32501.011
03.04.11.0004

N00204.AR.000391
NAS PENSACOLA
5090.3a

PHASE II

CONTAMINATION ASSESSMENT/ REMEDIAL ACTIVITIES INVESTIGATIONWORK PLAN — GROUP B NAVAL AIR STATION PENSACOIA PENSACOLA, FLORIDA

North Chevalier Disposal Area (Site 11) Scrap Bins (Site 12) Supply Department Outside Storage (Site 26)

July 1992

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

ecology and environment, inc.
316 SOUTH BAYLEN STREET, PENSACOLA, FLORIDA 32501, TEL. (904) 435-8925
International Specialists in the Environment

recycled paper

TABLE OF CONTENTS

Section		Page
1	INTRODUCTION	1-1
2	SITE DESCRIPTION	2-1
	2.1 Site 11 - North Chevalier Disposal Area	2-1
	2.2 Site 12 - Scrap Bins	2-1
	2.3 Site 26 - Supply Department Outside Storage Area	2-1
3	SITE HISTORY	3-1
	3.1 Site 11 - North Chevalier Disposal Area	3-1
	3.2 Site 12 - Scrap Bins	3-1
	3.3 Site 26 - Supply Department Outside Storage Area	3-4
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 the last version of document]

Table of Contents (Cont.)

Section		Page
7	PHYSIOGRAPHY AND HYDROGEOLOGY	7-1
	7.1 Physiography and Regional Hydrogeology	7-1
	7.1.1 Physiography	7-1
	7.1.2 Regional Hydrogeology	7-1
	7.1.2.1 Surficial/Sand-and-Gravel Aquifer	7-2
	7.1.2.2 Intermediate System	7-4
	7.1.2.3 Ploridan Aquifer System	7-5
	7.2 Site Eydrogeology	7-5
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	FIELDVORK METHODOLOGY	14-1
	14.1 Phase.I Field Screening	14-1
	14.1.1 Physical Survey	14-1
	14.1.1.1 Overall Physical Reconnaissance	14-1
	14.1.1.2 HNu/OVA Surface Emissions Survey and Particulate Air [Screening]	14-2
	14.1.1.3 Radiation Survey	14-2
	14.1.1.4 Habitat/Biota Survey	14-[2]

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

1100430

Table of Contents (Cont.)

Section		Page
14.1.2	Geophysical Survey	14-3
14.1.3	Analytical Screening	14-5
14.1.3.1	Laboratory Analyses	14-5
14.1.4	Hydrologic Assessment	14-8
14.2	Phase II--Characterization/Extent Delineation	14-[8)
14.2.1	Contaminant Source Survey	14-[19]
14.2.2	Sampling and Analysis	14-[21]
14.2.2.1	Surface Water and Sediment Sampling	14-[42]
14.2.2.2	Soil Sampling	14-[43]
14.2.2.3	Soil Boring Completion and Permanent Monitoring Well Installation and Development	14-[46)
14.2.2.4	Groundwater Sampling	14-[48]
14.2.3	Hydrologic Assessment	14-[50]
14.2.4	Engineering Survey	14-[51]
14.2.5	Interim Remedial Measures	14-[52)
14.2.6	Report	14-[52]
14.3	Phase 111--Extent Delineation	14-[52)
14.3.1	Biota Sampling	14-[53]
14.3.2	Soil Sampling	14-[53]
14.3.3	Shallow Monitoring Well Installation and Development	14-[53)
14.3.4	Intermediate and Deep Monitoring Well Installation and Development	14-[53]
14.3.5	Groundwater Sampling	14-[53]
14.3.6	Hydrologic Assessment	14-[53)
[14.3.7	Engineering Survey	14-54]
14.3.[8]	Air Sampling	14-[54]
14.4	Phase IV--Extent Delineation	14-[54]
14.[5]	Field Quality Assurance/Quality Control	14-[55]
14.[5].1	Documentation	14-[55]
14.[5].2	Field QA/QC Samples	14-[55)

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

Table of Contents (Cont.)

Section		Page
	14.[6] Decontamination and Waste Management Procedures	14-[55]
	14.[6].1 Decontamination Procedures	14-[55]
	14.[6].2 Waste Management Procedures	14-[55]
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-[3]
	19.6 Feasibility Study Report	19-3
20	REPORT	20-1
21	DOCUMENT REVISION	21-1
22	PROJECT MANAGEMENT	22-1

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

1100431

Table of Contents (Cont.)

Section		Page
23	PROJECT SCHEDULE	23-1
24	REFERENCES	24-1
(25	FLORIDA PROFESSIONAL GEOLOGIST SEAL	25-11

Appendix

A	SITE-SPECIFIC SAFETY PLANS	A-1
B	SITE-SPECIFIC QUALITY ASSURANCE PROJECT PLANS	B-1
C	THREATENED AND ENDANGERED FLORA AND FAUNA ASSOCIATED WITH NAS PENSACOLA	C-1
D	JUNE 1990 SECTION 14.2 PHASE 11--CHARACTERIZATION	D-1

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

LIST OF ILLUSTRATIONS

Figure		Page
2-1	Location Map--NAS Pensacola Sites 11, 12, and 26	2-2
2-2	Site Map--NAS Pensacola Sites 11, 12, and 26	2-3
14-1	Tentative Soil Boring and Temporary Monitoring Well Locations, Sites 11, 12, and 26--Phase I	14-4
14-2	Particulate Air Sampling, Soil Boring, and Temporary Monitoring Well Locations--NAS Pensacola Site 11--Phase I	14-10
14-3	Sediment Sample, Soil Boring, and Monitoring Well Well Locations--NAS Pensacola Site 12--Phase I	14-11
14-4	Particulate Air Sampling, Soil Boring, and Temporary Monitoring Well Locations--NAS Pensacola Site 26--Phase I	14-12
14-5	Proposed Soil Boring Locations--NAS Pensacola Site 11--Phase II	14-[22]
14-6	Proposed Monitoring Well Locations--NAS Pensacola Site 11--Phase II	14-[23]
14-7	Proposed Sediment Sample, Soil Boring, and Monitoring Well Locations--NAS Pensacola Site 12--Phase II	14-[24]
14-8	Proposed Soil Boring and Monitoring Well Locations--NAS Pensacola Site 26--Phase II	14-25
23-1	Phase I Project Schedule--Sites 11, 12, and 26	23-2
23-2	Phase 11 Project Schedule--Sites 11, 12, and 26	23-3
23-3	Phase III Project Schedule--Sites 11, 12, and 26	23-4
23-4	Phase IV Project Schedule--Sites 11, 12, and 26	23-5

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

LIST OF TABLES

Table		Page
2-1	Construction Details of Monitoring Wells on or near Sites 11, 12, and 26 at NAS Pensacola	2-4
3-1	Summary of Chemical Analyses of Groundwater Samples from Sites 11 and 26 Taken in 1984	3-2
3-2	Summary of Chemical Analyses of Groundwater Samples from Sites 11 and 26 Taken in 1986	3-3
14-1	Phase I Sampling and Analytical Requirements--Group B ..	14-6
14-2	Phase II Sampling and Analytical Requirements, NAS Pensacola Site 11	14-26
14-3	Phase II Sampling and Analytical Requirements, NAS Pensacola Site 12	14-27
14-4	Phase II Sampling and Analytical Requirements, NAS Pensacola Site 26	14-28
14-5	Rationale for Proposed Phase II Soil Sample Locations and Analyses, NAS Pensacola Site 11	14-29
14-6	Rationale for Proposed Phase II Monitoring Well Locations and Groundwater Sample Analyses, NAS Pensacola Site 11	14-31
14-7	Rationale for Proposed Phase II Surface Water and Sediment Sample Locations and Analyses, NAS Pensacola Site 12	14-33
14-8	Rationale for Proposed Phase II Soil Sample Locations and Analyses, NAS Pensacola Site 12	14-34
14-9	Rationale for Proposed Phase II Monitoring Well Locations and Groundwater Sample Analyses, NAS Pensacola Site 12	14-36

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

List of Tables (Cont.)

Table		Page
14-10	Rationale for Proposed Phase II Soil Sample Locations and Analyses, NAS Pensacola Site 26	14-[39]
14-11	Rationale for Proposed Phase II Monitoring Well Locations and Groundvater Sample Analyses, NAS Pensacola Site 26	14-[40]

[Bold items enclosed in bracket8 denote changes to the last version of document]

1100434

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 North Chevalier Disposal Area (Site 11), the Scrap Bins (Site 12), and the Supply Department Outside Storage Area (Site 26) 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 during January of 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 of 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 of 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:

- Efficient identification of those sites where 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, allows 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 II and hence will comprise Contamination Assessment-type investigations. On the other hand, 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/Feasibility Study (RI/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 Remedial Investigation Report, which will provide all the information necessary for the development and completion of a Feasibility Study.

2. SITE DESCRIPTION

2.1 Site 11 - North Chevalier Disposal Area

This site occupies approximately an 18-acre area adjacent to an arm of Bayou Grande north of Chevalier Field (figures 2-1 and 2-2). At the center of the site are two large pre-fabricated buildings (Buildings 3627 and 3628) and Building 3445 is located at the southwestern corner of the site. The area around buildings 3627 and 3628 are paved with asphalt. A new north-south paved road runs through the site. Surface elevations on the site are approximately 5 feet above mean sea level (MSL) and topography slopes gently to the east toward Bayou Grande. The surface soils are sandy and well drained. There are 11 shallow and one deep groundwater monitoring wells on or near this site. The construction details of these wells are listed in Table 2-1.

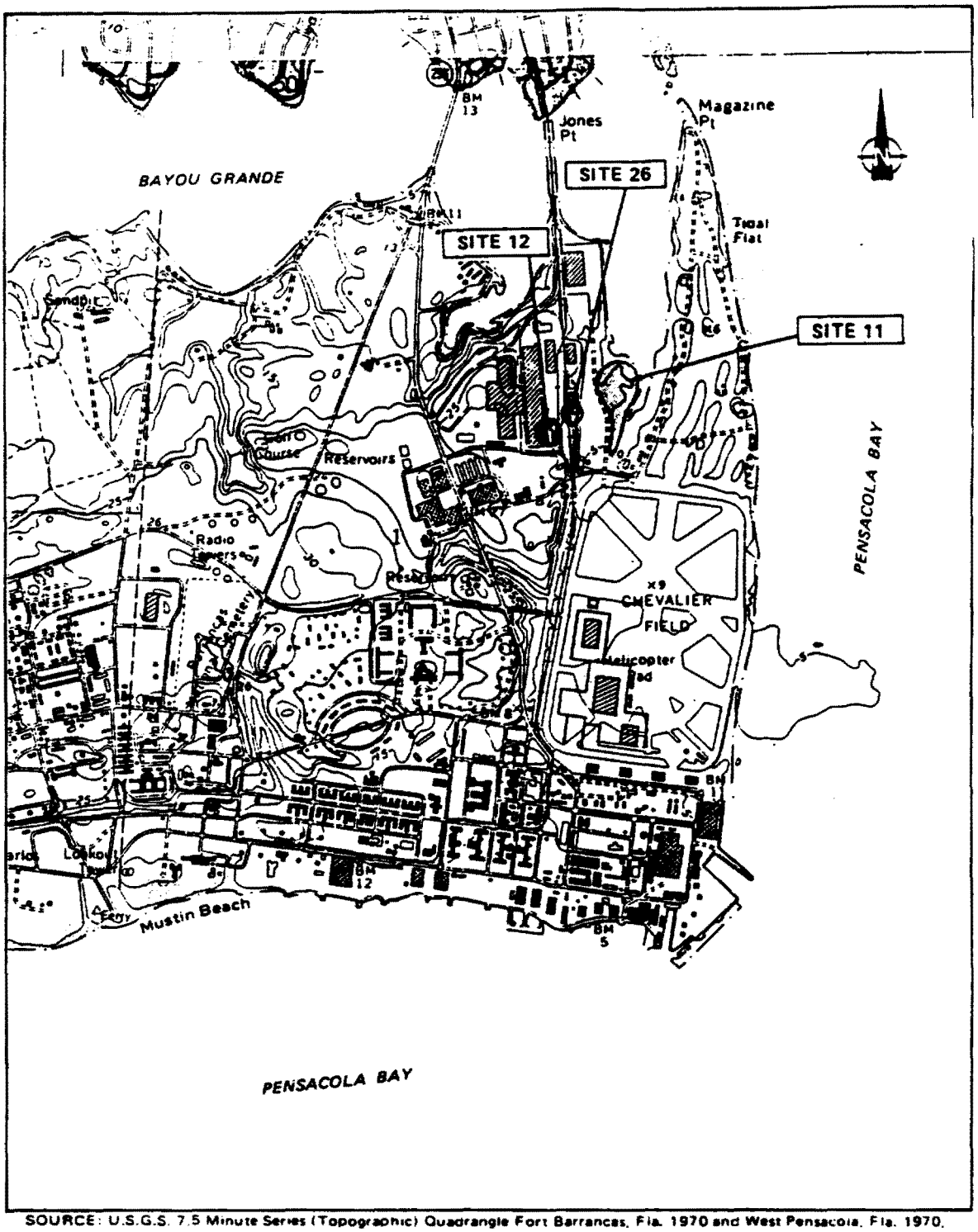
2.2 Site 12 - Scrap Bins

Site 12 is located approximately 800 feet northwest of Chevalier Field and 600 feet west of Site 11 (figures 2-1 and 2-2). Most of the site area is enclosed by a fence and covered with a large concrete pad where heavy equipment is currently kept. Surface elevations on this site are approximately 15 to 18 feet above MSL and the topography appears to be nearly level. Where exposed, surface soils are sandy and well drained. No monitoring wells are located directly on this site; however, a shallow well, GH-15, is located approximately 300 feet to the east. The construction details of well GM-15 are listed in Table 2-1.

2.3 Site 26 - Supply Department Outside Storage Area

Site 26 is located north[west] of Chevalier Field and immediately south of Building *684* (figures 2-1 and 2-2). This site occupies an area approximately 100 by 200 feet. On the site is a small prefabricated

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



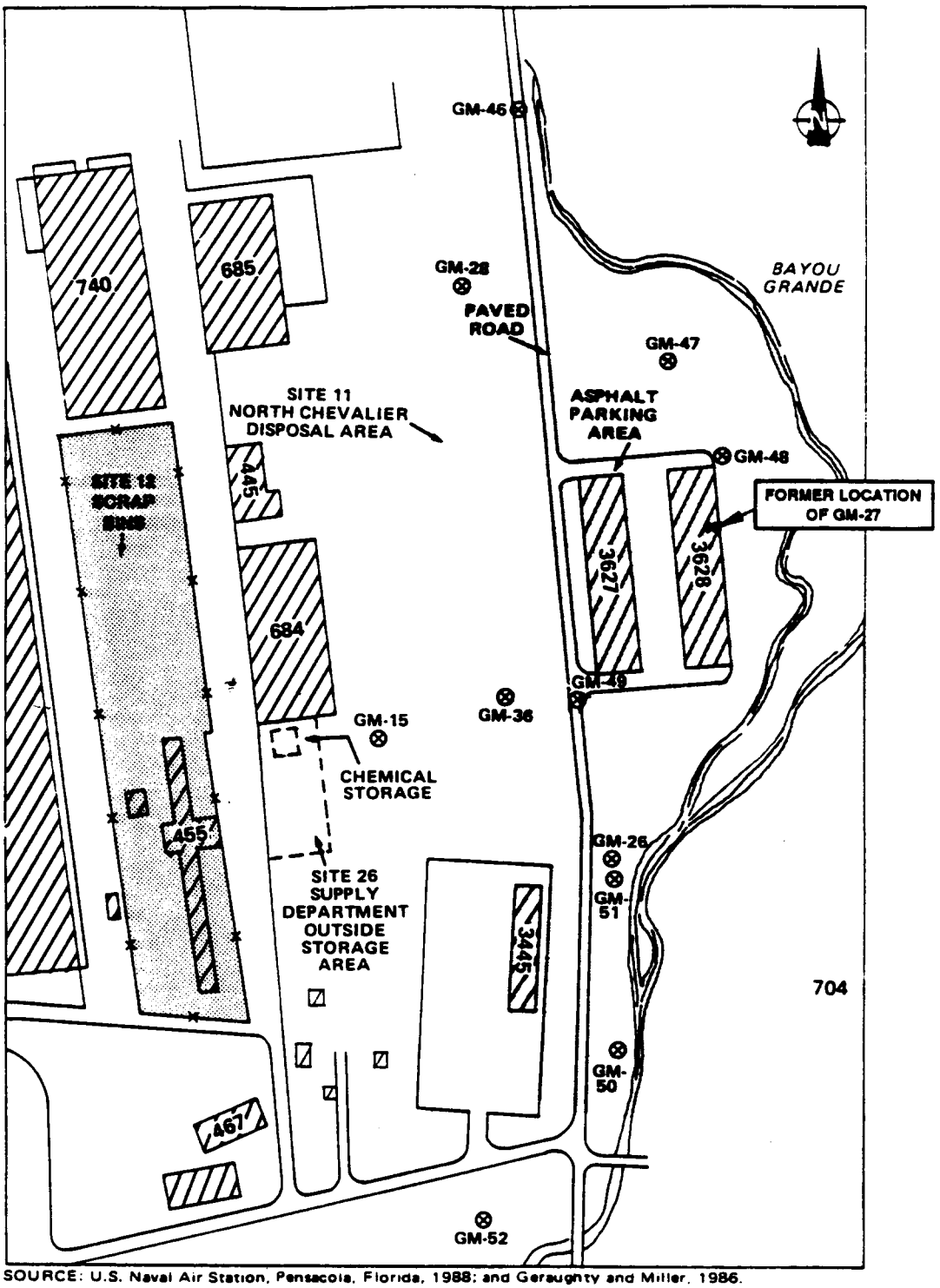
SOURCE: U.S.G.S. 7.5 Minute Series (Topographic) Quadrangle Fort Barrancas, Fla. 1970 and West Pensacola, Fla. 1970, photorevised 1987.

SCALE

0 ½ 1 MILE

0 .5 1 KILOMETER

Figure 2–1 LOCATION MAP– NAS PENSACOLA SITES 11, 12, and 26



SOURCE: U.S. Naval Air Station, Pensacola, Florida, 1988; and Geraughty and Miller, 1986.

