 of the GQAPP. Modifications to these procedures are described below:

No Modifications

Section 11.0 -- Internal Quality Control Checks

Internal quality control check procedures are presented in Section 11.0 of the GQAPP. Modifications to these procedures are described below:

No Modifications

Section 12.0 -- Performance and System Audits

Performance and system audit procedures are presented in Section 12.0 of the GQAPP. Specific audits planned for this site investigation are listed below:

Audit Type	Frequency/Date	Description
	To Be Determined	

Section 13.0 -- Preventive Maintenance

Preventive maintenance procedures are presented in Section 13.0 of the GQAPP. Modifications to these procedures are described belov:

No Modifications

Section 14.0 -- Procedures Used to Assess Accuracy, Precision, and Completeness of Data

Procedures used to assess the accuracy, precision, and completeness of data are presented in Section 14.0 of the GQAPP. Modifications to these procedures are described below:

No Modifications

Section 15.0 -- Corrective Action

Corrective action procedures are presented in Section 15.0 of the GQAPP. Modifications to these procedures are described belw:

No Modifications

Section 16.0 -- Quality Assurance Reports to Management

Quality assurance report procedures are presented in Section 16.0 of the GQAPP. Modifications to these procedures are described belov:

No Modifications

170112

Appendix A -- Additional Personnel Biographies

Personnel assigned to this site investigation whose biographies do not appear in the GOAPP are listed below; biographies for these site personnel are presented on the following pages.

To Be Determined

Section 1.0 -- Title Page

Work Plan Group: I
Site No.: 18
Site Name: PCB Spill at Substation A Site

Prepared by: Jon A. Schmidt
Ecology and Environment, Inc.
1203 Governor's Square Boulevard, Suite 401
Tallahassee, Florida 32301

Prepared for: Department of the Navy
Southern Division
Naval Facilities Engineering Command
2155 Eagle Drive, P.O. Box 10068
Charleston, South Carolina 29411-0068
Contract Number N62467-88-C-0200

Signature Approvals:

E & E Project Manager: _____
J. Barksdale

E & E Regional QA/QC Coordinator: _____
K. Walker

E & E ASC Director: _____
A. Clifton

E & E QA/QC Project Officer: _____
M. Meredith

Section 2.0 — Table of Contents

		Page	Date
Section 1.0	— Title Page	1	5-19-92
Section 2.0	— Table of Contents	2	5-19-92
Section 3.0	— Project Summary	3	5-19-92
Section 4.0	— Project Organization and Responsibility	5	4-24-89
Section 5.0	— QA/QC Objectives for Measurement Data	5	5-19-92
Section 6.0	— Fieldwork and Sampling Procedures	8	4-24-89
Section 7.0	— Sample Custody	8	4-24-89
Section 8.0	— Calibration Procedures and Frequency	8	4-24-89
Section 9.0	— Analytical Procedures	8	4-24-89
Section 10.0	— Data Reduction, Validation, and Reporting	9	4-24-89
Section 11.0	— Internal Quality Control Checks	9	4-24-89
Section 12.0	— Performance and Systems Audits	9	4-24-89
Section 13.0	— Preventive Maintenance	10	4-24-89
Section 14.0	— Procedures Used to Assess Accuracy. Precision. and Completeness of Data	10	4-24-89
Section 15.0	— Corrective Action	10	4-24-89
Section 16.0	— Quality Assurance Reports to Management	10	4-24-89
Appendix A	— Additional Personnel Biographies	11	4-24-89

170114

Section 3.0 -- Project Summary

Work Plan Group: I

Site No. : 18

Site Name: PCB Spill at Substation A Site

Site Description: A complete site description and history are presented in Sections 2.0 and 3.0 of the attached work plan.

Phase I -- Field Screening
Physical Survey (check all that apply):

- X Overall Physical Reconnaissance
- X HNu/OVA Surface Emission Survey
- ___ Radiation Survey
- X Habitat/Biota Survey
- ___ Asbestos Survey (in Rubble)
- X Hydrologic Assessment

Geophysical Survey (check all that apply):

- ___ Electromagnetic Conductivity:
  - ___ EM-31 ___ EM-34
- ___ Hagnetometry
- ___ Very Low Frequency
- ___ Ground Penetrating Radar
- ___ Seismic Refraction
- ___ Seismic Reflection

Analytical Screening (check all that apply):

- ___ Field Analyses:
- ___ Soil Headspace Analyses: Planned Number of Samples ___
- ___ Soil Gas Analyses : Planned Number of Samples ___
- X Laboratory Analyses:

PLANNED NUMBER OF SAMPLES		CATEGORIES OF ANALYSES
Surface Water	___	X Volatile Organic Compounds
Sediment	___	X Polynuclear Aromatic Hydrocarbons
Soil	15	X Phenols
Groundwater	3	___ Organophosphorus Pesticides
Duplicates	2	___ Chlorinated Herbicides
Trip Blanks	___	___ Carbamates
Field Blanks	___	X Pesticides/Polychlorinated Biphenyls
Rinsate Blanks	___	X Total Recoverable Petroleum Hydrocarbons
Other	___	X Metals
		___ Gross Alpha

Section 3.0 — Project Summary (Continued)

Phase II — Characterization

PLANNED NUMBER OF SAMPLES

Surface Vater	___	Air	___	Duplicates	2
Sediment	___	Biota:		Trip Blanks	2
soi1	9	Flora	___	Field Blanks	1
Groundwater	2	Fauna	___	Rinsate Blanks	2

CATEGORIES OF ANALYSES

- X Purgeable Aromatics
- X Purgeable Halocarbons
- X Base/Neutral Extractables
- X Acid Extractables
- ___ Polynuclear Aromatic Hydrocarbons
- X Pesticides
- X Polychlorinated Biphenyls
- X Total Recoverable Petroleum Hydrocarbons
- X Metals
- X Cyanide

Additional analytical categories are identified below:

- X Gross Alpha
- X Gross Beta
- X Gamma Scan
- X Total Organic Carbon
- X Hardness (vater only)
- X Alkalinity
- X Total Suspended Solids (water only)
- X Total Kjeldahl Nitrogen
- X Ammonia Nitrogen
- X Orthophosphate Phosphorus
- X Dissolved Oxygen (in field)
- X 5-day Biological Oxygen Demand
- X Chemical Oxygen Demand
- X pH
- X Percent Moisture
- X Grain Size
- X BTU Content
- X Ash Content
- X Total Organic Halogens
- X Sulfur
- X Ignitability
- X Cation Exchange Capacity

170115

Section 4.0 -- Project Organization and Responsibility

The overall organizational structure for this site is discussed in Section 4.0 of the GQAPP. Site-specific designated personnel and their responsibilities are listed below:

Site Manager:
Team/Task Leader(s): To Be Determined
Field Support Personnel:

Biographies for those personnel listed above which are not included in the GQAPP are included in Appendix A of this document.

Section 5.0 -- QA/QC Objectives for Measurement Data

Criteria for reporting the accuracy, precision, and completeness of data are presented in Section 5.0 of the GQAPP. Detection limits for screening and quantitative analyses are presented in Section 9.0 of the GQAPP. Procedures used to assess data accuracy, precision, and completeness are presented in Section 14.0 of the GQAPP. All analytes (including field parameters), sample media, and method numbers relevant to the investigation of this site are listed in the following table, which also identifies any modifications to the accuracy (A), precision (P), completeness (C), and detection limit (DL) criteria specified in the above-referenced GQAPP sections.

Analyte	Media	Method No.	A	P	C	DL
Laboratory Screening Analyses						
Volatile Organic Compounds	S/W	--	N/M	N/M	N/M	N/M
Polynuclear Aromatic Eydrocarbons	S/W	--	N/M	N/M	N/M	N/M
Pesticides	S/W	--	N/M	N/M	N/M	N/M
Polychlorinated Biphenyls	S/W	--	N/M	N/M	N/M	N/M
Total Recoverable Petroleum Hydrocarbons	S/W	EPA 418.1	N/M	N/M	N/M	TBD
Phenols	S/W	--	N/M	N/M	N/M	N/M
Arsenic	S/W	--	N/M	N/M	N/M	N/M
Cadmium	S/W	--	N/M	N/M	N/M	N/M
Chromium	S/W	--	N/M	N/M	N/M	N/H
Copper	S/W	--	N/M	N/M	N/H	N/M
Lead	S/W	--	N/M	N/M	N/M	N/M
Nickel	S/W	--	N/M	N/M	N/M	N/M
Silver	S/W	--	N/M	N/M	N/M	N/M
Zinc	S/W	--	N/M	N/H	N/M	N/M
Laboratory Analyses						
Gross Alpha	W	EPA 900.0	N/M	N/H	N/M	N/M
Gross Beta	W	EPA 900.0	TBD	TBD	TBD	TBD
Gamma Scan	W	EPA 901.1	TBD	TBD	TBD	TBD
TCL Purgeables + xylene	S/W	EPA 8240/624	N/M	N/M	N/M	N/M
TCL BNAs	S/W	EPA 8270/625	N/H	N/M	N/M	N/M
TCL Pesticides 6 PCBs	S/W	EPA 8080/608	N/M	N/M	N/M	N/M
Total Recoverable Petroleum Hydrocarbons	S/W	EPA 418.1	N/M	N/M	N/M	N/M
TAL Metals:						
Aluminum	S/W	EPA 6010	N/M	N/M	N/M	N/M
Antirony	S/W	EPA 6010	N/M	N/M	N/M	N/M
Arsenic	S/W	EPA 7060	N/M	N/M	N/M	N/M
Barium	S/W	EPA 6010	N/M	N/M	N/M	N/M
Beryllium	S/W	EPA 6010	N/M	N/M	N/M	N/M
Boron	S/W	EPA 6010	N/M	N/M	N/M	N/M
Cadmium	S/W	EPA 6010	N/M	N/M	N/H	N/M
Calcium	S/W	EPA 6010	N/M	N/M	N/M	N/M
Chromium	S/W	EPA 6010	N/M	N/M	N/M	N/M
Cobalt	S/W	EPA 6010	N/M	N/M	N/M	N/M
Copper	S/W	EPA 6010	N/M	N/M	N/M	N/M
Iron	S/W	EPA 6010	N/M	N/M	N/M	N/M
Lead	S/W	EPA 7421	N/M	N/M	N/M	N/M
Magnesium	S/W	EPA 6010	N/M	N/M	N/M	N/M
Manganese	S/W	EPA 6010	N/M	N/M	N/M	N/M