SCALE

0 100 200 400 600 FEET

KEY:

⊗ Existing Monitoring Well

Building

Figure 2-2 SITE MAP — NAS PENSACOLA SITES 11, 12, AND 26

TABLE 2-1

CONSTRUCTION DETAILS OF MONITORING WELLS ON OR NEAR SITES 11, 12, AND 26 AT NAS PENSACOLA

Well Designation	Surface Elevation (ft msl)	TOC Elevation (ft msl)	Total Depth Drilled (ft)	Screened Interval (ft)	Depth to Filter Pack (ft)
GM-15	6.4	7.54	11.5	9.0 - 11.5	5.0
GM-26	3.6	4.48	11.5	9.2 - 11.7	5.2
[GM-27*	6.0	8.06	18.0	15.5 - 18.0	11.5]
GH-28	8.6	10.82	20.0	17.9 - 20.4	13.9
GM-36	5.4	7.75	20.0	17.7 - 20.2	13.8
GM-46	9.7	12.17	15.0	12.5 - 15.0	8.0
GH-47	5.2	7.73	15.0	12.5 - 15.0	8.0
GM-48	6.4	8.90	15.0	12.5 - 15.0	8.0
GH-49	4.9	7.36	15.0	12.5 - 15.0	8.0
GM-50	3.2	5.71	15.0	12.5 - 15.0	7.0
GM-51	2.3	4.84	63.0	58.0 - 63.0	55.0
GM-52	3.2	5.65	15.0	12.5 - 15.0	6.0

[*Monitoring well GM-27 vas destroyed before Geraghty and Miller, Inc.'s, 1986 Study.]

Source: Geraghty and Hiller [1984], 1986.

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

1100437

metal building currently used by NAS Pensacola to store chemicals. The types of chemicals being stored is unknown. The [vest] side of the site is bounded by a paved road and the [east] side is bounded by a wooded area. Surface elevations are approximately 15 to 18 feet above MSL. The topography on the site is gently sloping toward the east. However, about 50 feet east of the site is a topographic break where elevations abruptly drop to about 5 feet above MSL. Surface soils are sandy and well drained. No monitoring wells are located on site; however, a shallow well, GH-15, is located approximately 120 feet east of the northeast corner of the site.

3. SITE EISTORY

3.1 Site 11 - North Chevalier Disposal Area

Site 11 was a low, swampy, partly submerged area where industrial wastes were disposed of and burned from the late 1930s to the mid1940s. The outer site boundary (edge of shaded area in Figure 2-2) is believed to coincide with the pre1930s shoreline as indicated on a 1930 topographic survey. Hence, it is inferred that the area covered by this site is the minimum area of fill (G 6 M 1984). It was reported that approximately 24 cubic yards per day (yd^3/day) of refuse, including wastes from aircraft engine overhauls, waste oils, lumber, and other burnables, were disposed of there. Prior to 1950, oil slicks were noted in the Bayou Grande branch following heavy rains. Naval Energy and Environmental Support Activity (NEESA 1983) reported that soil collected during the installation of a monitoring well in 1980 at this site showed oil contamination. In an Initial Assessment Study (IAS) survey conducted by the NEESA in 1983, a sediment sample collected from Bayou Grande near this site showed high concentrations of cadmium, chromium, mercury, nickel, and lead (140 mg/kg, **8,900** mg/kg, 2 mg/kg, 27 mg/kg, and 650 mg/kg, respectively). In addition, areas of oily soil were noticed (NEESA 1983). In 1986, a Characterization Study conducted by Geraghty and Hiller, Inc. (G & M) concluded that the groundwater in this site was generally contaminated with volatile organic compounds (VOCs), and had slightly elevated levels of lead and mercury. Tables 3-1 and 3-2 list the detected compounds.

3.2 Site 12 - Scrap Bins

From the early 1930s to the mid1940s, garbage from NAS Pensacola was placed in scrap bins and stored in this area (industrial wastes were sent to the North Chevalier Disposal Area). Approximately 16 yd^3/day

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

TABLE 3-1

SUMMARY OF CHEMICAL ANALYSES OF GROUNDWATER SAMPLES
SITES 11 AND 26 TAKEN IN 1984
(ug/L)

	Well Numbers				
Compound	GM-15	GM-26	GH-27	GH-28	GM-36
Methylene chloride	**TR**	**TR**	--	TR	--
Trans-1,2-dichloroethene	--	--	--	**TR**	--
Chloroform	--	22	--	--	--
1,1,1-trichloroethane	--	TR	--	--	--
Trichloroethane	TR	TR	--	**TR**	--
1,2-dichloroethane	TR	--	--	--	--
Tetrachloroethene	TR	--	--	--	--
Benzene	--	--	--	--	--
Toluene	--	--	--	--	--
Vinyl Chloride	--	--	--	--	--
Ethyl Benzene	--	--	--	--	--
1,1-dichloroethane	--	--	--	--	--
TOTAL VOLATILES	11	32	0	10	0

Note: -- = Not Detected
TR = Trace [<10 ug/L (ppb)]

Source: G & M 1986

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

1100430

TABLE 3-2

SUMMARY OF CHEMICAL ANALYSES OF GROUNDWATER SAMPLES FROM SITBS 11 AND 26 TAKEN IN 1986 (ug/L)

Compound	Well Number (GM-)									
	26	*28*	*36*	*46*	*47*	*48*	*49*	*50*	*51*	*52*
Methylene chloride	--	--	--	--	--	--	--	--	--	--
Trans-1,2-dichloroethene	TR	TR	--	--	TR	--	--	39	--	530
Chloroform	--	TR	--	--	--	--	--	--	--	--
1,1,1-trichloroethane	--	--	--	--	--	--	--	--	--	--
Trichloroethene	--	--	--	--	--	--	--	--	--	21
1,2-dichloroethane	--	--	--	--	--	--	--	--	--	--
Tetrachloroethene	--	--	--	--	--	--	--	--	--	--
Benzene	32	21	--	--	59	18	--	TR	TR	--
Toluene	TR	TR	--	--	21	--	--	--	--	--
Vinyl Chloride	16	54	--	--	14	TR	--	390	TR	73
Ethyl Benzene	--	--	--	--	33	--	--	--	--	--
1,1-dichloroethane	--	--	--	--	--	--	--	TR	--	--
TOTAL VOLATILES	65	94	--	--	132	27	--	437	4	813
Lead	--	--	--	--	--	--	--	--	69	
NT										
Hercury	--	--	--	--	27	--	--	--	--	NT

Note: -- = Not detected
TR = Trace [<10 ug/L]
NT = Not tested

Source: G & M *1986*

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

(2 truck loads per day) of vet garbage vas stored here before being hauled off and used as livestock feed. There is no evidence of hazardous material disposal at this site (NEESA 1983).

3.3 Site 26 - Supply Department Outside Storage Area

This site was used prior to 1956 until 1964 for outdoor storage of industrial Chemicals, including paint strippers and acids, by the NAS Pensacola Supply Department. Incoming containers of these materials vere placed on steel matting where leaks into the soil sometimes occurred (NEESA 1983). During the IAS, three soil samples were collected to depths of 2 feet, and vcre analyzed for EP toxicity metals. The results shoved that no samples exceeded EP Toxicity limits, A Verification Study conducted by G & M in 1984, however, shoved chlorinated aliphatic solvents present at trace levels in a groundwater sample taken from monitoring well GM-15 (downgradient of this site). The analytical results of this sample are contained in Table 3-1. The presence of these detected compounds may be an indication of prior spillage of paint stripping chemicals.

1100440

4. CLIMATOLOGY

The 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 of the days during the summer months and can cause a 10° to 20° F drop in temperature in 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 seven inches per month) and lowest during spring and fall (averaging four 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, which reduces the potential recharge resulting from heavy summer rains. 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 1978). Eurricanes and tornadoes are infrequent but can cause substantial damage to the nearshore environment. Six hurricanes have passed within 50 miles of Pensacola since 1980.

1100441

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 semi-natural (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 pine),

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

Ouercus 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 statewide 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 (Uolfe et al. 1988).

Two other community types may be found in the western portions of the NAS Pensacola facility. These are flatvoods and sandhill vegetative communities. Platvoods vegetation occupies areas vhich 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 low depressions and small creeks and drainage courses, but the overstory vegetation is usually replaced by Taxodium ascendens (pond cypress), Cliftonia aonophylla (black titi), Cyrilla racemiflora (swamp titi), and other hydric or riparian species. Open moist savannah areas within flatvoods are dominated by the herbaceous plants Pinguicula spp. (butterwort), Sarracenia spp. (pitcher-plants), Uticularia spp. (bladderworts), Polygala spp. (milkworts), and Drosera spp. (sundews; Uolfe 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), Ouercus laevis (turkey oak), O. marilandica (bluejack oak), O. 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 (vire grass). These habitats were verified vith walk-through surveys and ground truthing by the Navy in March of 1986 (Navy 1986).

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

1100442

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

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; Polfe et al. 1988).

Intermittent streams found on NAS Pensacola have lost most of the original vegetation associated with this habitat. For example, at Site 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 vas conducted during a predominantly non-mating season, it is likely that there are more species of birds using the facility and surrounding vaters as feeding and nesting sites than have been found.

Reptiles and 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 which 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 C). Most of the reptiles and amphibians that may be found on the facility can be expected to use the surface vater bodies in some stage of their life cycle. Any contamination of surface vater bodies can be detrimental to existing populations of reptiles and amphibians utilizing that vater body.

5.1.2 Aquatic

Prcshvater. 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 vith aquatic habitats are Semotilus atromaculatus (creek chub), Gambusia affinis (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 vaters (Uolfe et al. 1988).

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

1100443

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 of 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 Haploscoloplos spp.) and bivalves (Anodontia alba and Tellina spp.) during most of the year. FDER saaples collected along the vastevater treatment plant outfall shov a drastic drop in species abundance and diversity close to the sevage 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 lov density yet moderate diversity of benthic infaunal organisms when compared to other estuarine systems vithin and around the turning basin. A complete comparison of the Navy's data can not be made to other literature at this tine because their data are not given in numbers per unit area. However, the Navy's data reveal that very few deep dvelling organisms reside in the areas around the turning basin, and a lack of deep dvelling 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 1928). The 13 most abundant species vere 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 vas highest in the more saline vaters near the NAS Pensacola facility during spring and summer. In the less saline vaters of East Bay', diversity vas lowest in summer and highest during the vinter months. Fish population density vas the highest in the more saline waters, vith peaks throughout the summer (Cooley 1978).

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).

1100444

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 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 hov many are removed. The nearest seagrass beds to the NAS facility are located in the 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 percent of all commercially valuable fish species are estuarine dependent during some phase of their life cycle. Shrimp, blue crab, and shellfish are knovn to release larvae that feed in and around estuaries until settlement. During early life history stages the juveniles reside vithin seagrass beds or other protected habitats until maturity. Any contamination of the vater 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 vithin 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 vaters. The atlantic bottlenose dolphin (Tursiops truncatus), however, has been sighted regularly off the NAS Pensacola facility. Manatees have been sighted irregularly, with one recent sighting in the area recorded by the Florida Natural Areas Inventory (FNAI) in October 1988. A goosebeaked whale (Ziphius cavirostris) vas reported stranded on Santa Rosa Island, and a pilot vhale (Globicephala aacrorhynchus) vas 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 vithin the vaters surrounding the NAS Pensacola facility.

Threatened and Endangered Species. A number of threatened and endangered species have been identified in the vicinity of the NAS Pensacola facility (see Appendix C). Many rare, threatened, and endangered species are associated vith the wetland or bog habitats found on NAS Pensacola. A total of 57 occurrences for six plant species vere recorded in an inventory conducted by FNAI (1988b) of the NAS Pensacola facility (see Appendix C). Host of these plants were found in the area around Sherman Field and habitats to the vest. 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 vaters surrounding the NAS Pensacola facility, as well as nesting and feeding animals on the

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

1100445

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

Site 11 occupies an area along Bayou Grande on the north side of NAS Pensacola. Vegetation on site has been altered to some degree by the construction of a road through the site and the erection of several warehouses. A sand pine scrub community surrounds the areas of construction; the community overstory is dominated by pines and scrub oaks, and the understory is dominated by species of palmettos, cladonia, rosemary, and yucca plants. In areas of building construction, the vegetation has been replaced by cultivated grass species.

Aquatic habitats that may be affected by Site 11 include a freshwater creek that crosses the eastern side of the site and Bayou Grande. It is unknown at this time if freshwater or estuarine marshes border the creek and/or Bayou Grande. It is expected that a large number of birds, reptiles, amphibians, marine invertebrates and fish, and mammals, currently use this site for feeding, nesting, or migration corridors.

Site 12 has been fully developed by NAS Pensacola activities. The site is covered vith concrete driveways and several warehouse facilities; therefore, there are no vegetative or aquatic habitats, and very few birds, reptiles, or small rodents associated with this site.

Site 26 is primarily an undeveloped area, with the exception of a chemical storage shed and a small concrete pad adjacent to the shed. The areas surrounding the site to the east and south are composed of a fairly well developed sand pine scrub community. Scrub oaks and grasses dominate the vegetation found around the site. It is expected that many birds, reptiles, amphibians, and small mammals currently use the site for feeding, nesting, or migration corridors.

6. SURFACE VATW 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 (U.S. Geological Survey [USGS] 1970a, and 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 vater table.

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

The discharge of surface vaters into Pensacola Bay, Bayou Grande, and the coastal vetland 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 vater or groundvater, into vetland 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 Water Hydrology

Tvo surface vater bodies lie in close proximity to sites 11, 12, and 26. These are a small unnamed creek and an arm of Bayou Grande. The small unnamed creek is mainly freshwater; its source is derived largely from groundvater seepage. The small creek flovs to the north into the arm of Bayou Grande vhich is brackish or marine. Both the portion of the creek adjacent to the sites and Bayou Grande are subject to tidal fluctuations in vater levels.

Given that shallow groundvater in this area discharges into these surface vater bodies, any contamination associated vith these sites may impact the surface vater. Rainfall runoff from contaminated soils could also have an impact on surface vater quality. No surface vater or sediment samples will be collected as part of this investigation vork plan; however, the investigation of Site 30 encompasses the collection of samples in these vater bodies.

1100447

7. PHYSIOGRAPHY AND HYDROGEOLOGY

7.1 Physiography and Regional Bydrogeology

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 mean sea level (MSL). 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.

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

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. 1984). In this portion of Florida, the Surficial Aquifer constitutes an important source of vater 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 l (FDER 1988b).] The sediments making up this aquifer belong to all or part of the Pliocene to Rolocene Series which, 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 vith 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 vith land surface and contains groundwater under vater table or perched vater table conditions. The results of numerous borings conducted at NAS Pensacola (G & M 1984, 1986) indicate that the surficial zone ranges in thickness betveen 40 and 70 feet and consists of tan and brown, fine- to medium-grained quartz sand. Depth to the vater table vithin 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 groundvater flov is controlled by the topography and by discharge to surface vater bodies. Consequently, shallov groundvater in the surficial zone moves tovard areas of lover elevation and/or the nearest surface vater body. Overall, the surficial zone has a high permeability. Numerous aquifer (slug) tests and laboratory permeability tests conducted on vells in or sediments from the surficial zone at NAS Pensacola (G & M 1986) yielded hydraulic

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

1100448

conductivity values ranging from 16 to 56 ft/day. Horizontal groundwater 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.

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 semi-confining 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 below land surface (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;

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

hovever, due to high iron content in the vater, the vells are infrequently used (G & M 1986). The principal sources of vater for NAS Pensacola are vells located at Corry Field, approximately 3 miles to the north. The thickness of the main producing zone can be highly variable; hovever, it is estimated to be up to about 100 feet at NAS Pensacola. Insufficient data exist for vells open to the main producing zone at NAS Pensacola to determine direction of groundvater flov vithin this zone; hovever, the flov direction is assumed to be generally southvard under ambient conditions. Pumpage of the supply vells vould locally cause groundwater in this zone to flow toward the vells.

As a result of the overlying lov permeability zone, groundvater vith n the main producing zone occurs under confined or semi-confined conditions. At one nested well location on NAS Pensacola (east of Building 648), the vater level elevation in a well open to the main producing zone is approximately 7 feet lover than that in an adjacent well open to the surficial zone (G & M 1986). This indicates that a significant dovnvard 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 knovn 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 vithin the sediments termed Miocene 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 al.~~ 1985). In general, the Intermediate System consists of fine-grained sediments, and functions as an effective confining unit vhich retards the exchange of vater betveen the overlying Sand-and-Gravel Aquifer and the underlying Floridan Aquifer System (SEGS 1986). For the most part, the entire sequence is poor to non-vater bearing. However, relatively thin beds of sand exist vithin the unit vhich may yield small quantities

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

of water. In the NAS Pensacola area the Intermediate System is approximately 1,100 feet thick and is composed of the lower portion of the Miocene Coarse Clastics, the Upper Member of the Pensacola Clay, the Escambia Sand Member of the Pensacola Clay, and the Lower Member of the Pensacola Clay, all of Miocene Age.

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 composed 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

In the immediate vicinity of sites 11, 12, and 26, the surficial zone of the Sand-and-Gravel Aquifer occurs from land surface to a depth of approximately 43 feet. The lithologic descriptions of cuttings collected during the installation of monitoring well GM-51, located on Site 11 (see Figure 2-2), indicates that the surficial zone primarily consists of tan to brown, fine- to medium-grained quartz sand. Ten shallow monitoring wells open to the surficial zone exist in the immediate proximity of sites 11, 12, and 26 (see Figure 2-2). These wells indicate that the water table in the Site 11 area occurs from approximately 2 feet BLS in the southern portion of the site to 7.5 feet BLS at the northern end. The depth to the water table at Site 12 is estimated at 12 to 15 feet BLS and 12 feet BLS at Site 26. Based on water-level data collected from these wells (G & N 1986), the direction of groundwater flow is generally to the east toward Bayou Grande, and the horizontal hydraulic gradient is approximately 0.003 (G & N 1986). G & M reported a hydraulic conductivity of 34 feet per day (ft/day) from tests on a shallow well (GM-49) located at Site 11. Assuming an effective porosity of 0.20, the horizontal flow velocity in the surficial zone in this area is estimated to be approximately 0.51 ft/day or 186 ft/year.