170116

Analyte	Media	Method No.	A	P	C	DL
Mercury	S/W	EPA 7471/7470	N/M	N/M	N/M	N/M
Nickel	S/W	EPA 6010	N/M	N/M	N/M	N/M
Selenium	S/W	EPA 7740	N/M	N/M	N/M	N/M
Silver	S/W	EPA 6010	N/M	N/M	N/M	N/M
Sodium	S/W	EPA 6010	N/M	N/M	N/M	N/M
Thallium	S/W	EPA 7841	N/M	N/M	N/M	N/M
Vanadium	S/W	EPA 6010	N/M	N/M	N/M	N/M
Zinc	S/W	EPA 6010	N/M	N/M	N/M	N/M
Cyanide	S/W	EPA 90101335.2	N/M	N/M	N/M	N/M
TOC	S/W	EPA 415.1	N/M	N/M	N/M	N/M
Hardness	W	EPA 130.2	N/M	N/M	N/M	N/M
Alkalinity	W	EPA 310.1	N/M	N/M	N/M	N/M
Total Suspended Solids	W	EPA 160.2	N/M	N/M	N/M	N/M
Total Kjeldahl Nitrogen	S/W	EPA 351.3	N/M	N/M	N/M	N/M
Nitrogen-Ammonia	S/W	EPA 350.3	N/M	N/M	N/H	N/M
Orthophosphate Phosphorus	S/W	EPA 365.2	N/M	N/M	N/M	N/M
5-day Biological Oxygen Demand	W	SM 5210	N/M	N/M	N/M	N/M
Chemical Oxygen Demand	W	EPA 410.4	N/M	N/H	N/M	N/M
pH	W	EPA 150.1	N/M	N/M	N/M	N/M
Percent Moisture	S	ASTM D-2216-80	N/M	N/M	N/M	N/M
Grain Size	S	ASTM D-422-63	N/M	N/M	N/M	N/M
BTU Content	S	ASTM D-2015-77	N/M	N/M	N/M	N/M
Ash Content	S	ASTM D-482	N/M	N/M	N/M	N/M
Total Organic Halogens	S	SW 9020	TBD	TBD	TBD	TBD
Sulfur	S	ASTM D-129-64	N/M	N/M	N/M	N/M
Ignitability	S/W	EPA 1010	N/M	N/M	N/M	N/M
Cation Exchange Capacity	S	EPA 9081	75-125	35	95%	100 mg/kg
Field Parameters						
pH	W	150.1	N/M	N/M	N/M	N/M
Specific Conductance	W	120.1	N/M	N/M	N/M	N/M
Temperature	W	170.1	N/M	N/M	N/M	N/M
Dissolved Oxygen	W	EPA 360.1	N/M	N/M	N/M	N/M

Notes: S = Soil and/or sediment
W = Groundwater
N/M = No Modifications from GQAPP
TBD = To Be Determined

* With the exception of Total Recoverable Petroleum Hydrocarbons, the laboratory screening analyses do not have EPA method numbers.