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

Immediately underlying the surficial zone in the vicinity of sites 11, 12, and 26 is the lov permeability zone of the Sand-and-Gravel Aquifer. Based on the cuttings from the installation of vell GM-51, this zone primarily comprises green to gray, sandy clayey silt vith some shell fragments. No monitoring wells open to the lov permeability zone exist in the vicinity of sites 11, 12, and 26; hovever, based on the lithology, this zone would be expected to function as a confining or sed-confining unit restricting the flov of groundvater betveen the surficial zone and the underlying main producing zone. The direction of groundwater flov vithin the lov permeability zone is unknown.

The direction of groundvater flov vithin the main producing zone at these sites is unknown; hovever, a generally southvard flov is expected under ambient conditions. An NAS Pensacola supply vell (Well No. 2) is located approximately 3,000 feet southvest of sites 11, 12, and 26, and is screened betveen 110 and 160 feet BLS, and thus is open to the main producing zone. This vell is utilized by NAS Pensacola for backup vater supply only during periods of peak demand. During these periods of pumping, the direction of flov in the main producing zone vould be tovard the supply vell. Insufficient data exists for vells open to the main producing zone to determine the horizontal hydraulic gradient in this zone at NAS Pensacola.

1100450

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

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 .incorporateand reference applicable technical and schedule sections, as appropriate, and will follow E & E's project management guidelines (see Section 22).

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

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 Sites 11, 12, and 26 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.

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

10. HEALTH AND SAFETY PLAN

A comprehensive General Health and Safety Plan (GHSP) and individual site-specific safety plans (SSPs) have been developed to provide readily available emergency information and preventative safety measures [(see Appendix A)]. The GHSP 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 (site entry, decontamination, etc.); hazard communication and training (safety training, briefings, documentation, etc.); safety equipment and instrumentation (monitoring, personnel protective equipment, etc.); hazard evaluation by contaminant class (metals, organics, etc.); and hazard evaluation for each task (drilling, sampling, etc.). The GHSP will be periodically updated, as required, during the course of this program.

In addition, the GHSP 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 (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 GHSP and the SSP will comply with the Occupational Safety and Health Administration (OSHA) Guidelines for Hazardous Waste Operations (29 CFR Section 1910).

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

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 SOAP 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 SOAP 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 SOAP and with U.S. Navy and EPA procedures.

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

12. AERIAL PHOTOGRAPH ANALYSIS

Prior to the initiation of fieldwork, E 6 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 that 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 augering, boring, drilling, or excavation activities, E 6 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 6 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 II) 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, which reflect the "focusing" objective--rather than 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.

14.1.1 Physical Survey

14.1.1.1 Overall Physical Reconnaissance

A field reconnaissance survey will be conducted on and around sites 11, 12, and 26. Available aerial photographs and maps will be used as guides in locating surface features. Visual inspections will be made regarding surface conditions, stressed vegetation, and surface drainage patterns.

During the reconnaissance survey, the field team will identify areas which 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 following sections.

The reconnaissance survey team will utilize radiation and air monitoring equipment during walkovers of each site area, in accordance vith Section 6.1.1 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.

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

During the establishment of the geophysical survey grid network (discussed in Section 14.1.2), 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 GOAPP. Measurements will be made at each established grid point, and . readings will be recorded in the field logbook.

Preliminary air screening will be conducted with a particulate monitor, such as a Mini-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 Radiation Survey

During the establishment of the geophysical survey grid netvork, a radiation survey will be conducted on sites 11 and 12 using a micro-R-meter and gamma scintillation detector. The survey will be conducted in accordance vith Section 6.3.2 of the GQAPP. Measurements will be made at each established grid point, and readings will be recorded in the field logbook.

14.1.1.4 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 vhich 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

1100457

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, as well as an evaluation of the literature, will be conducted for each site.

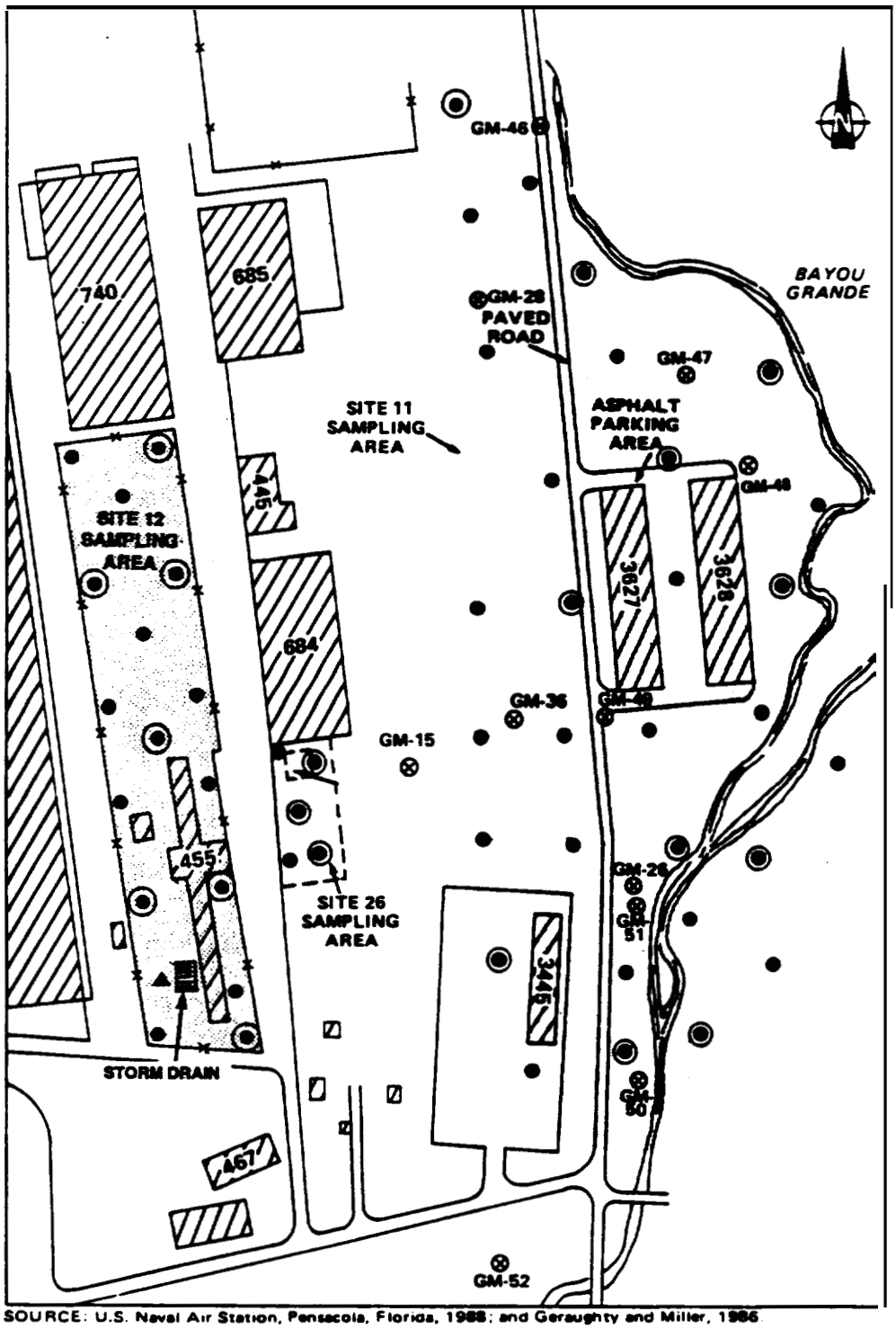
14.1.2 Geophysical Survey

At sites 11 and 26, electromagnetic terrain conductivity (EH-31 and EM-34XL) and magnetometer surveys will be conducted. The geophysical survey will not be performed on Site 12 because of probable interference from steel rebar in the concrete which covers the entire site. The geophysical surveys will be conducted in the Site 11 and 26 sampling areas shown on Figure 14-1. The survey will be performed in accordance with field methodologies and data interpretation techniques discussed in Section 6.2 of the GQAPP.

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

The EH-31 and magnetometer surveys will be conducted by obtaining measurements at each 25-foot interval grid point. EM-34XL readings will be obtained at alternating grid point locations with a spacing of 50 feet.

The geophysical data will be used in conjunction with other background data to identify anomalous conditions in the landfilled areas, water table conditions, the location of potential subsurface contaminant plumes, and the horizontal and vertical orientation of contaminant plumes, if located. Ultimately, the interpretation of these data will be a primary consideration in the development of a rationale for determining Phase I and Phase II sample locations.



SOURCE: U.S. Naval Air Station, Pensacola, Florida, 1988; and Geraughty and Miller, 1986

SCALE

0 100 200 400 600 FEET

KEY:

- ⊗ Existing Monitoring Well
- ○ Tentative Soil Boring
- ◯ Tentative Temporary Monitoring Well
- ▲ Tentative Sediment Sample
- ▨ Building

Figure 14–1 TENTATIVE SOIL BORING AND TEMPORARY MONITORING WELL LOCATIONS, SITES 11.12, AND 26 - PHASE I

1100453

14.1.3 Analytical Screening

14.1.3.1 Laboratory Analyses

Phase I sampling activities for sites 11, 12, and 26 will require the installation of shallow temporary monitoring wells, groundwater sampling, and the collection of soil samples. All of the samples will be analyzed in the laboratory for analytical screening parameters. The analytical screening program has been developed for the Phase I effort to 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 shown in Table 14-1.

Surface Water -- Surface vater and sediment samples collected from Bayou Grande in areas adjacent to these sites are addressed in the work plan for Site 30, phases I and II [(E & E 1992b).]

Sediment -- One sediment sample is tentatively proposed to be collected from the storm drain at Site 12, as shown on Figure 14-1. The sediment sample will be collected in accordance with Section 6.9.2 of the GQAPP and the analytical requirements are shown in Table 14-1.

Soil --Fifty-one soil borings will be drilled in Group B sites: 30 on Site 11, 16 on Site 12, and five on Site 26, as shown on Figure 14-1. At each location, samples will be collected by compositing soils from 5 foot intervals until the water table is reached. For the purpose of calculating sample numbers, the depth to water table is assumed to be 5 feet BLS at Site 11 and 15 feet BLS at sites 12 and 26. If surface runoff pathways to Bayou Grande are identified, soil samples will be collected in the areas of the pathways.

The soil samples will be collected using either a solid stem auger extraction method or a hand-operated bucket auger. All sampling, compositing, and lithologic logging will be performed in accordance with

TABLE 14-1

PHASE I SAMPLING AND ANALYTICAL REQUIREMENTS-GROUP B

SITE 11

Medium	no. of Samples	Duplicates	Total	Analyticgl Suite[a,]
soil	30	2	32	A
Groundwater[d]	11	1	12	A
TOTAL	41	3	44	

Medium	No. of Samples	Dupli-cates	Trip Blanks[f]	Field Blanks	Rinsate Blanks	Preservative Blanks'	Total.	Analytical Suite[a,c]
Groundwator[e]	11	1	1	1	1	1	16	B

SITE 12

Medium	no. of Samples	Duplicator	Total	Analyticgl Suite[a,]
Sediment	1	1	2	A
Soil	48	2	50	A
Groundwater[d]	7	1	8	A
TOTAL	55	3	58	

8

14[NASP]UH1102:T0394/991/11

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

1100453

Table 14-1 (Coat.)

SITE 26

Medium	No. of Samples	Duplicates	Total	Analytical Suite[a,b]
soil	15	1	16	A
Groundwater[d]	3	1	4	A
TOTAL	18	2	20	

14[NASP]UH1102:T0394/991/11

Key:

[a]Analytical suite dosignations are as follows:

A = Volatile organic compounds, polynuclear aromatic hydrocarbons, phenols, pesticides and total PCBs, total rocovorablo hydrocarbons, and metals (total, unfiltered).

B = Target Compound List (TCL) volatile organic compounds plus xylene and ketones, TCL base/neutral and acid extractable organic compounds, TCL pesticides and PCBs, total rocovorablo hydrocarbons, TCL metals (total [i.e., unfiltered], and dissolved [i.e., millipore-filtered]), cyanido. total organic carbon, hardness (water only), and alkalinity (water only).

[b]Specific constituents oncompassod 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 (GQAPP).

[c]Specific constituonts oncompassod by the various chemical groups included within analytical suite B are idontifiod in Tables 9-[6] through 9-[15] of the GQAPP.

[d]Groundwater samples and analytical requirements shown are for Phase I temporary wells only.

[e]Groundwater samples and analytical requirements shovn are tor Phase I existing permanent wells only.

[f]Trip blanks will bo analyzed for TCL volatile organic compounds only.

[g]Preservative blanks will bo analyzed for TCL volatile organic compounds, total rocovorablo hydrocarbons, dissolvod TCL metals, and cyanido.

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

Section 6.6 of the GQAPP. Equipment decontamination will be performed in accordance vith Section 6.10 of the GQAPP.

Groundwater -- Twenty-one temporary stainless steel monitoring wells will be installed around sites 11, 12, and 26. 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 water table (i.e., the top of the screen extends slightly above the water level). As shovn on Figure 14-1, the locations for these wells are tentative. The interpreted results of the geophysical investigation, as vell as information gained froa field reconnaissance surveys and aerial photograph analyses, will allow adjustments and finalization of the temporary shallow vell network. The 21 temporary wells and 11 existing monitoring wells will be purged and sampled in accordance with Section 6.8 of the GOAPP.

14.1.4 Hydrologic Assessment

The temporary wells and existing well network will be surveyed to obtain top of casing (TOC) elevations referenced to USGS datum or to a suitable established benchmark located within the vicinity of these sites. Static water levels will be measured in each well to determine shallow groundwater flow direction and horizontal hydraulic gradient.

In conjunction with the wellhead survey, the elevations of other nearby features such as ponds and streams will be established.

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

14.2 Phase II--Characterization/Extent Delineation

This section of the Contamination Assessment/Remedial Activities Investigation Work Plan--Group B (Site 11, North Chevalier Disposal Area; Site 12, Scrap Bins; Site 26, Supply Department Outside Storage Area), Naval Air Station Pensacola, Pensacola, Florida, has been

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

1100400

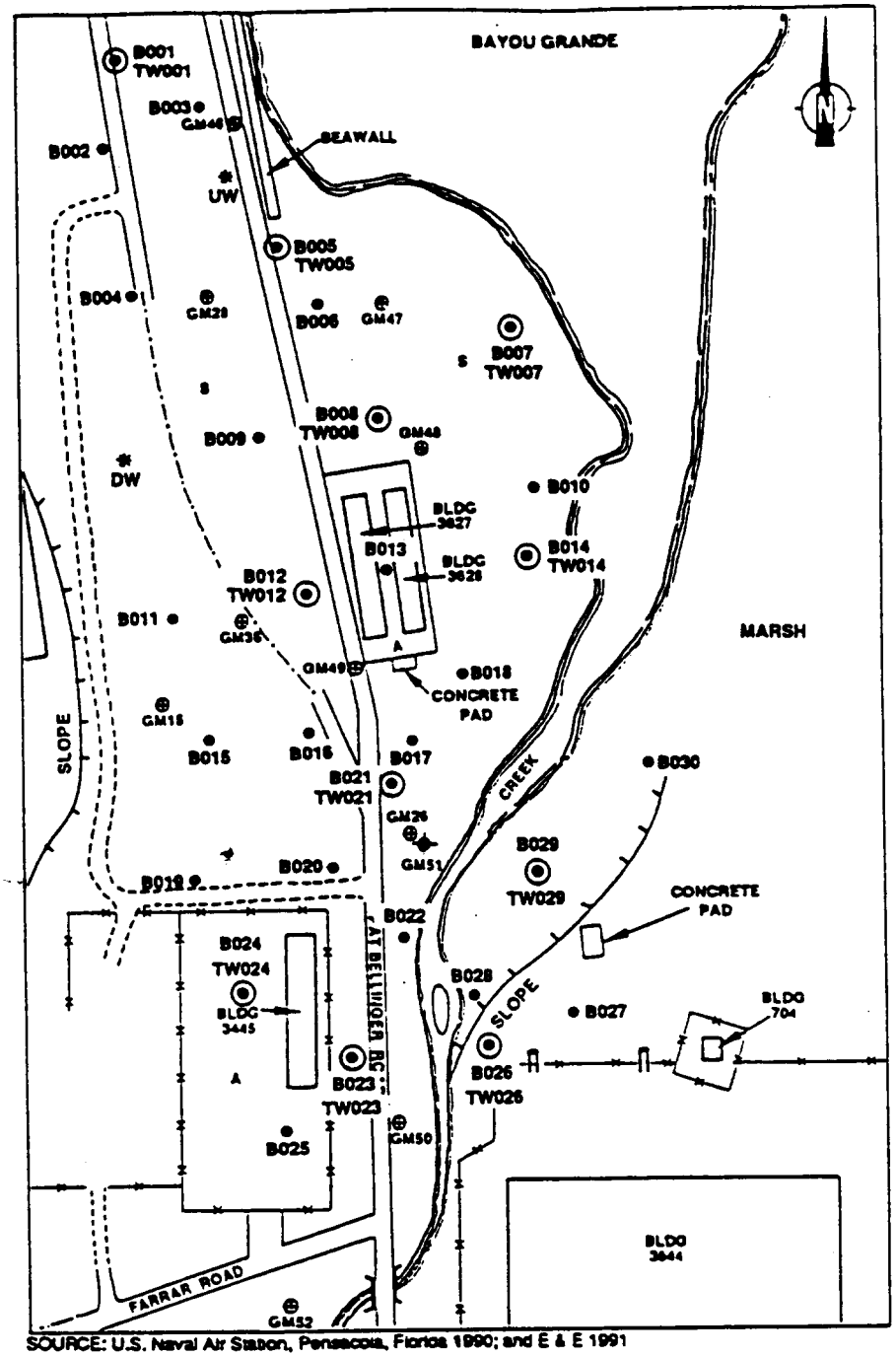
entirely revised to reflect the results of the Phase I activities proposed in the original work plan document ([June] 1990). The original version ([June] 1990) of Section 14.2 of this work plan is presented in Appendix D. Figures 14-2, 14-3, and 14-4 show the actual Phase I sampling locations and location designations. The results of the Phase I investigation of sites 11, 12, and 26 are presented, respectively, in E & E's Final Interim Data Report, Contamination Assessment/Remedial Activities Investigation, North Chevalier Disposal Area (Site 11), Naval Air Station Pensacola, Pensacola, Florida, Volumes I and 11, October 1991; E & E's Final Interim Data Report, Contamination Assessment/ Remedial Activities Investigation, Scrap Bins (Site 12), Naval Air Station Pensacola, Pensacola, Florida, October 1991; and E 6 E's Final Interim Data Report, Contamination Assessment/Remedial Activities Investigation, Supply Department Outside Storage Area (Site 26), Naval Air Station Pensacola, Pensacola, Florida, October 1991.

In general, the results of E & E's Phase I investigation of sites 11, 12, and 26, reviewed in combination with those of previous investigations of the site (NEESA 1983; and [Site 11 only] G&M 1984, 1986), indicated the following:

Site 11

- A potential source of radiation contamination exists in the east portion of Site 11 (approximately 50 feet east of Building 3628), where an elevated radiation reading of 40 to 45 µR/h was obtained during the Phase I radiation survey. However, the nature of the source material and the extent of the contamination are unknown.

- Elevated levels of metals (including arsenic and lead), total recoverable petroleum hydrocarbons (TRPHs), several VOCs, polynuclear aromatic hydrocarbons (PAHs), and phenols were detected in on-site soil samples over a large area of the site. Metals contamination of unsaturated-zone soils is nearly ubiquitous at Site 11 south of buildings 3627 and 3628. The combined TRPH, PAH, and phenol contamination of soils in the unsaturated zone exists over the entire site, except in the extreme north portion and in the north-central portion of the site. Soil contamination detected at Site 11 may be a result of past on-site activities, including industrial waste disposal and burning and landfilling. It is also apparent that Bayou Grande has



SOURCE: U.S. Naval Air Station, Pensacola, Florida 1990; and E & E 1991

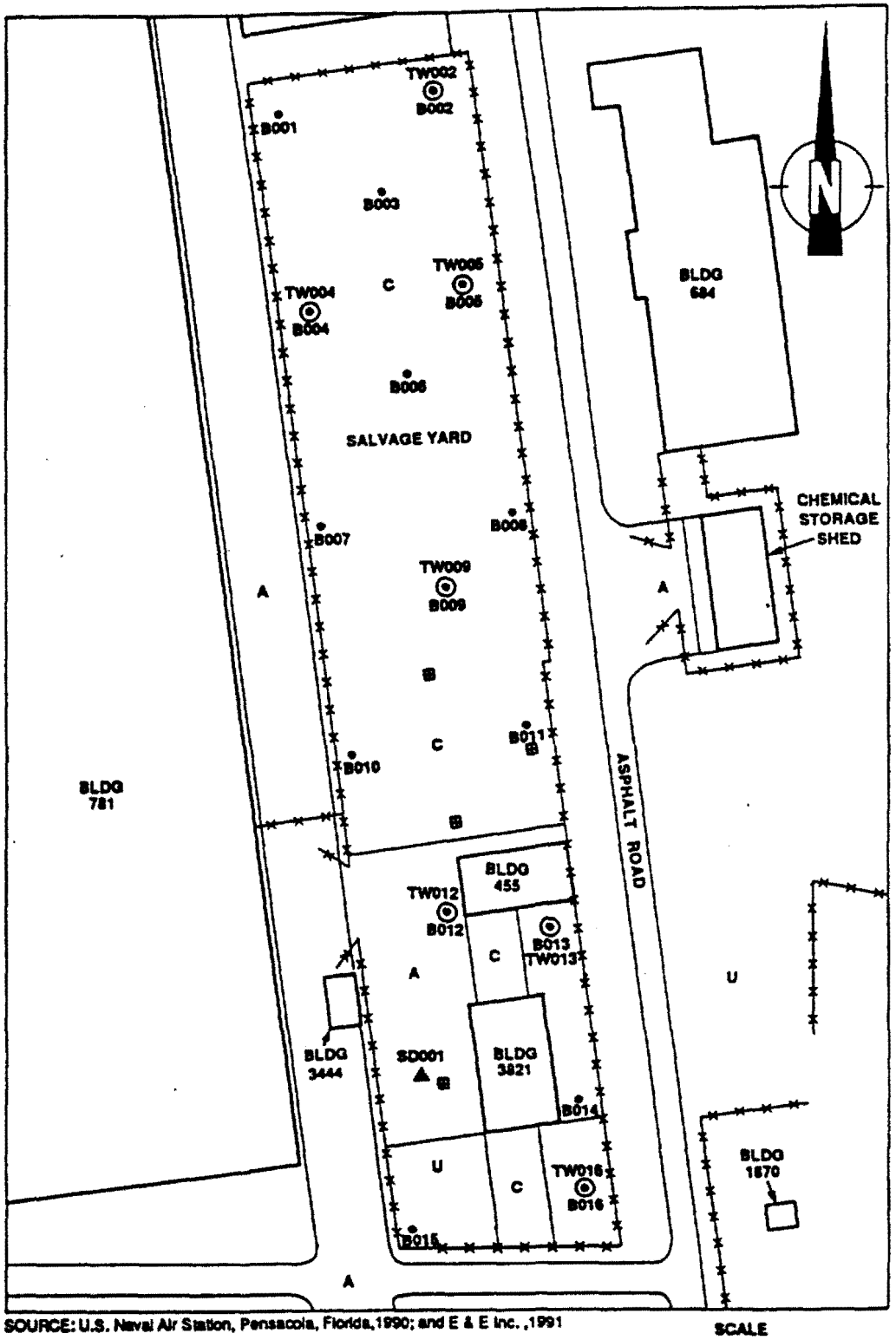
SCALE
0 200 400 FEET

KEY:

Unmaintained Road	A	Asphalt Paved Area	DW/UW	Downwind/Upwind
Abandoned Road	S	Sand	●	Soil Boring
BLDG 882 Building	⊕	Existing Permanent Shallow Monitoring Well	B005	Soil Boring Number
Fence	✦	Existing Permanent Deep Monitoring Well	○	Temporary Monitoring Well
Outfall Pipe	*	Particulate Air Sampling Location	TW005	Temporary Monitoring Well Number

Figure 14-2 PARTICULATE AIR SAMPLING, SOIL BORING, AND TEMPORARY MONITORING WELL LOCATIONS — NAS PENSACOLA SITE 11 — PHASE I

1100461



SOURCE: U.S. Naval Air Station, Pensacola, Florida, 1990; and E & E Inc., 1991

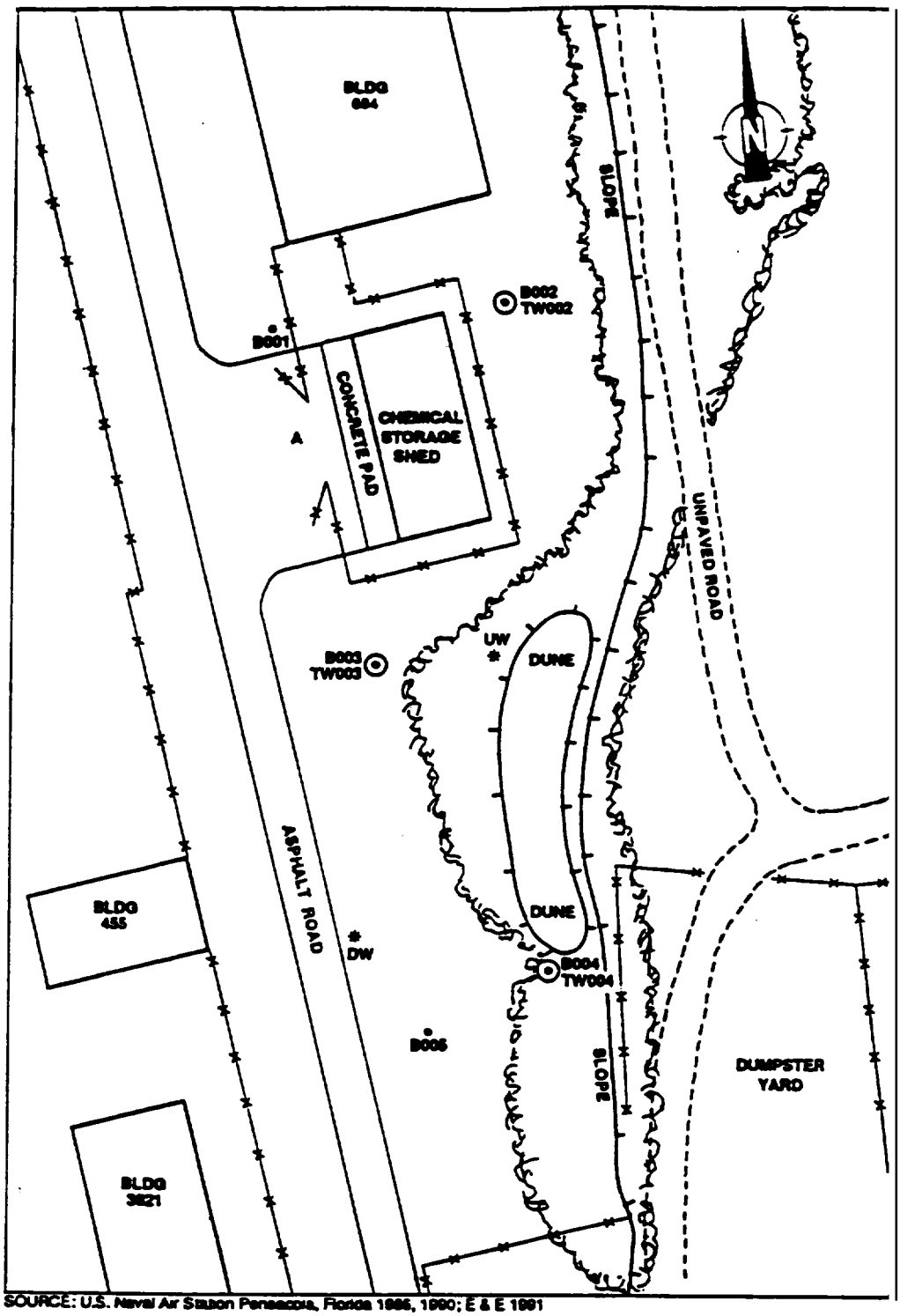
SCALE

0 100 200 FEET

KEY:

A	Asphalt Paved Area	■	Storm Water Drain	•	Soil Boring
C	Concrete Paved Area	⊸⊸	Fence	B002	Soil Boring Number
U	Unpaved Area	▲	Sediment Sample	○	Temporary Monitoring Well
BLDG 684	Building	SD001	Sediment Sample Number	TW002	Temporary Monitoring Well Numbe

Figure 14-3 SEDIMENT SAMPLE, SOIL BORING, AND MONITORING WELL LOCATIONS NAS PENSACOLA SITE 12 — PHASE I



SOURCE: U.S. Naval Air Station Pensacola, Florida 1986, 1990; E & E 1991

SCALE 0 100 FEET

KEY:

BLDG 455	Building	DW/UW	Downwind/Upwind
	Fence	•	Soil Boring
A	Asphalt Paved Area	○	Temporary Monitoring Well
	Trees	B003	Soil Boring Number
*	Particulate Air Sampling Location	TW003	Temporary Monitoring Well Number

Figure 14-4 PARTICULATE AIR SAMPLING, SOIL BORING, *AND* TEMPORARY MONITORING WELL LOCATIONS — NAS PENSACOLA SITE 26 — PHASE I

1100462

been impacted by Site 11 soil contamination--sediment samples collected during the corresponding Phase I investigation of Site 30 exhibited elevated levels of metals, TRPHs, PAHs, and phenols.

- Small thicknesses of floating petroleum product were observed on the water table in the central and southern portion of the site, and an oil sheen was observed in the creek near the southern end of the site.

- Metals concentrations, exceeding either the respective Florida Primary Drinking Water Standards or Florida Groundwater Guidance Concentrations, are widespread in Site 11 groundvater samples. The distribution of elevated total lead, chromium, zinc, and copper concentrations in Site 11 groundvater samples suggests that the central and south areas of the site, near buildings 3627 and 3628, and 3445, respectively, represent at least sources of metals contamination in the aquifer matrix sediments, if not also a source of actual groundwater contamination. Site 11 groundwater metals contamination is clearly impacting Bayou Grande--surface water samples collected during the corresponding Phase I investigation of Site 30 exhibited arsenic, chromium, and zinc at levels exceeding Florida water quality standards.

- Widespread TRPH contamination of groundwater in the central and south portions of the site, VOC contamination in the northeast and south portions of the site (and at different depths vithin the Sand-and-Gravel Aquifer), and PAH and phenol contamination in the northeast portion of the site are probably attributable to on-site sources. It is possible that some VOC, PAH, and phenol contamination in the extreme south and southeast portions of Site 11 may also represent potential off-site sources impacting Site 11 and Bayou Grande.

Site 12

- A potential source of radiation contamination exists in the southeast area of Site 12, where elevated radiation readings (30 to 35 µR/h) were obtained during the radiation survey. Aovever, the nature of the source materials(s) and the extent of the contamination are unknown.

- The stormwater drain sediment sample (SD001) collected at Site 12 exhibited elevated concentrations of metals, TRPHs, PAHs, and polychlorinated biphenyls (PCBs). These results indicate potential sources of contamination exist within the southwest area of the site--the area setved by the drain. The high concentrations of PAHs and PCBs suggest a source exists in close proximity to this area of the site: however, these concentrations also may be residual from some prior on-site leakage.

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

- Several localized areas of soil contamination appear to be present. Elevated levels of total metals and TRPHs are generally videspread; hovever, the contribution of each metal varies from boring to boring across the site, suggesting aultiple potential sources. PAR and phenol contaminant distributions also indicate distinct, localized sources within or adjacent to the site area.

- Metals concentrations exceeding Florida standards vere .detected in groundvater samples collected across the site. The groundvater metals contamination detected has occurred, to some extent, possibly as a result of on-site storage of vaste materials observed near buildings *455* and 3821 during the Phase I site reconnaissance. PCB concentrations belov detection limits in groundvater samples froa the north portion of the site indicate a localized potential source in that area. Phenol concentrations belov detection limits in groundvater samples near Building 455 may be associated vith soil phenol contamination in the southwest corner of the site or vith potential sources adjacent to the site.

(Based on these Phase I results, the Site 12 investigation is no longer limited to screening, but will encompass a full-scale RI/FS.]

Site 26

- Although Site 26 soils shov only traces of total metals, it is apparent that isolated areas of soil contamination exist. These areas are limited in lateral and vertical extent. Soil metals contamination in the north portion of the site may be associated vith the area of the former chemical storage building. Soil metals contamination in the south portion of the site may be associated vith other endemic or ambient sources in this area. PAH contamination is present at depths up to 10 feet BLS in the north portion of the site. TRPH contamination is found only in the 0- to 5-foot BLS interval in the south portion of the site; hovever, TRPH contamination appears to be distributed uniformly across the site area at deeper intervals and may be attributable to an off-site ambient source.

- Metals concentrations exceeding Florida standards vere detected for arsenic, chromium, and cadmium. The arsenic concentration, occurring only in well TW002 in the north portion of the site, may be attributable to an off-site source adjacent to Site 26, possibly Site 12, the Scrap Bin Area. In addition, chromium, vhich vas elevated vith respect to the Florida Primary Drinking Vater Standard in all three Phase I temporary wells, also vas detected in nearly all Site 26 soil saaples, vhich suggests the presence of an endemic source on Site 26. At present, 1,1,1-trichloroethane contamination is limited to the central site area, and the concentration detected vas far

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

1100463

below the Florida Primary Drinking Water Standard. The source and extent of this contaminant plume are unknown; however, the plume may have resulted from site activities at the location of the potential, historical, on-site source area, the former chemical storage area. It is possible that this contaminant may also be associated with an off-site source, possibly Site 12.

In light of the Phase I results summarized above, the objectives of the Phase II investigations of sites 11, 12, and 26 will be as follows:

Site 11

- Identify, to the greatest extent possible, the on-site sources of radiation, metals, and organic contamination as well as potential ambient sources of contamination in the site vicinity;

- Fully characterize the naturelmagnitude and delineate the overall extent of on-site soil and groundwater contamination and the impact of this Contamination on the [the adjacent, south arm of Bayou Grande and on the vicinity of the creek outlet] (Site 30); and

- .Initiate the Risk Assessment and, as warranted, the Feasibility Study for the site.

Site 12

- Identify to the greatest extent possible the on-site sources of radiation, metals, and organic contamination, additional off-site sources of contamination, and any potential ambient sources of contamination in the site vicinity;

- Fully characterize the naturelmagnitude and delineate the overall extent of on-site soil and groundwater contamination and on-site and off-site stormwater sewer sediment and surface water contamination; and

- Initiate the Risk Assessment and Feasibility Study for the site.

Site 26

- Identify, to the ,greatest extent possible, the on-site sources of metals and organic contamination, the impact of any off-site sources of contamination, and any potential ambient sources of contamination in the site vicinity;

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

- Fully characterize the nature/magnitude and delineate the overall extent of on-site soil and groundwater contamination; and

- Initiate the Risk Assessment and, as warranted, the Feasibility Study for the site.

In order to meet the above objectives, the Phase II investigation of sites 11, 12, and 26 will include the following elements:

- Contaminant source survey;

- Stormwater sewer sediment and surface water sampling (Site 12 only);

- Soil sampling;

- Installation of shallov, intermediate (Site 11 only), and deep (Site 11 only) monitoring wells;

- Collection of groundwater samples from all existing (Site 11) and newly installed wells;

- Hydrologic assessment; and

- Engineering survey.

The specific scope of work associated vith each of the above elements is described in sections 14.2.1 through 14.2.4. In developing the specific scopes of work, the Phase I and previous analytical results have both been evaluated regarding all requirements of the CERCLA and Superfund Amendments and Reauthorization Act (SARA), as well as all other ARARs. For sites 11, 12, and 26, these ARARs include:

- Resource Conservation and Recovery Act (RCRA);

- Clean Vater Act (CVA);

- Safe Drinking Vater Act (SDWA);

- 40 CFR Parts 264, 265, 270, and 271 (Corrective Action for Solid Waste Management Units at Hazardous Vaste Management Facilities; Proposed Rule);

- Chapter 17-25, Florida Administrative Code (FAC; Regulation of Stormvater Discharge [Site 12]);

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

1100464

- Chapter 17-3, FAC (Water Quality Standards);
- Chapter 17-302, FAC (Surface Water Quality Standards [Site 12]);
- Chapter 17-550, FAC (Drinking Water Standards, Monitoring, and Reporting); and
- Chapter 17-770, FAC (State Underground Petroleum Environmental Response).