Section 6.0 — Fieldwork and Sampling Procedures

Fieldwork and sampling procedures are presented in Section 6.0 of the GQAPP. Modifications to these procedures are described belov:

No Modifications

Section 7.0 — Sample Custody

Sample custody procedures are presented in Section 7.0 of the GQAPP. Modifications to these procedures are described belov:

No Modifications

Section 8.0 -- Calibration Procedures and Frequency

Calibration procedures and frequency are presented in Section 8.0 of the GQAPP. Modifications to these Procedures are described belov:

No Modifications

Section 9.0 -- Analytical Procedures

Screening and quantitative analytical procedures are presented in Section 9.0 of the GQAPP. Site-specific accuracy, precision, completeness, and detection limit criteria are presented in Section 5.0 of this SQAPP. Modifications to any other of the analytical procedures are described below:

No Modifications

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Section 10.0 -- Data Reduction, Validation, and Reporting

Data reduction, validation, and reporting procedures are presented in Section 10.0 of the GQAPP. Modifications to these procedures are described below:

No Modifications

Section 11.0 -- Internal Quality Control Checks

Internal quality control check procedures are presented in Section 11.0 of the GQAPP. Modifications to these procedures are described below:

No Modifications

Section 12.0 -- Performance and System Audits

Performance and system audit procedures are presented in Section 12.0 of the GQAPP. Specific audits planned for this site investigation are listed below:

Audit Type	Frequency/Date	Description
	To Be Determined	

Section 13.0 -- Preventive Maintenance

Preventive maintenance procedures are presented in Section 13.0 of the GQAPP. Modifications to these procedures are described belov:

No Hodifications

Section 14.0 — Procedures Used to Assess Accuracy, Precision, and Completeness of Data

Procedures used to assess the accuracy, precision, and completeness of data are presented in Section 14.0 of the GQAPP. Hodifications to these procedures are described below:

No Hodifications

Section 15.0 — Corrective Action

Corrective action procedures are presented in Section 15.0 of the GQAPP. Modifications to these procedures are described belov:

No Hodifications

Section 16.0 -- Quality Assurance Reports to Management

Quality assurance report procedures are presented in Section 16.0 of the GQAPP. Hodifications to these procedures are described below:

No Hodifications

170118

Appendix A — Additional Personnel Biographies

Personnel assigned to this site investigation whose biographies do not appear in the GQAPP are listed below; biographies for these site personnel are presented on the following pages.

To Be Determined

Section 1.0 -- Title Page

Work Plan Group: I
Site No.: 28
Site Name!: Transformer Accident

Prepared by: Jon A. Schmidt
Ecology and Environment, Inc.
1203 Governor's Square Boulevard, Suite 401
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Prepared for: Department of the Navy
Southern Division
Naval Facilities Engineering Command
2155 Eagle Drive, P.O. Box 10068
Charleston, South Carolina 29411-0068
Contract Number N62467-88-C-0200

Signature Approvals:

E 6 E Project Manager: _____
J. Barksdale

E & E Regional QA/QC Coordinator: _____
K. Walker

E 6 E ASC Director: _____
A. Clifton

E 6 E QA/QC Project Officer: _____
M. Meredith

Section 20 Table of Contents

		Page	Date
Section 1.0	Title 'Page	1	5-19-92
Section 2.0	Table of Contents	2	5-19-92
Section 3.0	Project Summary	3	5-19-92
Section 4.0	Project Organization and Responsibility	5	4-24-89
Section 5.0	QA/QC Objectives for Measurement Data	5	5-19-92
Section 6.0	Fieldwork and Sampling Procedures	8	4-24-89
Section 7.0	Sample Custody	8	4-24-89
Section 8.0	Calibration Procedures and Frequency	8	4-24-89
Section 9.0	Analytical Procedures	8	4-24-89
Section 10.0	Data Reduction, Validation, and Reporting	9	4-24-89
Section 11.0	Internal Quality Control Checks	9	4-24-89
Section 12.0	Performance and Systems Audits	9	4-24-89
Section 13.0	Preventive Maintenance	10	4-24-89
Section 14.0	Procedures Used to Assess Accuracy. Precision. and Completeness of Data	10	4-24-89
Section 15.0	Corrective Action	10	4-24-89
Section 16.0	Quality Assurance Reports to Management	10	4-24-89
Appendix A	Additional Personnel Biographies	11	4-24-89

170120

Section 3.0 -- Project *Summary*

Work Plan Group: I

Site No.: 28

Site Name: Transformer Accident

Site Description: A complete site description and history are presented in Sections 2.0 and 3.0 of the attached work plan.

Phase I -- Field Screening
Physical Survey (check all that apply):

- X Overall Physical Reconnaissance
- X HNu/OVA Surface Emission Survey
- ___ Radiation Survey
- X Habitat/Biota Survey
- ___ Asbestos Survey (in Rubble)
- X Hydrologic Assessment

Geophysical Survey (check all that apply):

- ___ Electromagnetic Conductivity:
  - ___ EM-31 ___ EM-34
- ___ Magnetometry
- ___ Very Low Frequency
- ___ Ground Penetrating Radar
- ___ Seismic Refraction
- ___ Seismic Reflection

Analytical Screening (check all that apply):'

- ___ Field Analyses:
- ___ Soil Headspace Analyses: Planned Number of Samples ___
- ___ Soil Gas Analyses : Planned Number of Samples ___
- X Laboratory Analyses:

PLANNED NUMBER OF SAMPLES		CATEGORIES OF ANALYSES
Surface Water	___	X Volatile Organic Compounds
Sediment	2	X Polynuclear Aromatic Hydrocarbons
Soil	24	X Phenols
Groundwater	4	___ Organophosphorus Pesticides
Duplicates	4	___ Chlorinated Herbicides
Trip Blanks	___	___ Carbamates
Field Blanks	___	X Pesticides/Polychlorinated Biphenyls
Rinsate Blanks	___	X Total Recoverable Petroleum Hydrocarbons
Other	___	X Metals
		___ Gross Alpha

Section 3.0 — Project Summary (Continued)

Phase II -- Characterization

PLANNED NUMBER OF SAMPLES

Surface Water	___	Air	___	Duplicates	4
Sediment	1	Biota:		Trip Blanks	4
Soil	15	Flora	___	Field Blanks	1
Groundwater	2	Fauna	___	Rinsate Blanks	5

CATEGORIES OF ANALYSES

- X Purgeable Aromatics
- X Purgeable Halocarbons
- X Base/Neutral Extractablcs
- X Acid Extractables
- ___ Polynuclear Aromatic Hydrocarbons
- X Pesticides .
- X Polychlorinated Biphenyls
- X Total Recoverable Petroleum Hydrocarbons
- X Metals
- X Cyanide

Additional analytical categories are identified below:

- X Gross Alpha
- X Gross Beta
- X Gamma scan
- X Total Organic Carbon
- X Hardness (water only)
- X Alkalinity
- X Total Suspended Solids (water only)
- X Total Rjeldahl Nitrogen
- X Ammonia Nitrogen
- X Orthophosphate Phosphorus
- X Dissolved Oxygen (in field)
- X 5-day Biological Oxygen Demand
- X Chemical Oxygen Demand
- X pH
- X Percent Moisture
- X Grain Size
- X BTU Content
- X Ash Content
- X Total Organic Halogens
- X Sulfur
- X Ignitability
- X Cation Exchange Capacity

170121

Section 4.0 -- Project Organization and Responsibility

The overall organizational structure for this site is discussed in Section 4.0 of the GQAPP. Site-specific designated personnel and their responsibilities are listed below:

Site Manager:
Team/Task Leader(s): To Be Determined
Field Support Personnel:

Biographies for those personnel listed above which are not included in the GQAPP are included in Appendix A of this document.

Section 5.0 -- QA/QC Objectives for Measurement Data

Criteria for reporting the accuracy, precision, and completeness of data are presented in Section 5.0 of the GQAPP. Detection limits for screening and quantitative analyses are presented in Section 9.0 of the GQAPP. Procedures used to assess data accuracy, precision, and completeness are presented in Section 14.0 of the GQAPP. All analytes (including field parameters), sample media, and method numbers relevant to the investigation of this site are listed in the following table, which also identifies any modifications to the accuracy (A), precision (P), completeness (C), and detection limit (DL) criteria specified in the above-referenced GQAPP sections.

Analyte	Media	Method No.	A	P	C	DL
Laboratory Screening Analyses						
Volatile Organic Compounds	S/W	--	N/M	N/M	N/M	N/M
Polynuclear Aromatic Hydrocarbons	S/W	--	N/M	N/M	N/M	N/M
Pesticides	S/W	--	N/M	N/M	N/M	N/M
Polychlorinated Biphenyls	S/W	--	N/M	N/M	N/M	N/H
Total Recoverable Petroleum Eydrocarbons	S/W	EPA 418.1	N/M	N/H	N/M	TBD
Phenols	S/W	--	N/M	N/M	N/M	N/H
Arsenic	S/W	--	N/H	N/M	N/M	N/M
Cadmium	S/W	--	N/M	N/M	N/M	N/M
Chroaium	S/W	--	N/M	N/M	N/M	N/M
Copper	S/W	--	N/M	N/M	N/M	N/M
Lead	S/W	--	N/M	N/M	N/M	N/M
Nickel	S/W	--	N/M	N/M	N/M	N/M
Silver	S/W	--	N/M	N/M	N/M	N/M
Zinc	S/W	--	N/M	N/M	N/M	N/M
laboratory Analyses						
Gross Alpha	V	EPA 900.0	N/M	N/M	N/M	N/M
Gross Beta	V	EPA 900.0	TBD	TBD	TBD	TBD
Gamma Scan	W	EPA 901.1	TBD	TBD	TBD	TBD
TCL Purgeables + xylene	S/W	EPA 8240/624	N/M	N/M	N/M	N/M
TCL BNAs	S/W	EPA 8270/625	N/M	N/M	N/M	N/M
TCL Pesticides & PCBs	S/W	EPA 8080/608	N/M	N/M	N/M	N/M
Total Recoverable Petroleum Hydrocarbons	S/W	EPA 418.1	N/M	N/M	N/M	N/H
TAL Metals:						
Aluminum	S/W	EPA 6010	N/M	N/M	N/M	N/M
Antimony	S/W	EPA 6010	N/M	N/M	N/M	N/M
Arsenic	S/W	EPA 7060	N/M	N/M	N/M	N/M
Barium	S/W	EPA 6010	N/M	N/M	N/M	N/M
Beryllium	S/W	EPA 6010	N/M	N/M	N/M	N/M
Boron	S/W	EPA 6010	N/H	N/H	N/M	N/M
Cadmium	S/W	EPA 6010	N/M	N/M	N/M	N/M
Calcium	S/W	EPA 6010	N/M	N/M	N/M	N/M
Chromium	S/W	EPA 6010	N/M	N/H	N/M	N/M
Cobalt	S/W	EPA 6010	N/M	N/M	N/M	N/M
Copper	S/W	EPA 6010	N/M	N/M	N/M	N/M
Iron	S/W	EPA 6010	N/M	N/M	N/M	N/M
Lead	S/W	EPA 7421	N/M	N/M	N/M	N/M
Magnesium	S/W	EPA 6010	N/M	N/M	N/M	N/M
Manganese	S/W	EPA 6010	N/M	N/M	N/M	N/M