Formal, quantitative air sampling will not be conducted during Phase II at sites 11, 12, and 26 because no evidence that these sites represent a potential source of airborne volatile or particulate contaminants was revealed by the Phase I surface emissions survey, particulate air [screening], or fieldwork air monitoring activities. Biota sampling also will not be conducted during Phase II because the potential contaminants of concern have not been sufficiently characterized. [Hovever, basewide biota sampling will be conducted in conjunction vith the investigation of operable units (OUs) 15, 16, and 17 (Bayou Grande Area, NAS Pensacola Wetlands, and Pensacola Bay Area, respectively).

Bvery effort will be made to complete the investigation of sites 11, 12, and 26 during Phase 11. 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 to maximize the amount of information obtained regarding the horizontal and vertical extents of possible contamination at these 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 vork 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 hydraulic properties of the soil or aquifer matrix. Hovever, sampling and/or analysis will not be performed on media for which the associated procedures are not described in the approved GQAPP. Furthermore, additional data from other site investigations may become available

prior to or during the completion of Phase II activities at sites 11, 12, and 26. This could varrant either an increase or decrease in the scope of vork proposed in this work plan.]

Based on the results of the activities identified above, during Phase 11 E & E will initiate the appropriate Risk Assessment and, as warranted, Feasibility Study activities. Risk Assessment activities will be directed toward identification of contaminants of concern as vell as identification of data gaps that must be eliminated to support the eventual completion of a Baseline Risk Assessment for the sites. [If no data gaps are identified, the Baseline Risk Assessment will be completed during Phase 11.)

Feasibility Study activities, which will be required for sites 11, 12, and 26, will be directed toward identification of data gaps that must be eliminated to support the eventual completion of a comprehensive Feasibility Study for the site. [If no data gaps are identified, the Feasibility Study will be completed during Phase II.]

In addition, if warranted, E & E will evaluate the Phase II results to identify whether any interim remedial measures (IRMs) are required and develop recommendations for implementation of these IRHs (see Section 14.2.5). [IRMs will only be implemented following receipt of BPA approval.]

All Phase II investigation activities and results will be discussed in a separate Interim Data Report for each site structured in the required format of a formal Draft Remedial Investigation Report. This Phase II Interim Data Report will provide a complete data synthesis incorporating the results of E 6 E's Phase I and Phase II investigations, as well as the results of previous investigations. The Interim Data Report will specify whether additional Phase III assessment activities are required, or vhether the formal Draft Remedial Investigation Report for the site can be prepared.

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

1100465

All Phase I investigation activities were completed in accordance with E & E's 1990 GQAPP for Contamination Assessments and Remedial Activities at NAS Pensacola. All Phase II investigation activities will be completed in accordance with the newly revised, updated 199[2] version of this document, subject to its approval. [In this section (14.2), all references apply to the 1992 version of the GQAPP.]

14.2.1 Contaminant Source Survey

A detailed contaminant source survey will be performed at sites 11, 12, and 26 in order to obtain a comprehensive understanding of potential contaminant source(s) at the sites. The survey will focus on existing information in NAS Pensacola files, previous investigative reports, and interviews vith current and former employees of the NAS Pensacola facility. Based on the information obtained from these sources, on-site past and/or present waste streams(s) and waste stream-related activities, on-site buildings and associated activities, on-site past and/or present underground utilities, and potential former and/or existing ambient sources of contamination will be delineated. All background source survey work will be conducted in close communication with the facility Installation Restoration (IR) coordinator as the survey may need to access repositories and/or individuals at several locations among the various tenant commands.

The identification of possible past and/or current waste streams, including volumes, disposal methods, and/or any leaks, that may have occurred at or impacted the sites will be based on a review of the Phase I historical aerial photograph analyses and Phase I and Phase II on-site field observations. The compilation of a list of former and existing on-site buildings/structures and delineation of all associated activities will include the development of a detailed summary table and the provision of former and existing building/structure plans, if available. The evaluation of former and existing underground utilities at the sites will include determining the former and current use of each utility structure. All former and existing utilities will be shown graphically on a site map (see Engineering Survey, Section 14.2.4), based on the detail available in the data base. Finally, the

identification of potential former and existing ambient contaminant sources will involve an evaluation of existing files and literature to determine vhether any normal daily activities at each facility, such as aircraft operations, may have created potential, low-level ambient contaminant source(s).

At sites 11, 12, and 26, specific tasks associated with the contaminant source survey will also include:

Site 11

- The identification of specific areas on Site 11 that were used for "concentrated" disposal of landfill waste and the source and nature of the disposed material;
- The identification of the source and nature of empty containers (i.e., cans) that have been discarded on the escarpment at the vest side of the site, and, in particular, their relationship to Site 26;
- Determination of the location of the industrial vaste sever or other waste conduits servicing industrial activities immediately northvest of the site;
- The identification of the source(s) and nature of apparent petroleum product observed on the water table in the southern portion of the site and seeping into the creek south of the site.
- The identification of the source(s) of abandoned storage containers at the vest-central area of the site, and the nature of the materials they contained.

Site 12

- The identification of the source(s) and nature of the drummed material that is and/or has been stored on the southern end of the site, and consideration of the impact it may have had on the radiation and PCB contaaination in this area;
- The identification of the sources and nature of material that has been stored in the scrap bins in the central and northern portions of the site;
- The identification of any past spills and/or leaks of stored materials on site, and the source and nature of these substances;

1100466

- The identification of the types of wastes and methods of storage at the site, past and present;

- Delineation of the stormwater discharge system and consideration of the potential effects it may have on the distribution of site contaminants as well as an off-site contaminant migration; and

- The specific identification of nearby activities/facilities that may have contributed to the generally widespread TRPH contamination at the site.

Site 26

- The identification of the sources and nature of materials that have been/are stored in the Chemical Storage Shed, including the identification of any past releases of these materials;

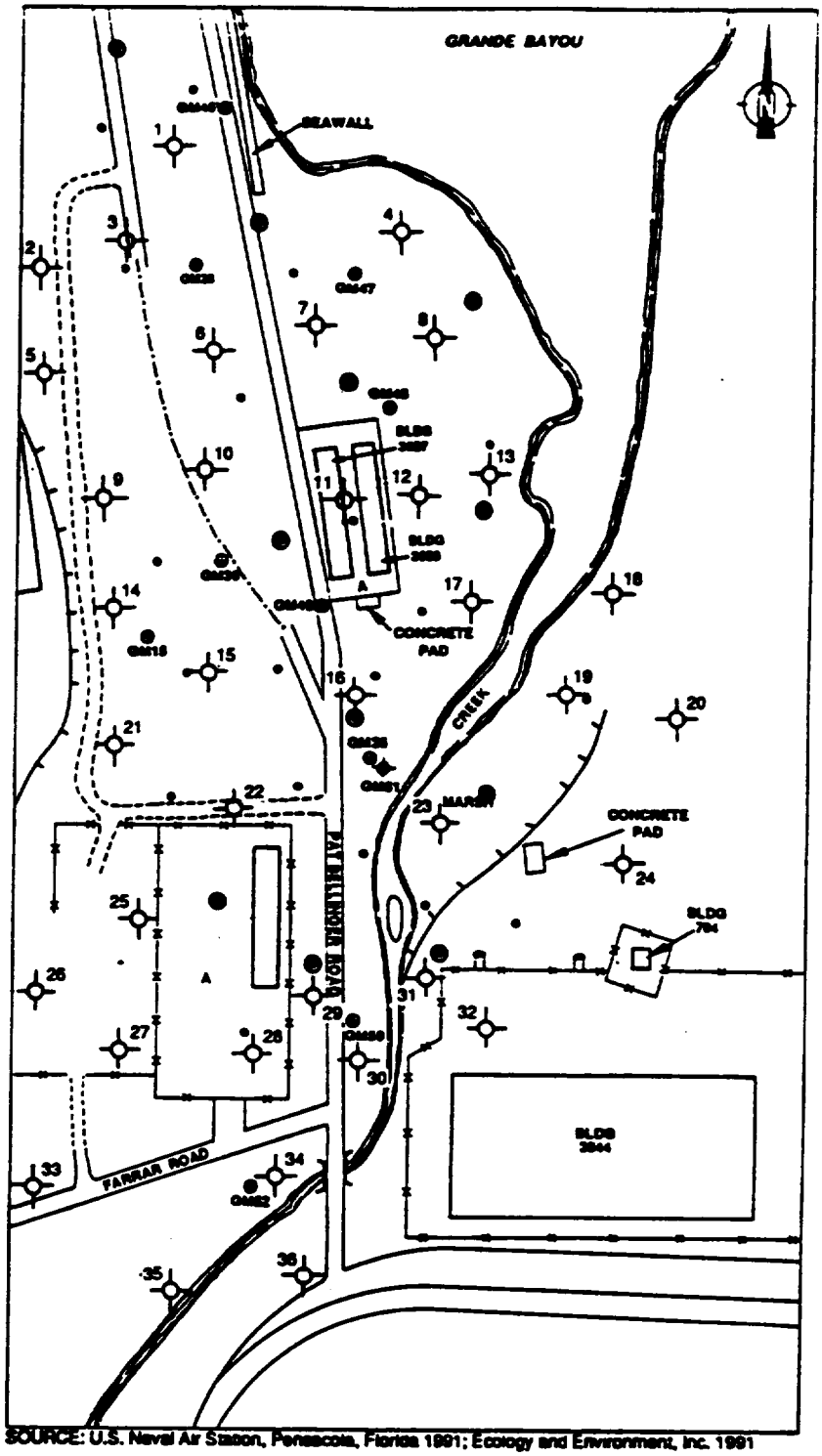
- The identification of any activities/facilities nearby which may be directly impacting the site, and, in particular, the potential effects of Site 12 activities on Site 26;

- The identification of the sources and nature of materials (cans, etc.) that have been disposed of on the surface in the dune escarpment area and the slope east of the site.

- The identification of the source of the one low-level VOC detected in the groundwater in the central portion of the site.

14.2.2 Sampling and Analysis

Figures 14-5 and 14-6 show the proposed Phase II soil boring and monitoring well locations for Site 11; Figure 14-7 shows the proposed Phase II sediment sample, soil boring, and monitoring well locations for Site 12, and Figure 14-8 shows the proposed soil boring and monitoring well locations for Site 26. Tables 14-2, 14-3, and 14-4 summarize the sampling and analytical requirements, including QA/QC samples, for the Phase II investigations of sites 11, 12, and 26, respectively. Tables 14-5 and 14-6 provide the specific rationale for each proposed Phase 11 Site 11 soil boring and monitoring well location, respectively, and for the analytical suite associated with each proposed Phase II sampling location. (Groundwater samples to be collected from the nine existing on-site wells and analyzed for suite A, see below, are not included in rationale Table 14-6). Tables 14-7, 14-8, and 14-9 provide the specific



SOURCE: U.S. Naval Air Station, Pensacola, Florida 1991; Ecology and Environment, Inc. 1991

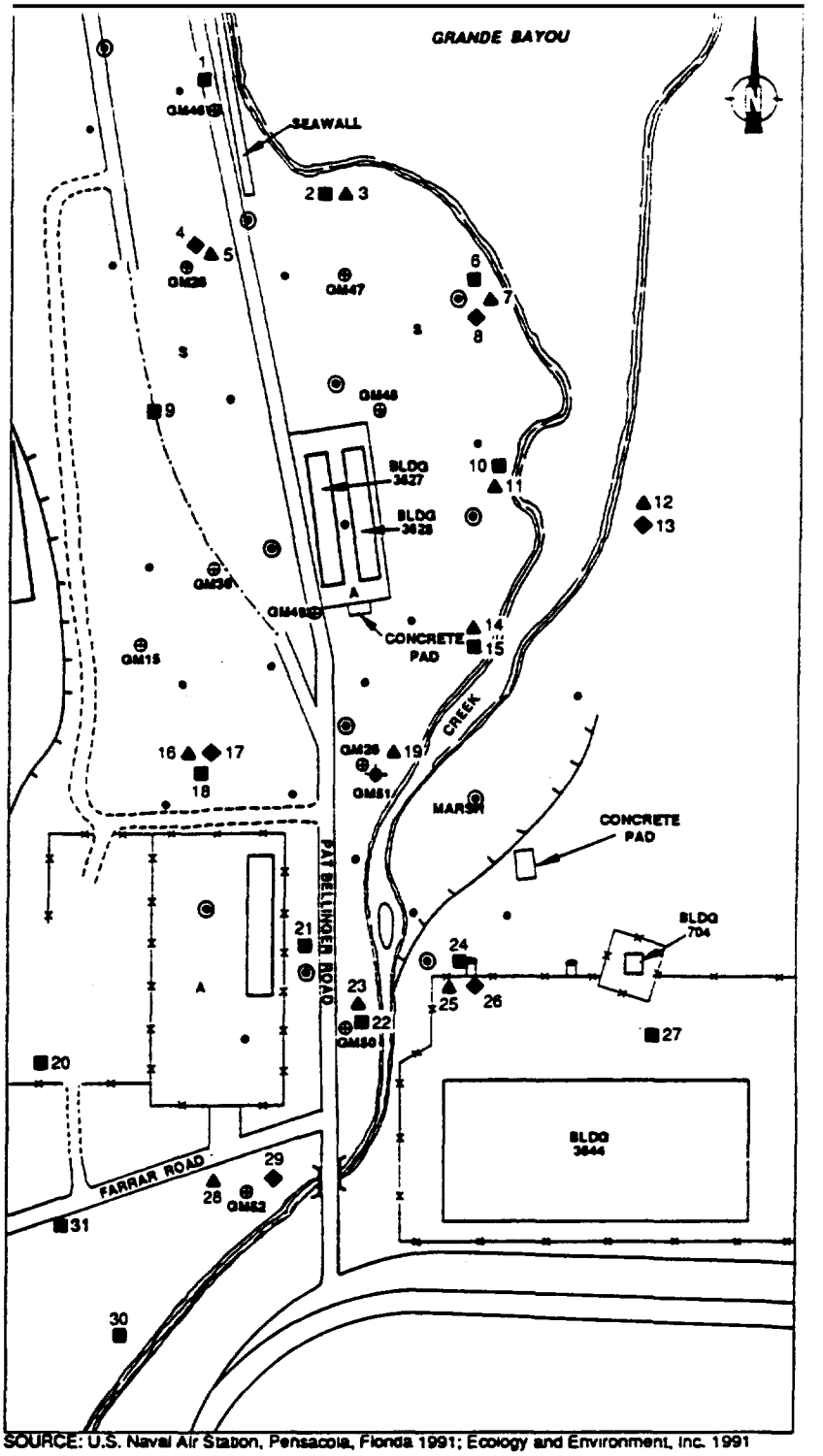
SCALE 0 200 400 FEET

KEY:

	Unmaintained Road	A	Asphalt Paved	•	Phase I Soil Boring
	Abandoned Road	S	Sand	○	Phase I Temporary Monitoring Well
BLDG 3469	Building	⊕	Existing Permanent Shallow Monitoring Well		Proposed Phase II Soil Boring
	Fence	◆	Existing Permanent Deep Monitoring Well	5	Location Reference Number
	Outfall Pipe				

Figure 14-5 PROPOSED SOIL BORING LOCATIONS
NAS PENSACOLA SITE 11 — PHASE II

1100467



SOURCE: U.S. Naval Air Station, Pensacola, Florida 1991; Ecology and Environment, Inc. 1991

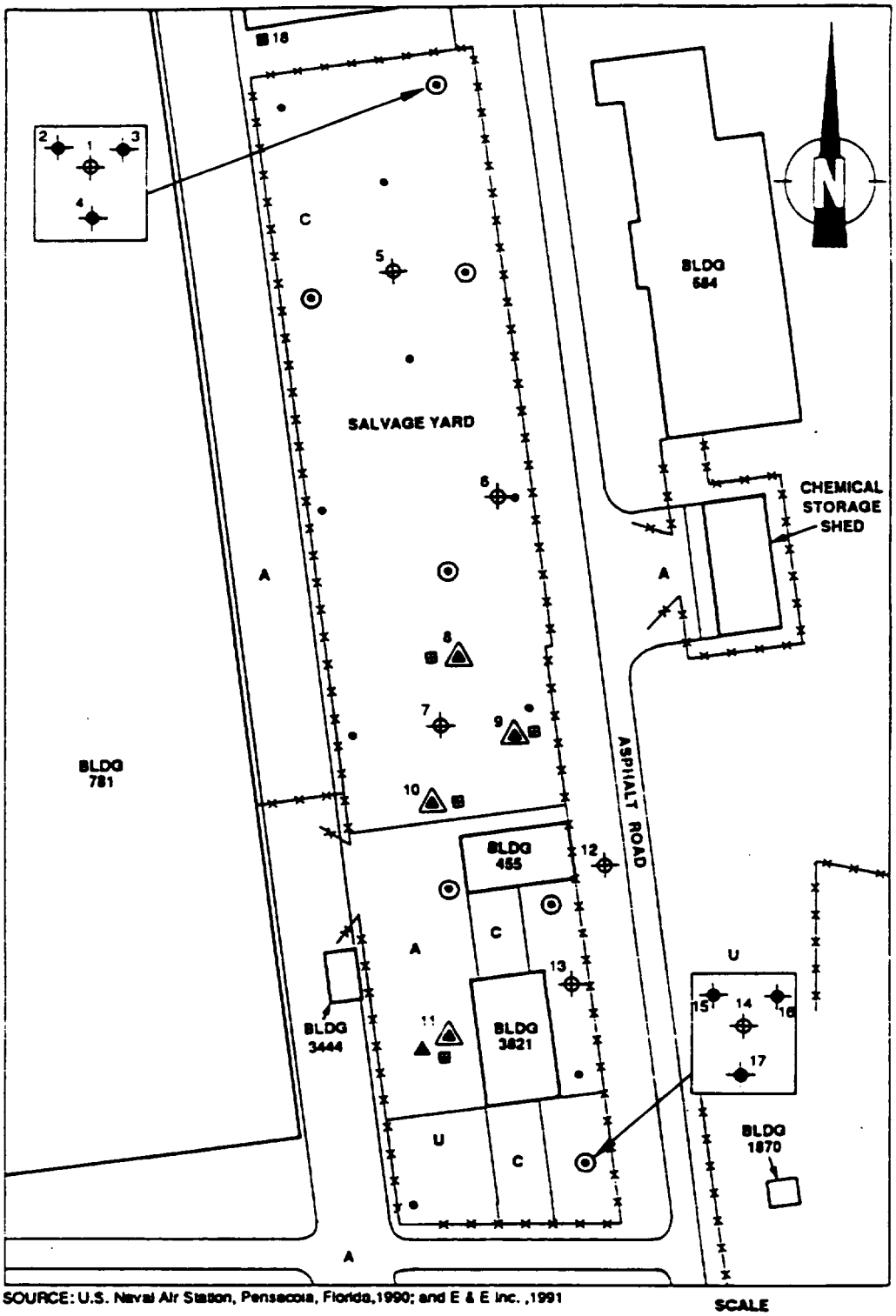
SCALE 0 200 400 FEET

KEY:

	Unmaintained Road	A	Asphalt Paved	○	Phase I Temporary Monitoring Well
	Abandoned Road	S	Sand	■	Proposed Phase II Shallow Monitoring Well
BLDG 3460	Building	⊕	Existing Permanent Shallow Monitoring Well	▲	Proposed Phase II Intermediate Monitoring We
	Fence	◆	Existing Permanent Deep Monitoring Well	◆	Proposed Phase II Deep Monitoring Well
	Outfall Pipe	•	Phase I Soil Boring	5	Location Reference Number

NOTE: Proposed shallow wells 1 and 22 replace damaged existing wells GM46 and GM50, respectively

Figure 14-6 PROPOSED MONITORING WELL LOCATIONS NAS PENSACOLA SITE 11 — PHASE II



SOURCE: U.S. Naval Air Station, Pensacola, Florida, 1990; and E & E Inc., 1991

SCALE

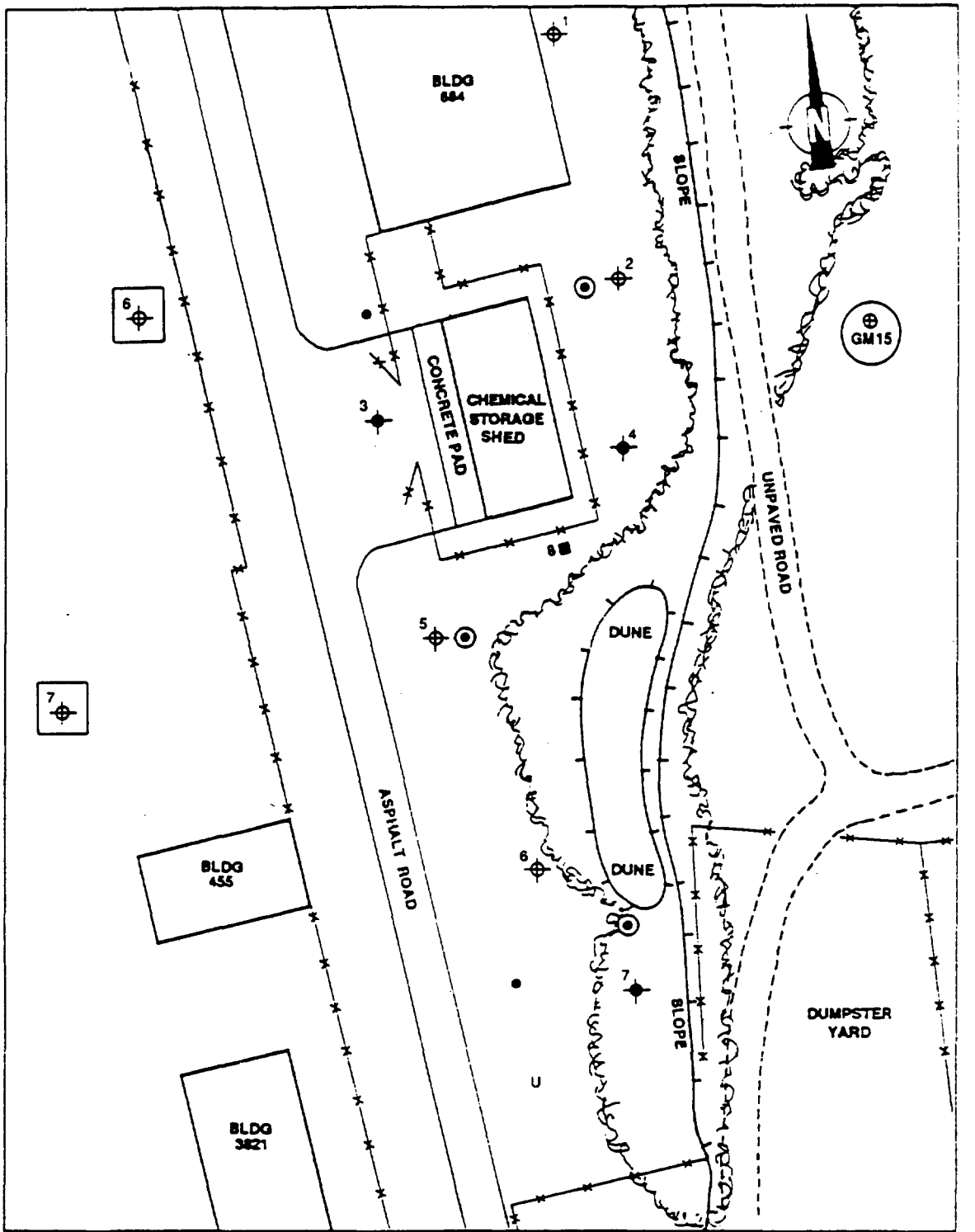
0 100 200 FEET

KEY:

BLDG 684	Building	U	Unpaved		Proposed Phase II Sediment Sample
	Fence		Phase I Sediment Sample		Proposed Phase II Soil Boring
	Storm Water Drain		Phase I Soil Boring		Proposed Phase II Soil Boring and Shallow Monitoring Well
A	Asphalt Paved		Phase I Temporary Monitoring Well	5	Location Reference Number
C	Concrete Paved		Proposed Phase II Shallow Monitoring Well		

Figure 14-7 PROPOSED SEDIMENT SAMPLE, SOIL BORING, AND MONITORING WELL LOCATIONS — NAS PENSACOLA SITE 12 — PHASE II

1100463



SOURCE: U.S. Naval Air Station, Pensacola, Florida 1991; Ecology and Environment, Inc. 1991

SCALE 0 100 FEET

KEY:

BLDG 684	Building	○	Phase I Temporary Monitoring Well	6	Proposed Site 12 Phase II Sampling Location (Approximate)
—×—×—	Fence	✦	Proposed Phase II Soil Boring	GM15	Existing Site 11 Shallow Monitoring Well (Approximate Location)
U	Unpaved	⊕	Proposed Phase II Soil Boring and Shallow Monitoring Well		
	Trees	5	Location Reference Number		
●	Phase I Soil Boring	■	Proposed Phase II Shallow Monitoring Well		

Figure 14-8 PROPOSED SOIL BORING AND MONITORING WELL LOCATIONS NAS PENSACOLA SITE 26 — PHASE II

Table 14-2

PHASE II SAMPLING AND ANALYTICAL REQUIREMENTS
NAS PENSACOLA SITE 11

Medium	No. of Samples[a]	Duplicates	Trip Blanks[b]	Preservative Blanks[b]	Field Blanks	Rinsate Blanks	Total'	Analytical suite[c,d]
Soil[e]	124	12	--	NR[f]	NR	6	142	A
	4	--	NR	NR	NR	--	4	B
	(1)	--	6	NR	NR	--	(1),6	C
	12	NR	NR	NR	NR	NR	12	F
	(48)	NR	NR	NR	NR	--	(48)	D
Groundwater[g]	[40]	4	--	1	4	4	[53]	A
	1	--	4	--	--	--	5	C
	(17)	NR	NR	NR	NR	NR	(17)	E
TOTAL	[182]	16	10	1	4	10	[223]	
	(65)	NR	NR	NR	NR	NR	(65)	

14[NASP]UH1102:T0394/872/10

Key:

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

[b]Trip blanks will bo analyzed for Appendix IX volatile organic compounds (VOCs) only. Preservative blanks will bo analyzed for Target Compound List (TCL) VOCs, total recoverable petroleum hydrocarbons (TRPHs), dissolvod Target Analyte List (TAL) metals, and cyanide.

[c]Analytical suite designations are as follows:

A = TCL VOCs; TCL base-neutral/acid extractable organic compounds (BNAs); TCL posticidos, and polychlorinated biphenyls (PCBs); TRPHs; TAL motals (total [i.e., unfiltered] and dissolved [i.e., millipore-filtered, water only]); cyanide; gross alpha, beta, and gamma radioactivity; total organic carbon: hardness (water only): and alkalinity (water only).

B = TAL metals.

C = Appendix IX VOCs, BNAs, dioxins, pesticides, PCBs, organophosphorus pesticides, herbicides, total motals, cyanide, and sulfide.

D = pH, alkalinity, percent moisture, grain size, BTU contont. ash contont. total organic halogens, sulfur, ignitability, and cation exchange capacity.

E = Total suspended solids, total Kjeldahl nitrogon (TKN), ammonia nitrogon, orthophosphate phosphorus, dissolvod oxygon (in field), 5-day biological oxygon demand (BOD_5), and chemical oxygon demand (COD).

F = Permeability.

[d]Specific constituents encompassed by tho various chemical groups included within tho above-listed analytical suites arm identified in tables 9-[6] through 9-[15] of tho GQAPP.

[e]26 boring locations x 3 depth intervals = 78 samples, plus 10 boring locations x 5 depth intervals = 50 samples, plus 2 samples from each of 6 deep well installation locations (total of 12 samples) for permeability analysis of confining unit matrix.

[f]NR = Not required.

[g]9 existing wells + [31] now wells ([14] shallow, 11 intorwdiato. and 6 deep) = [40] samples.

Source: Ecology and Environment, Inc., 1992.

1100463

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

Table 14-3

PHASE II SAMPLING AND ANALYTICAL REQUIREMENTS
NAS PENSACOLA SITE 12

Medium	No. of Samples[a]	Dupli-cates	Trip Blanks[b]	Preservative Blanks[b]	Field Blanks	Rinsate Blanks	Total[a]	Analytical Suite[c,d]
Surface Water[e]	1	1	1	--	--	--	3	A
	(1)	NR[f]	NR	NR	NR	NR	(1)	D
Sediment[g]	7	1	1	NR	NR	1	10	A
	(2)	NR	NR	NR	NR	NR	(2)	E
Soil[h]	36	4	1	NR	NR	1	42	A
	36	4	1	NR	NR	1	42	B
	2	--	NR	NR	NR	--	2	C
	(20)	NR	NR	NR	NR	NR	(20)	E
Groundwater[i]	[8]	1	1	1	1	1	[13]	A
	(3)	NR	NR	NR	NR	NR	(3)	D
TOTAL	[90]	11	5	1	1	4	[112]	
	(25)	NR	NR	NR	NR	NR	(26)	

14[NASP]UH1102:T0394/871/10

Key:

[a]The number of samples shown in parentheses will be analysed for the additional parameters indicated.

[b]Trip blanks will be analysed for Target Compound List (TCL) volatile organic compounds (VOCs) only. Preservative blanks will be analysed for TCL VOCs, total recoverable petroleum hydrocarbons (TRPHs), dissolved Target Analyte List (TAL) metals, and cyanide.

[c]Analytical suite designations are as follows:

A = TCL VOCs; TCL base-neutral/acid extractable organic compounds (BNAs); TCL pesticides and polychlorinated biphenyls (PCBs); TRPHs; TAL metals (total [i.e., unfiltered] and dissolved [i.e., millipore-filtered, water only]); cyanide; gross alpha, beta, and gamma radioactivity; total organic carbon; hardness (water only); and alkalinity (water only).

B = TCL VOCs and TCL BNAs.

C = TAL metals.

D = Total suspended solids, total Kjeldahl nitrogen (TKN), ammonia nitrogen, orthophosphate phosphorus, dissolved oxygen (in field), 5-day biological oxygen demand (BOD_5), and chemical oxygen demand (COD).

E = pH, alkalinity, percent moisture, grain size, BTU content, ash content, total organic halogens, sulfur, ignitability, and cation exchange capacity.

[d]Specific constituents encompassed by the various chemical groups included within the above-listed analytical suites are identified in tables 9-[6] through 9-[15] of the GQAPP.

[e]Sample location not shown on Figure 14-7; will be collected at outfall of on-site storm drainage system, when located.

[f]NR = Not required.

[g]Three sample locations not shown on Figure 14-7; will be collected at upstream and downstream extensions of on-site storm drainage system, and at outfall, when located.

[h]12 boring locations x 6 depth intervals = 72 samples, plus 1 boring location x 2 depth intervals = 2 samples.

[i]Total of [8] new shallow wells = [8] samples; downgradient control will also be provided by the [5] shallow wells to be installed on Site 26.

Source: Ecology and Environment, Inc., 1992.

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

Table 14-4

PHASE II SAMPLING AND ANALYTICAL REQUIREMENTS
NAS PENSACOLA SITE 26

Medium	No. of Samples[a]	Dupli-cates	Trip Blanks[b]	Preservative Blanks[b]	Field Blanks	Rinsate Blanks	Total[c]	Analytical Suite[c,d]
Soil[e]	42	4	--	NR[f]	NR	1	47	A
	(1)	--	1	NR	NR	--	(1),1	B
	2	--	NR	NR	NR	--	2	C
	(8)	NR	NR	NR	NR	NR	(8)	D
Groundwater[g]	[5]	1	--	1	1	1	[9]	A
	(1)	--	1	--	NR	NR	(1),1	B
	(2)	--	--	--	--	--	(2)	E
TOTAL	[51]	5	2	1	1	2	[62]	
	(10)	NR	NR	NR	NR	NR	(10)	

14[NASP]UH1102:T0394/870/10

Key:

[a]The number of samples shown in parentheses will bo analyxod for tho additional parameters indicated.

[b]Trip blanks will bo analyxod for Appendix IX volatile organic compounds (VOCs) only. Preservative blanks will bo analyxod for Target Compound List (TCL) VOCs, total recoverable petroleum hydrocarbons (TRPHs), dissolvod Target Analyte List (TAL) metals, and cyanid..

[c]Analytical suite designations are as follows:

A = TCL VOCs; TCL base-neutral/acid extractable organic compounds (BNAs); TCL pesticides and polychlorinated biphenyls (PCBs); TRPHs; TAL motals (total [i.e., unfiltered] and dissolvod [i.e., millipore-filtered, water only]); cyanide; gross alpha, beta, and gamma radioactivity; total organic carbon: hardness (water only): and alkalinity (water only).

B = Appendix IX VOCs, BNAs, dioxins, pesticides, PCBs, organophosphorus posticidos, horbicidos, total motals, cyanide, and sulfide.

C = TAL motals.

D = pH, alkalinity, percent moisture, grain size, BTU contont. arh contont, total organic halogens, sulfur, ignitability, and cation exchange capacity.

E = Total suspended solids, total Kjeldahl nitrogon (TKN), ammonia nitrogon, orthophosphate phosphorus, dissolvod oxygon (in field), 5-day biological oxygon demand (BOD_5), and chemical oxygon demand (COD).

[d]Specific constituents encompassed by tho various chemical groups included uithin tho above-listed analytical suites are identified in tables 9-[6] through 9-[15] of tho GQAPP.

[e]Total of 6 boring locations x 6 depth intervals = 36 samples, plus 1 boring location x 8 depth intervals = 8 samples.

[f]NR = Not required.

[g]Total of [5] now shallow wells = [5] samples; upgradient control will also be provided by Site 12 proposed shallow well locations 6 and 7: downgradient control will also bo provided by Site 11 existing shallow well GM15.

Source: Ecology and Environment, Inc., 1992.

1100470

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

Table 14-5

RATIONALE FOR PROPOSED PHASE II SOIL SAMPLE LOCATIONS AND ANALYSES NAS PENSACOLA SITE 11

Location Reference Number(s)	Sample Type(s)[a]	Location Rationale	Analytical Suite(s)[b]	Analytical Rational.
4, 6, 7, 8, 10, 12, 17, 22. 23, 30, 35, 36	AWT	Determine tho presence and nature of potontial soil contamination in areas not sampled during Phaso I.	A	Characterize full spoctrua of potontial contaminants.
	BWT	Evaluate potontial presence of aquifer matrix soil contaaination by metals based on high Pharo I temporary well metals concentrations.	B (Locations 7 and 8 only)	Metals are only concern here.
1, 2, 5, 9, 14, 18, 21, 25, 26, 27. 33, 34	AWT	Delineate potential outer extent of contaaination dotoctod during Phase I soil sampling.	A	Idontify absence of contaaination in thoro areas or characterize Cull spoctrua of potontial contaminants.
3, 11, 13 15, 16, 19, 29. 31	AWT	Confirm contanination dotoctod during Phaso I soil sampling (metals, TRPHs, VOCs, PAHs, phenols, PCBs).	A	Characterize full spectrum of potential contaainants.
	BWT	Evaluate potontial presence of aquifer matrix soil contaaination based on Phaso I soil and ground-water contaaination (metals, VOCs, PAHs, phenols, and PCBs).	A, D (BWT all locations)	Characterize full spoctrua of potential contaminants (suite A). Support potential site remediation planning activities (suite D).

14[NASP|UH1102:T0394/1050/7

Key at end of table.

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

Table 14-5 (Cont.)

Location Reference Number(s)	Sample Type(s)[a]	Location Rational.	Analytical Suite(s)[b]	Analytical Rational.
20, 24, 32	AWT	Evaluate potential source of Phase I soil contamination detected east of creek/Bayou Grande which may bo from activities unrelated to Site 11.	A	Charactoriro full spectrum of potential contaminants.
28	AWT	Confirm contamination detected during Phase I soil sampling (metals, TRPHs, PAHs and phenols).	A	Characterize full spectrum of potential contaminants.
			C (2.5 - 5.0' interval only)	Satisfy RCM requirements.
Deep Well Locations 4, 8, 13, 17, 26, 29 (see Figure 14-6)	CVn	Deep well locations where confining unit should be encountered during installation.	F	Support potential site remediation planning activities.

14[NASP]UH1102:T0394/1050/7

Key:

[a]AWT = Soil samples collected above water table at following intervals (BLS): 0-[1.0], [1.0]-2.5, 2.5-5, 5-10, 10-15, 15-20, 20-25 feet;
BWT = Soil samples collected below water table at following intervals (BLS): 0-5, 5-10 feet.
CUM = Deep well locations where confining unit should be encountered durinq installation.
[b]Specific parameters included within each analytical suite arm given in Table 14-2.
TRPHs = Total recoverable petroleum hydrocarbons.
VOCs = Volatile organic carbons.
PAHs = Polynuclear aromatic hydrocarbons.
PCBs = Polychlorinated biphenyls.
RCRA = Resource Conservation and Recovery Act.

Source: Ecology and Environment, Inc., 1992.

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

00471

Table 14-6

RATIONALE FOR PROPOSED PHASE II MONITORING WELL LOCATIONS AND GROUNDWATER SAMPLE ANALYSES[a] NAS PENSACOLA SITE 11

Location Reference Number(s)	Sample Type(s)[b]	Location Rational.	Analytical Suite(s)[c]	Analytical Rational.
2, 10, 15, 18, 21, 22	SGW	Determine presence and nature of potential shallow groundwater contamination. All wells in or hydraulically downgradient of contamination detected across Site 11 during Phase I (metals, TRPHs, VOCs, PAHs, phenols, and PCBs). Shallow well at location 22 is to replace damaged well GM50.	A E (Locations 10, 21, and 22 only)	Characterize full spectrum of potential contaminants. Support potential site remediation planning activities.
1, 9 20, 30, **[31]**	SGW	Delineate extent of groundwater contamination detected across Site 11 during Phase I. Proposed wells either hydraulically upgradient (locations 9 and 20) or across gradient (locations 1, 30, and **[31]**) of Phase I Site 11 contamination.	A E (Locations 9 and 20 only)	Determine absence of contamination in those areas or characterize full spectrum of potential contaminants. Support potential site remediation planning activities.
6, 24	SGW	Confirm nature and magnitude of groundwater contamination detected in Phase I temporary monitoring wells TW007 and TW026 (metals, VOCs, PAHs, phenols, and/or PCBs).	A E	Characterize full spectrum of potential contaminants. Support potential site remediation planning activities.
27	SGW	Delineate extent or identify source of shallow groundwater contamination detected in Phase I temporary monitoring well TW026 (metals, PAHs, and PCBs). Located hydraulically upgradient from TW026.	A	Determine absence of contamination in this area or characterize full spectrum of potential contaminants.

14[NASP]UH1102:T0394/1051/7

Key at end of table.

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

Table 14-6 (Cont.)

Location Reference Number(s)	Sample Type(s)[b]	Location Rationale	Analytical Suite(s)[c]	Analytical Rational.
3, 5, 7 11, 12 14, 16, 19 23, 25 28	IGW	Dotormino presence and nature of intormodiato depth groundwater contamination. Proposed wells are located in or downgradiont of areas of shallow contamination and are clustered with existing or propoaod shallow and/or doop wells.	A E (Location. 7, 16, 19, 23 and 28 only)	Characterize Cull spectrum of potontial contaminants. Support site remediation planning activities.
4, 8 13, 17, 26, 29	DGW	Dotormino presence and nature of doop ground-water contamination. Proposed wells are located in or downgradiont of areas of shallow contamination and are clustered with oxiating or propoaod shallow and/or intormodiato depth wells.	A E (Location. 8 and 29 only)	Characterize Cull spectrum of potontial contaminants. Support potential site romodiation planning activitioa.

14[NASP|UH1102:T0394/1051/7

Key:

[a] All nine oxiating wells will also bo sampled during Phase II Cor analytical suit. A parameters. In addition, on52 will bo analysed Cor analytical suite C and existing wells GM47, GM51, and GM52 will bo analysed Cor analytical suit. E (see Table 14-2).
[b] SOW = Groundwater sample from shallow monitoring well; IGW = groundwator sample from intormodiato monitoring well; DGW = groundwator sample from doop monitoring well.
[c] Specific parameters included within each analytical suite are given in Table 14-2.

Source: Ecology and Enviconmont, Inc., 1992.

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

Table 14-7

RATIONALE FOR PROPOSED PHASE II SURFACE WATER AND SEDIMENT SAMPLE LOCATIONS AND ANALYSES NAS PENSACOLA SITE 12

Location Reference Number(s)	Sample Type(s)[a]	Location Rational.	Analytical Suite(s)[b]	Analytical Rational.
8, 9, 10	SD	Delineate extent of contamination in on-sit. stormwater drainago system (high contaminant concontcations dotoctod in Phase I stormwator drainago system sediment sample SD001).	A	Characterize full spectrum of potential contaminants.
11	SD	High contaninant concentrations detected in Phase I sediment sample SD001, stormwater drainage system.	A	Characterize full spectrum of potential contaminants.
			E	Support potential site remediation planninq activitios.
18[c]	SD	Delineate upstream extent (potential off-sit. contaminant contributions) of on-site stormwater drainage system contamination.	A	Characterize full spectrum of potential contaminants.
19[c]	SD	Delineate downstream extent (off-site migration) of on-sit. stormwater drainage system contamination.	A	Characterize full spectrum of potential contaminants.
20[c]	SW SD	Characterize potential contaminant accumulation at outfall/discharge area of stormwater drainage system downstream of site.	A	Characterize full spectrum of potential contaminants.
			D,E	Support potential site remediation planning activities.

14[NASP]UH1102:T0394/1035/7

Key:

[a] SW = Surface water; SD = sediment.
[b] Specific parameters included within each analytical suite are given in Table 14-3.
[c] These three sample locations (reference numbers 18. 19, and 20) are not shovn on Figure 14-4; these samples will be collected at upstream and downstream extensions of the on-site stormwater drainago system, and at the outfall, when located.

fourco: Ecology and Environment, Inc., 1992.

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

1100473

Table 14-8

RATIONALE FOR PROPOSED PHASE II SOIL SAMPLE LOCATIONS AND ANALYSES NAS PENSACOLA SITE 12

Location Reference Number(s)	Sample Type(s)[a]	Location Rational.	Analytical Suite(s)[b]	Analytical Rationals
1-4, 14-17	AWT	Identify nature and extent ot PAH and phenol contamination dotoctod in Phaso I soil boring. B002 and B016.	A Locations 1 and 14)	Characterize Cull apoctcum of potontial contaminants.
			B Locations 2-4 and 15-17)	BNAs are of definite concern here and VOCs are ot potontial concern.
			E (Locations 1 and 14)	Support potontial site remediation planning activities.
5	AWT	Confirm absence of roil contamination in this area of site as indicated by Phase I soil borings B003, B004, B005, and *8006.*	A	Confirm absence ot contamination.
6	AWT	Low level PAHs and trace level PCBs dotoctod in Phaso I soil boring B008.	A	Characterize full spectrum of potontial contaminants.
			E	Support potontial site remediation planninq activities.
7	AWT	Elevated TRPHs and trace level PCBs dotoctod in Phaso I roil boring B010.	A	Characterize full spectrum of potontial contaminants.

14[NASP]UH1102:T0394/1033/7

Key at and of table.

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

Table 14-8 (Cont.)

Location Reference lumber(s)	Sample Type(s)[a]	Location Rationale	Analytical Suite(s)[b]	Analytical Rationale
12	BWT	Evaluate potential presence of aquifer matrix soils contamination by metals based on high Phase I temporary well TW012 and TW013 metal concentrations.	C	Metals are only concern here.
			E	Support potential site remediation planning activities.
13	AWT	High radiation readings recorded during radiation survey and during attempted drilling activities (drilling discontinued duo to high radiation levels).	A	Characterize full spectrum of potential contaminants.

14[NASP]UH1102:T0394/1033/7

Key:

[a]AWT = Soil samples collected above water table at following intervals (BLS): 0-[1.0] foot, [1.0]-2.5 foot, 2.5-5 foot, 5-10 foot 10-15 feet, 15-20 feet;
BWT = Soil samples collected below water table at following intervals (BLS): 20-25 foot, 25-30 foot.
[b]Specific parameters included within each analytical suite are given in Table 14-3.

VOCs = Volatile organic compounds.
BNAs = Base/neutral and acid extractable compounds.
PAHs = Polynuclear aromatic hydrocarbons.
PCBs = Polychlorinated biphenyls.
TRPHs = Total recoverable petroleum hydrocarbons.

Source: Ecology and Environment, Inc., 1992.

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

Table 14-9

RATIONALE FOR PROPOSED PHASE II MONITORING WELL LOCATIONS AND GROUNDWATER SAMPLE ANALYSES[a]
NAS PENSACOLA SITE 12

Location Reference Number(s)	Sample Type(s)[b]	Location Rationale	Analytical Suite(s)[c]	Analytical Rationale
1, 14	SGW	Chromium dotoctod in Phase I tomporary wells TW002 and TW016; no organics dotoctod in these groundwater samples, even thouqh associated Phase I borinqr (BOO2 and B006) contained PAHs and phenols.	A D (Location 14)	Confirm presence of metal contamination and absence of organic contamination. Support potontial site romodiation planning activitior.
5	SGW	Downgradient of Pharo I tomporary well TW004, which oxhibitod traco level PCBs.	A D	Charactoriro Cull rpoctrum of potontial contaminants. support potontial site romodiation planning activitior.
6	SGW	Low levels PAHs and traco level PCBs dotoctod in Pharo I roil borinq B008; downgradiont of Pharo I temporary well TW009, which oxhibitod elevated chromium and traco level PCBs.	A	Charactoriro full rpoctrum of potential contaminants.
7	SGW	Downgradient of Phase I boring B01D, which exhibited elevated TRPHs and trace level PCBs; evaluate potential leakage from stormwater drainaqo system.	A	Characterize full rpoctrum of potontial contaminants.
12	SGW	Downgradient of Pharo I temporary wells B012 and B013 (which exhibited high chromium levels and [B012 only] traco phenols) and of stormwater drainage system.	A D	Charactoriro full rpoctrum of potontial contaminants. Support potontial site romodiation planning activitior.
13	SGW	Area of hiqh Pharo I radiation readings; downgradient of Phase I stormwater drainage system sediment sample SD001, which exhibited significant contamination.	A	Charactoriro full rpoctrum of potontial contaminants.

14[NASP]UH1102:T0394/1034/0

Key at end of Table

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

1100474

Table 14-9 (Cont.)

Location Reference Number(s)	Sample Type(s)[b]	Location Rationale	Analytical Suite(s)[c]	Analytical Rationale
[18	**SGW**	**Delineate extent of groundwater contamination detected in temporary monitoring well TW002. Proposed well is hydraulically upgradient of Phase I Site 12 contamination.**	**A**	**Determine absence of contamination in those areas or characterize full spectrum of potential contaminants.]**

14[NASP]UH1102:T0394/1034/0

Key:

[a]Additional downgradient control will be provided by the four shallow wells to be installed on Site 26.
[b]SGW = Groundwater sample from shallow monitoring well.
[c]Specific parameters included within each analytical suite are given in Table 14-3.

PAHs = Polynuclear aromatic hydrocarbons.
PCBs = Polychlorinated biphenyls.
TRPHs = Total recoverable petroleum hydrocarbons.

Source: Ecology and Environment, Inc., 1992.

rationale for each proposed Phase II Site 12 surface vater and sediment sample, soil boring, and monitoring vell location, respectively, and for the analytical suite associated vith each proposed Phase II sampling location. Tables 14-10 and 14-11 provide the specific rationale for each proposed Phase II Site 26 soil boring and monitoring vell location, respectively, and for the analytical suite associated with each proposed Phase II sampling location.

The sample location reference numbers listed in tables 14-5 and 14-6 correspond to the location numbers on figures 14-5 and 14-6; the sample location reference numbers listed in tables 14-7, 14-8, and 14-9 correspond to the location numbers on Figure 14-7; and the sample location reference number listed in tables 14-10 and 14-11 correspond to the location numbers on Figure 14-8. The analytical suite designations used in tables 14-5 through 14-11 correspond to the designations used and defined in tables 14-2 through 14-4.

It is proposed to sample for analysis the nine Site 11 existing vells and all newly installed wells for analytical suite A during Phase II to provide a uniform, time-synchronous perspective on sites 11, 12, and 26 groundwater conditions. This perspective will be critical to properly evaluate the groundvater migration pathvay. It should be noted that tvo of the previously existing permanent monitoring vells on Site 11 (GM46 and GM50) have been damaged and/or destroyed and are not included in the number of existing vells.

In addition, during Phase II field activities at NAS Pensacola site groups A through E, soil borings, shallov monitoring vells, and intermediate monitoring wells will be completed at three background locations across the base, [clustered with tbe existing deep supply wells. These background soil borings and monitoring wells,] together vith the three existing (on-base] deep supply vells, [vill be] sampled for analytical suite A. (Soil samples collected below the vater table will be analyzed for [Target Analyte List] [TAL] metals). These background locations will help provide a perspective regarding on-site occurrences of potential contaminants as vell as aid in evaluating the

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

1100475

Table 14-10

RATIONALE FOR PROPOSED PHASE II SOIL SAMPLE LOCATIONS AND ANALYSES NAS PENSACOLA SITE 26

Location Reference Number(s)	Sample Type(s)[a]	Location Rational.	Analytical Suite(s)[b]	Analytical Rationale
1, 3 4, 6	AWT	Determine presence or absence of contamination in these areas.	A	Characterize full spectrum of potential contaminants.
2	AWT	PAHs detected in Phase I soil boring 8002.	A	Characterize full spectrum of potential contaminants.
	BWT	Evaluate potential presence of aquifer matrix soils contamination by metals based on high Phase I temporary well TW002 metal concentrations,	C	Metals are only concern here.
			D	Support potential site remediation planning activities.
5	AWT	PAHs detected in Phase I soil boring 8003.	A	Characterize full spectrum of potential contaminants.
			B	Meet RCRA requirements.
			D	Support potential site remediation planning activities.
7	AWT	TRPHs detected in Phase I soil boring B004.	A	Characterize full spectrum of potential contaminants.

14[NASP]UH1102:T0394/1036/7

Key :

[a]AWT = soil samples collected above water table at following intervals (BLS): 0-[1.0] foot, [1.0]-2.5 foot, 2.5-5 foot, 5-10 feet, 10-15 feet, 15-20 feet;
BWT = Soil samples collected below water table at following intervals (BLS): 20-25 foot, 25-30 feet.
[b]Specific parameters included within each analytical suite are given in Table 14-4.

PAHs = Polynuclear aromatic hydrocarbons.
RCRA = Resource Conservation and Recovery Act.
TRPHs = Total recoverable petroleum hydrocarbons.

Source: Ecology and Environment, Inc., 1992.

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

Table 14-11

RATIONALE FOR PROPOSED PHASE II MONITORING WELL LOCATIONS AND GROUNDWATER SAMPLE ANALYSES[a]
NAS PENSACOLA SITE 26

Location Reference Number(a)	Sample Type(s)[b]	Location Rational.	Analytical Suite(s)[c]	Analytical Rational.
1, 6	SGW	Determine presence/absence of groundwater contamination in these areas.	A	Characterize full spectrum of potential contaminants.
2	SGW	Elevated metals detected in Phase I temporary well TW002.	A	Characterize full spectrum of potential contaminants.
			E	Support potential site remediation planning activities.
5	SGW	Elevated metals and 1,1,1-trichloroethane detected in Phase I temporary well TW003.	A	Characterize full spectrum of potential contaminants.
			B	Meet RCRA requirements.
			E	Support potential site remediation planning activities.
[8	SGW	Determine presence and nature of potential shallow groundwater contamination. Proposed well is hydraulically downgradient of detected Site 12 contamination.	A	Characterize full spectrum or potential contaminants.]

14[NASP]UM1102:T0394/1037/7

Key:

[a]Upgradient control will be provided by Site 12 proposed shallow well locations 6 and 7; downgradient control will be provided by Site 11 existing shallow well GM15.
[b]SGW = Groundwater sample from shallow monitoring well; IGW = groundwater sample from intermediate monitoring well; DGW = groundwater sample from deep monitoring well.
[c]Specific parameters included within each analytical suite are given in Table 14-4.

RCRA = Resource Conservation and Recovery Act.

Source: Ecology and Environment, Inc., 1992.

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

impact of potential, base-wide ambient contaminant sources. The collection of these background soil and groundwater samples is discussed in the work plan for [Group A--]Site 1 (Sanitary Landfill[; E & E 1992a)].

Table 14-2 indicates that one sample from each medium at Site 11 will be additionally analyzed for Appendix IX parameters (analytical suite C), and Table 14-4 indicates that one sample from each medium at Site 26 will be additionally analyzed for Appendix IX parameters. It should be noted that for these samples, analytical suite A analyses will only be performed for parameters not encompassed by Appendix IX (e.g., gross alpha, beta, and gamma radioactivity). Furthermore, it should be noted that trip blanks for sites 11, 12, and 26 will not be analyzed for full analytical suite A parameters, but only for VOCs (Appendix IX VOCs for sites 11 and 26 and [Target Compound List] [TCL] VOCs for Site 12). Finally, it should also be noted that the number of required trip blanks shown on tables 14-2, 14-3, and 14-4 reflects the total number of trip blanks required for the entire sampling program for each site.

As noted above, tables 14-5 through 14-11 provide specific rationales for proposed Phase II sampling locations and analyses for each site. In general, sampling locations were selected based on the Phase I results in accordance with one of the following criteria:

- Area of known contamination,
- Area of potential Contamination, or
- Knovn or suspected area of no contamination.

Sampling locations selected according to the first criterion are required to allow identification of the full spectrum of potential on-site contaminants as well as the maximum levels of occurrence. Locations selected according to the second criterion are required to delineate the distribution of contamination on site and in the site vicinity. Locations selected according to the third criterion are required to confirm that the extent of contamination has been completely

delineated. The specific, detailed rationales provided in tables 14-5 through 14-11 for each sampling location or group of locations clearly meet one or more of the three general criteria defined above.

All three of the above criteria must be met in order to complete a Baseline Risk Assessment and, as warranted, Feasibility Study for the site. Furthermore, in most instances, meeting the above criteria requires that the collected samples be analyzed for the full suite of parameters in analytical suite A. Eowever, in some cases (e.g., evaluation of potential aquifer matrix contributions to the high total metal concentrations detected in Phase I temporary well groundwater samples), a more limited analytical program (e.g., TAL metals in soils collected BWT) is warranted.

Finally, to support potential remediation planning activities for these sites, selected samples from each medium also must be analyzed for those parameters which directly control the viability of various remedial alternatives (see analytical suites D [tables 14-2 and 14-41, and E [Table 14-31).

14.2.2.1 Surface Water and Sediment Sampling

Sediment samples will be collected in accordance vith Section 6.9.2 of the GQAPP. Where possible, sediment samples will be collected at depths of surface to 0.4 foot below the surface with one of the following: a stainless steel trowel, a bucket-type mud auger, an Eckman dredge, or other coring device. The composition of sediment materials retrieved will be recorded in the field notebook. Equipment decontamination activities will be conducted in accordance vith Section 6.10 of the GQAPP.