170122

Analyte	Media	Method No.	A	P	C	DL
Hercury	S/W	EPA 7471/7470	N/M	N/M	N/M	N/M
Nickel	S/W	EPA 6010	N/M	N/M	N/H	N/M
Selenium	S/W	EPA 7740	N/M	N/M	N/H	N/M
Silver	S/W	EPA 6010	N/M	N/M	N/M	N/H
Sodium	S/W	EPA 6010	N/M	N/M	N/M	N/H
Thallium	S/W	EPA 7841	N/M	N/M	N/M	N/M
Vanadium	S/W	EPA 6010	N/M	N/M	N/M	N/M
Zinc	S/W	EPA 6010	N/M	N/M	N/M	N/M
Cyanide	S/W	EPA 9010/335.2	N/M	N/M	N/M	N/M
TOC	S/W	EPA 415.1	N/M	N/M	N/M	N/M
Hardness	W	EPA 130.2	N/M	N/M	N/M	N/M
Alkalinity	W	EPA 310.1	N/M	N/M	N/M	N/M
Total Suspended Solids	W	EPA 160.2	N/M	N/M	N/M	N/M
Total Kjeldahl Nitrogen	S/W	EPA 351.3	N/M	N/M	N/M	N/M
Nitrogen-Ammonia	S/W	EPA 350.3	N/M	N/M	N/M	N/M
Orthophosphate Phosphorus	S/W	EPA 365.2	N/M	N/M	N/M	N/M
5-day Biological Oxygen Demand	W	SM 5210	N/M	N/M	N/M	N/M
Chemical Oxygen Demand	W	EPA 410.4	N/M	N/M	N/M	N/M
pH	W	EPA 150.1	N/M	N/M	N/M	N/M
Percent Moisture	S	ASTM D-2216-80	N/M	N/M	N/M	N/M
Grain Size	S	ASTM D-422-63	N/M	N/M	N/M	N/M
BTU Content	S	ASTM D-2015-77	N/M	N/M	N/M	N/M
Ash Content	S	ASTM D-482	N/M	N/M	N/M	N/M
Total Organic Halogens	S	SW 9020	TBD	TBD	TBD	TBD
Sulfur	S	ASTM D-129-64	N/M	N/M	N/M	N/M
Ignitability	S/W	EPA 1010	N/M	N/M	N/M	N/M
Cation Exchange Capacity	S	EPA 9081	75-125	35	95%	100 mg/kg
Field Parameters						
pH	W	150.1	N/M	N/M	N/M	N/M
Specific Conductance	W	120.1	N/M	N/M	N/M	N/M
Temperature	W	170.1	N/M	N/M	N/M	N/M
Dissolved Oxygen	W	EPA 360.1	N/M	N/M	N/M	N/M

Notes: S = Soil and/or sediment
W = Groundwater
N/M = No Modifications from GQAPP
TBD = To Be Determined

* With the exception of Total Recoverable Petroleum Hydrocarbons, the laboratory screening analyses do not have EPA method numbers.

Section 6.0 — Fieldwork and Sampling Procedures

Fieldwork and sampling procedures are presented in Section 6.0 of the GQAPP. Hodifications to these procedures are described belov:

No Hodifications

Section 7.0 — Sample Custody

Sample custody procedures are presented in Section 7.0 of the GQAPP. Hodifications to these Procedures are described belov:

No Hodifications

Section 8.0 — Calibration Procedures and Frequency

Calibration procedures and frequency are presented in Section 8.0 of the GQAPP. Hodifications to these procedures are described belov:

No Modifications

Section 9.0 -- Analytical Procedures

Screening and quantitative analytical procedures are presented in Section 9.0 of the GQAPP. Site-specific accuracy, precision, completeness, and detection limit criteria are presented in Section 5.0 of this SQAPP. Hodifications to any other of the analytical procedures are described below:

170123

No Modifications

Section 10.0 -- Data Reduction, Validation, and Reporting

Data reduction, validation, and reporting procedures are presented in Section 10.0 of the GQAPP. Modifications to these procedures are described below:

No Modifications

Section 11.0 -- Internal Quality Control Checks

Internal quality control check procedures are presented in Section 11.0 of the CQAPP. Modifications to these procedures are described below:

No Modifications

Section 12.0 -- Performance and System Audits

Performance and system audit procedures are presented in Section 12.0 of the GQAPP. Specific audits planned for this site investigation are listed below:

Audit Type	Frequency/Date	Description
	To Be Determined	

Section 13.0 — Preventive Maintenance

Preventive maintenance procedures are presented in Section 13.0 of the GQAPP. Hodifications to these procedures are described belov:

No Modifications

Section 14.0 — Procedures Used to Assess Accuracy, Precision, and Completeness of Data

Procedures used to assess the accuracy, precision, and Completeness of data are presented in Section 14.0 of the GQAPP. Modifications to these procedures are described belov:

No Modifications

Section 15.0 -- Corrective Action

Corrective action procedures are presented in Section 15.0 of the GQAPP. Modifications to these procedures are described below:

No Hodifications

Section 16.0 -- Quality Assurance Reports to Management

Quality assurance report procedures are presented in Section 16.0 of the GOAPP. Modifications to these procedures are described below:

No Hodifications

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Appendix A -- Additional Personnel Biographies

Personnel assigned to this site investigation whose biographies do not appear in the GQAPP are listed below; biographies for these site personnel are presented on the following pages.

To Be Determined

APPENDIX F

THREATENED AND ENDANGERED FLORA AND FAUNA ASSOCIATED WITH NAS PENSACOLA

[Bold items enclosed in brackets denote changes to last version of document]

APPENDIX F

THREATENED AND ENDANGERED FLORA AND FAUNA OBSERVED OR LIKELY TO OCCUR WITHIN THE NAS PENSACOLA FACILITY OR NEARBY

Scientific Name	Common Name	Base Status[a]	status[b] FGFWFC (or FDA)	status[b] USFWS	Habitat
FISHES					
Acipenser oxyrhynchus	Atlantic sturgeon	M	SSC	UR 2	Gulf coast, estuarine
Ammocrypta asprella	Crystal darter	U	T	UR 2	Fresh water
Etheostoma histrio	Harlequin darter	U	SSC		Fresh water
Fundulus jenkinsi	Salt marsh topminnow	P	SSC		Salt, fresh, brackish waters
Lepisosteus spatula	Alligator gar	U	SSC		Brackish, fresh, salt water
Moxostoma carinatum	River redhorse	U	SSC		Fresh water
AMPHIBIANS AND REPTILES					
Alligator mississippiensis	American alligator	R	SSC	T(S/A)	Swamps, marshes, ponds
Caretta caretta caretta	Loggerhead turtlo	M?	T	T	Marine, coastal
Chelonia mydas mydas	Green turtle	M?	E	E	Marine, coastal
Dermochelys coriacea	Leatherback turtle	M	E	E	Marino, coastal
Drymarchon corais coupori	Eastern indigo snake	P	T	T	Open areas near water
Eretmochelys imbricata	Hawksbill turtle	M?	E	E	Marine, coastal
Gopherus polyphemus	Gopher tortoise	P	SSC	UR 1	Sandy coastal plains
Graptemys pulchra	Alabama map turtle	U	SSC		Swamps, streams, marshes, ponds
Lepidochelys kempi	Atlantic ridley turtlo	M?	E	E	Marine, coastal
Rana areolata aesopus	Florida gopher frog	P	SSC	UR 2	Sand hill communities
Macroclemys temmincki	Alligator snapping turtlo	SR	SSC	UR 2	Swamps, marshes, ponds

Koy at end of table.

170127

Table Appendix F (Cont.)

Scientific Name	Common Name	Base Status[a]	Status[b] FGFWFC (or FDA)	Status[b] USFWS	Habitat
MAMMALS					
Mustela vison lutensis	Florida mink	U		UR 2	Terrestrial habitats
Peromyscus polionotus trissyllepsis	Perdido Key beach mouse	N/A	T	E	Beach dunes
Trichechus manatus latirostris	West Indian manatee	M	E	E	Atlantic and Gulf coasts
BIRDS					
Charadrius melodus	Piping plover	P	T	T	Open, dry, sandy beaches
Charadrius alexandrinus	Snowy plover	P	T	UR 2	Open, dry, sandy beaches
Dendroida dominica stoddardi	Stoddard's yellow throated warbler	D-U		UR 2	Wooded habitats
Dendroica kirtlandii	Kirtland's warbler	U	E	E	Wooded habitat8
Haematopus palliatus	American oystercatcher	U	SSC		Coastal habitats
Egretta rufescens	Reddish egret	P-u	SSC	UR 2	Freshwater/coastal uotlandr
Egretta caerulea	Little blue heron	D-U	SSC		Freshwater/coastal uotlandr
Egretta thula	Snowy egret	P-u	SSC		Freshwater/coastal wetlands
Grus canadensis pratensis	Florida sandhill crane	U	T		Freshwater uotlandr
Falco peregrinus tundrius	Arctic peregrine falcon	M	E	T	Winters on coasts
Falco sparverius paulus	Southeastern kestrel	R	T	UR 2	Open pine forests, clearings
Haliaeetus leucocephalus	Bald eagle	P-u	T	E	Pine forests/coastal habitat
Pandion haliaetus	Osprey	R	SSC		Near water
Pelecanus occidentalis	Brown pelican	R	SSC	AC	Mangrove trees, coasts

14[NASP]UH1101:T0312/1578/2

Key at end of table.

Table Appendix F (Cont.)

Scientific Name	Common Name	Base Status[a]	status[b] FGFWFC (or FDA)	status[b] USFWS	Habitat
Picoides borealis	Rod-cockadod woodpockor	P-u	T	E	Cavity nests/old pine stands
Vermivora bachmanii	Bachmann's warbler	U	E	E	Uoodod habitats
Campephilus principalis	Ivory-billed woodpockor	U	E	E	Wooded habitats
Sterna antillarum	Least torn	U	T		Coastal habitats
Mycteria americana	Wood stork	U	E	E	Freshwater/coastal wetlands
Rostrhamus sociabilis	Snail kite	U	E	E	Freshwater/coastal wetlands
INVERTEBRATES					
Copris gopheri	Scarab beetle	P		UR 2	Associated w/gopher tortoise
Chrysopsis gossypina cruiseana	Cruise's goldon-astor	P	E	UR 1	Coastal dunes
Drosera intermedia	Spoon-leaved sundew	R	T		Aquatic habitats
Epigaea repens	Trailing arbutus	U	E		Dry, acid, sandy soil
Kalmia latifolia	Mountain laurel	U	T		Rich, moist, shady woods
Lilaeopsis carolinensis	Carolina lilaeopsis	R		UR 2	
Lilium iridollae	Panhandle lily	U	E	UR 2	Black, mucky soils
Pinguicula planifolia	Chapman's butterwort	U	RE	UR 2	
Polygonella macrophylla	Large-leaved jointweed	R	T	UR 1	Sand pino-oak scrub
Rhododendron austrinum	Orange azalea	U	E	UR 5	Moist, woody habitats

14[NASP]UH1101:T0312/1578/2

Key at end of table.

Table Appendix F (Cont.)

Scientific Name	Common Name	Base Status[a]	Status[b] FGFWFC (or FDA)	Status[b] USFWS	Habitat
Sarracenia leucophylla	White-top pitchorplant	R	E		Open acid bogs
Sarracenia rubra	Sweet pitchorplant	U	E	UR 2	Acid bogs/slash pine woods
Stewartia malacodendron	Silky camellia	U	E		Slopes of wooded ravines

14[NASP]UH1101:T0312/1578/2

Key:

[a]Status of species on tho NAS Pensacola facility:
R = Resident.
M = Migrant.
SR = Suspected resident.
P = Possible resident duo to available habitat; survey required.
U = Unknown, survey required.
N/A = lot expected to occur on tho NAS Pensacola facility.

[b]State and federal status:
E = Endangered.
T = Threatened.
T(S/A) = Threatened duo to similarity in appearance.
AC = Agency concern; not currently listed or a candidate Cor listing.
UR 1 = Under review tor federal listing with substantial evidence indicating at least some degree of biological vulnerability and/or throat.
UR 2 = Under review, insufficient biological data available.
UR 5 = Candidate species but taxa has proven to bo more widespread than previously believed and/or those species that are not subject to any identifiable throat.
FDA = Florida Department of Agriculture.
FGFWFC = Florida Game and Freshwater fish Commission.
USFWS = U.S. Fish and Wildlife Service.

Source: Ecology and Environment, Inc., 1992 after Florida Natural Areas Inventory 1988.