The number and types of field surface vater and sediment QA/QC samples to be collected were determined in accordance with Section 11.1 of the GQAPP.

1100477

Site 11

Surface water and sediment samples collected from Bayou Grande in areas adjacent to Site 11 are addressed in the work plan for [Group E--]Site 30 (buildings 649 and 755; E & E 199[2b]).

Site 12

During the Phase II sampling, one surface water sample and seven sediment samples will be collected at Site 12. A combined surface water/sediment sample will be collected off site at the outfall of the stormwater drainage system that runs through the site (not shown on Figure 14-7). In addition, four sediment samples will be collected from the on-site stormwater drains and two sediment samples (sample locations 18 and 19) will be collected at off-site, downstream stormwater drains associated with the Site 12 drainage system (see Figure 14-7).

Surface water samples will be collected in accordance with Section 6.9.1 of the GQAPP. If the water in the outfall is shallower than 1 foot, the sample will be collected from the surface [and, whenever possible, directly into the sampling container. If not possible,] a glass or stainless steel beaker or similar sampling device [will be used]. If the water is greater than 1 foot deep, the sample will be collected within 1 foot of the bottom using a Kemmerer or similar sampling device. All equipment decontamination will be conducted in accordance with Section 6.10 of the GQAPP.

The surface water sample will be analyzed for the analytical parameters included in analytical suites A and D (see Table 14-3). All seven sediment samples will be analyzed for the analytical parameters included in analytical suite A (see Table 14-3). In addition, two of the seven sediment samples will also be analyzed for the parameters included in analytical suite E (sample locations 11 and 20; see Figure 14-7 and tables 14-3 and 14-7).

14.2.2.2 Soil Sampling

All Phase II soil sampling, compositing, and lithologic logging will be performed in accordance with Section 6.6 of the GQAPP. Equipment

decontamination will be performed in accordance with Section 6.10 of the GQAPP. The number and types of soil field QA/QC samples to be collected during Phase II were determined in accordance with Section 11.1 of the GQAPP.

At soil boring locations where a monitoring well will not be installed, soil borings will be completed using hollow-stem auger methods, and soil samples will be collected using split-spoon samplers in accordance with Section 6.6.2 of the GQAPP.

Site 11

During the soil boring and shallow monitoring well installation (Section 14.2.2.3), soil samples will be collected at 36 soil boring locations across Site 11 (samples will also be collected BVT at six new deep well locations; see figures 14-5 and 14-6). At each location, except as noted below, composite soil samples will be collected from each of the following depth intervals: 0 to [1.0] foot BLS, [1.0] foot to 2.5 feet BLS, 2.5 to 5 feet BLS, and then every 5-foot interval to the water table. For the purpose of estimating sample numbers, the depth to the water table is assumed to be 5 feet BLS across the site. At 10 boring locations (3, 7, 8, 11, 13, 15, 16, 19, 29, and 31), soil samples will also be collected from two depth intervals BVT: 0 to 5 feet BVT and 5 to 10 BWT (see Figure 14-5 and Table 14-5).

One hundred twenty-four of the 140 soil samples will be analyzed for the parameters included in analytical suite A (36 sample locations; see Figure 14-5 and tables 14-2 and 14-5). In addition, one of these samples (sample location 28) will also be analyzed for the parameters included in analytical suite C and 48 of these soil samples will also be analyzed for the parameters in analytical suite D. Four of the 20 samples collected BUT will be analyzed for analytical suite B parameters. The remaining 16 samples collected BVT will be analyzed for analytical suite A parameters. Twelve samples collected BVT at nev deep well locations 4, 8, 13, 17, 26, and 29 will be analyzed for the suite F parameter (permeability) only (See Figure 14-6 and tables 14-2 and 14-5).

1100473

Site 12

During the Phase II soil boring and monitoring well installation (Section 14.2.2.2), soil samples will be collected at 13 locations across Site 12 (see Figure 14-7). At each location, except as noted below, composite soil samples will be collected from each of the following depth intervals: 0 to [1.0] foot BLS, [1.0] foot to 2.5 feet BLS, 2.5 to 5 feet BLS, and then every 5-foot interval to the water table. For the purpose of estimating sample numbers, the depth to the water table is assumed to be 20 feet BLS across the site. At one boring location (location 12; see Figure 14-7), soil samples will be collected only from the two depth intervals BWT: 0 to 5 feet BWT and 5 to 10 feet BWT.

Thirty-six of the 74 soil samples will be analyzed for the parameters included in analytical suite A (six sample locations). Another 36 of the 74 samples (not of the 36 discussed above) will be analyzed for the parameters included in analytical suite B (sample locations 2, 3, 4, 15, 16, and 17). The remaining two of the 74 samples will be analyzed for the parameters included in analytical suite C (sample location 12, BWT only). In addition, 20 of these samples will also be analyzed for the parameters in analytical suite E (see Figure 14-6 and tables 14-3 and 14-8).

Site 26

During the Phase II soil boring and monitoring well installation (Section 14.2.2.2), soil samples will be collected at seven locations across Site 26 (see Figure 14-8). At each location, except as noted below, composite soil samples will be collected from each of the following depth intervals: 0 to [1.0] foot BLS, [1.0] foot to 2.5 feet BLS, 2.5 to 5 feet BLS, and then every 5-foot interval to the water table. For the purpose of estimating sample numbers, the depth to the water table is assumed to be 18 feet BLS across the site. At one boring location (location 2; see Figure 14-81, soil samples will also be collected from two depth intervals BWT: 0 to 5 feet BWT and 5 to 10 feet BUT.

Forty-tvo of the 44 soil samples will be analyzed for the parameters included in analytical suite A (seven sample locations). One of the 42 samples discussed above will also be analyzed for the parameters included in analytical suite B (sample location 5). The remaining tvo of the 44 samples will be analyzed for the parameters included in analytical suite C (sample location 2, BWT only). In addition, eight of the 44 samples will be analyzed also for the parameters included in analytical suite D (see Figure 14-8 and tables 14-4 and 14-10).

14.2.2.3 Soil Boring Completion and Permanent Monitoring Well Installation and Development

A total of 3[1] permanent monitoring vells will be installed at Site 11, seven will be installed at Site 12, and four will be installed at Site 26. These vells will be located and designed to supplenent the Phase I investigation results regarding the lateral and vertical extent of groundwater contamination. The number and target completion depths of these wells are as follows:

Site 11:

- [Four]teen shallov vells, each of vhich will be approximately 20 feet deep (tvo of vhich are proposed to replace existing damaged wells GM46 and GM50);
- Eleven intermediate wells, each of vhich will be approximately 40 feet deep; and
- Six deep wells, each of vhich will be approximately 65 feet deep.

Site 12:

- [Bight) shallov wells, each of vhich will be approximately 30 feet deep.

Site 26:

- [Five] shallov vells, each of vhich will be approximately 30 feet deep.

Figures 14-6, 14-7, and 14-8 shov the locations of the proposed monitoring vells at each site, and tables 14-6, 14-9, and 14-11 provide

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

1100473

a detailed rationale for the selection of each of the monitoring well locations and target depths at each site.

In order to detect the presence of any floating product at sites 11, 12, and 26, the shallow wells will be completed into the upper portion of the surficial zone of the Sand-and-Gravel Aquifer so that the well screen brackets the water table. At Site 11, the intermediate and deep wells will be installed to investigate the vertical extent of possible groundwater contaminants, particularly any dense nonaqueous phase liquids (DNAPLs). The 11 intermediate wells will be completed into the lower portion of the surficial zone immediately above the first confining/semi-confining unit. The six deep wells will be completed into the upper portion of the main producing zone of the Sand-and-Gravel Aquifer immediately below the first confining/semi-confining unit. Each of the intermediate wells will be clustered with a shallow well and each of the six deep wells will be clustered with one intermediate and one shallow well to assist in delineating the vertical extent of any contamination at that location as well as determine the vertical hydraulic gradients between the monitored zones (see Figure 14-6). All of the shallow wells on sites 11, 12, and 26 and the majority of the intermediate wells on Site 11 will be installed using hollow-stem auger methods, and constructed of 4-inch-diameter, flush-threaded polyvinyl chloride (PVC) casing terminating in 10 feet of 0.015-inch, factory-slotted screen.

At Site 11, in order to prevent the potential downward migration of any shallow contaminants during drilling, intermediate well locations 3, 5, 7, 11, 14, 16, 19, 23, and 28 (see Figure 14-6) and the six deep wells will be installed, using either hollow-stem auger or hydraulic rotary methods, through 8-inch-diameter PVC surface casings. The surface casings will be grouted in place and allowed to set 24 hours prior to drilling the well borehole to the target depth, in accordance with Section 6.7.4 of the GOAPP. The intermediate well surface casing will be set at approximately 30 feet BLS, and the deep well surface casings will be set several feet into the first confining/semi-confining unit. The six deep wells and three intermediate wells installed through the

surface casings will be constructed in the same manner as the shallov vells. All drilling and finished monitoring vell construction will be conducted in accordance vith sections 6.7.2 and 6.7.3 of the GQAPP. In addition, all nevly installed vells will be protected above surface grade vith a steel surface casing and locking vellhead cover. In paved or heavily [traveled] areas, the vells will be protected at surface grade vith a flush-mount security cover and locking cap.

In conjunction vith the drilling of the vell boreholes, continuous split-spoon samples will be collected to the target completion depth of each vell in accordance vith Section 6.7.2.3 of the GOAPP. At Site 11, vhere vells are constructed in clusters, split-spoon samples will only be collected during drilling of the deepest vell borehole. In addition, during the drilling of each of the deep wells, tvo Shelby-tube samplers, 2 feet in length, will be driven into the first confining/semi-confining unit to obtain samples for laboratory permeability testing.

After installation, each of the nev monitoring vells will be developed using a submersible pump and/or bailer in accordance vith Section 6.7.5 of the GOAPP. Development vaste will be contained in 55-gallon drums, labeled, and moved to a storage area on NAS Pensacola, as directed by the Navy (see also Section 14.[6].2).

All drilling equipment will be decontaminated prior to use and betveen the installation of each vell in accordance vith Section 6.10 of the GOAPP. All borehole cuttings and drilling fluids will be stored in 55-gallon drums, labeled, and moved to a storage area on NAS Pensacola, as directed by the Navy (see also Section 14.[6].2)

14.2.2.4 Groundvater Sampling

Purging and sampling of each vell will be performed in accordance vith sections 6.8.2 and 6.8.3 of the GOAPP, respectively. Equipment decontamination activities will be performed in accordance vith Section 6.10 of the GOAPP. The number and types of groundvater field QA/QC samples to be collected vere determined in accordance vith Section 11.1 of the GQAPP.

1100480

All shallow monitoring wells will be checked for floating and/or sinking immiscible hydrocarbons with an oil/water interface probe. All intermediate monitoring wells will be checked for sinking immiscible hydrocarbons with an oil/water interface probe.

Site 11

During Phase 11, groundwater samples will be collected from nine existing wells and 3[1] newly installed on-site monitoring wells at Site 11 (see Figure 14-6).

All [40] samples will be analyzed for the parameters included in analytical suite A. In addition, one sample, collected from existing well GM52, will also be analyzed for the parameters included in analytical suite C, and 17 of the [40] groundwater samples will also be analyzed for the parameters included in analytical suite E (see Figure 14-6 and tables 14-2 and 14-6).

Site 12

During Phase 11, groundwater samples will be collected from the [eight] newly installed on-site shallow monitoring wells at Site 12 (see Figure 14-7). All [eight] samples will be analyzed for the parameters included in analytical suite A (see tables 14-3 and 14-9). In addition, three of these [eight] groundwater samples (sample locations 5, 12, and 14) will be analyzed for the parameters included in analytical suite D (see Figure 14-7 and tables 14-3 and 14-9).

Site 26

During Phase 11, groundwater samples will be collected from the [five] newly installed on-site shallow monitoring wells at Site 26 (see Figure 14-8). All [five] samples will be analyzed for the parameters included in analytical suite A (see tables 14-4 and 14-11). One of these samples (sample location 5) will also be analyzed for the parameters included in analytical suite B. In addition, two of the [five] samples (sample locations 2 and 5) will be analyzed for the parameters included in analytical suite E (see Figure 14-8 and tables 14-4 and 14-11).

14.2.3 Hydrologic Assessment

The rain objective of the Phase II hydrologic assessment is to further delineate the [hydrogeologic character] of the underlying aquifer at sites 11, 12, and 26. Slug and short-term specific capacity tests, rather than a (long-term] pump test, have been proposed for Phase II because the location and distribution of contaminants in the various zones of the underlying aquifer have not yet been precisely identified. The hydrologic assessment at sites 11, 12, and 26 will include a well-head elevation survey of all the nevly installed permanent monitoring vells; static vater level measurements in all the on-site vells and, at Site 11, the on-site surface vater bodies; and short-term specific capacity and/or slug tests on all the newly installed permanent vells.

All of the nevly installed monitoring vells will be surveyed during the engineering survey (Section 14.2.4), and referenced to a USGS benchmark, in accordance vith Section 6.7.6 of the GQAPP. In addition, staff gauges will be placed in all surface vater bodies on Site 11 (the creek and Bayou Grande) and will be surveyed relative to the same datum as the wells.

At sites 11, 12, and 26, static vater levels will be measured in all the existing and proposed on-site vells and, at Site 11, in the on-site vater bodies on at least four occasions: once during the sampling of the newly installed wells; once approximately two to four weeks after sampling to obtain an estimate of the short-term temporal variability in vater levels; once during a low tidal phase; and once during a high tidal phase. The measurements taken during opposing tidal phases will be collected on the same day in order to accurately evaluate tidal influences on vater level elevations at these sites.

Limited aquifer testing will be conducted on all nevly installed monitoring vells, This testing will consist primarily of performing short-term specific capacity tests on vells that are capable of sustaining a measurable yield. The specific capacity testing at sites 11, 12, and 26 will be conducted during the development of the nevly installed wells. The procedure for specific capacity testing involves

1100481

measuring the initial static water level in the well and then withdrawing groundwater from the well at a constant rate for a designated period. The sustained water level during pumping is then noted, and the pump is turned off. The water level recovery in the well is then recorded continuously over time until the water level equilibrates to the initial static level. In addition to measuring drawdown in the developing well during the specific capacity testing, water levels will be measured in adjacent shallow, intermediate, and/or deep monitoring wells to determine the extent to which the respective, monitored zones may be hydraulically connected.

Injection or withdrawal-type slug tests will be performed on newly installed wells that are not capable of sustaining a measurable yield. The procedure for slug testing involves measuring the initial static water level in the well and then injecting or withdrawing a known volume from the well, using a solid stainless steel cylinder, to create an instantaneous change in water level. The water level is then recorded continuously over time until the water level equilibrates to the initial static level.

The purposes of the specific capacity and slug testing are to obtain site-specific, first estimate values for hydraulic conductivity (K), transmissivity (T), and groundwater flow velocity (V) for each of the monitored depth zones. During each of these tests, a calibrated tape and/or electronic data logger will be used to monitor and record the water levels in the well(s) being tested or observed.

[A rain gauge will be installed at or near the sites and monitored regularly during the fieldvork.)

14.2.4 Engineering Survey

A comprehensive engineering survey will be conducted to accurately identify all site sampling locations and cultural and topographic features. All sampling and monitoring well locations will be identified both horizontally and vertically. In addition, any utilities, aboveground structures, and improvements (such as pavement) will be

located. Any pertinent information found during the contaminant source survey (Section 14.2.1) will be incorporated into this survey. The survey also will delineate topographic variability using contour intervals of 2 feet.

All engineering survey information will be integrated vith any existing computer-aided design *(CAD)* base maps so that all updated, site-related information can be precisely and efficiently added to the base map. The development of a CAD base map will include the addition of previous data point locations (i.e., coordinates of latitude and longitude). The survey draving will be produced in mylar and blueline copies: the CAD file for the draving will be kept on diskette.

14.2.5 Interim Remedial Measures

During the field investigation, circumstances on site may require IRMs. IRMs will be initiated on a case-by-case basis and [only **following** receipt of EPA approval.] Rapid response will be emphasized. An IRM could involve the installation of security fences and varning signs: construction of berms, caps, and/or recovery and treatment systems; and removal of soil, sediment, and/or drums. If an IRM is conducted, a detailed, explanatory report of the IRM will be developed by E & E and provided to the Navy [and **EPA.**]

14.2.6 Report

Refer to Section 20 of this vork plan (revised [July 1992]) for a description of the Phase II report.

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 source(s), Phase III activities will be geared toward further delineating the horizontal and vertical extents of contamination.

1100482

14.3.1 Biota Sampling

If deemed appropriate based on the findings of phases I and 11, additional biota sampling may be conducted in Phase 111. [If required,] for Phase II, a separate biological sampling plan will be prepared. [Eovever, basewide biota sampling will be conducted as part of the investigation of OUs 15, 16, and 17.1

14.3.2 Soil Sampling

Soil sampling will be conducted in conjunction with the installation of any new shallow, intermediate, and/or deep monitoring wells.

14.3.3 Shallov Monitoring Well Installation and Development

Additional shallow monitoring wells may be required to further determine the horizontal extent of any shallow groundwater contamination detected in phases I and II.

14.3.4 Intermediate and Deep Monitoring Well Installation and Development

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

14.3.5 Groundvater Sampling

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

14.3.6 Hydrologic Assessment

All wells installed during Phase III will require a wellhead survey to obtain TOC elevations. Water level measurements will be made for all site monitoring wells and nearby surface vater bodies. Horizontal 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 zone, as well as the degree to which hydraulic connection exists between the surficial zone and underlying main producing zone at each site.

(14.3.7 Engineering Survey

A comprehensive engineering survey will be conducted to accurately identify all new site sampling locations. All sampling and monitoring well locations will be identified both horizontally and vertically. In addition, any improvements (such as pavement) will be located. All engineering *survey* information will be integrated vith the existing Phase II CAD base maps so that all updated, site-related information can be precisely and efficiently added to the base map. The survey draving will be produced in mylar and blueline copies; the CAD file for the draving will be kept on diskette.]

14.3.[8] Air Sampling

The need for formal air sampling during Phase III 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;
- Shallow monitoring well installation and development;
- Intermediate and deep monitoring well installation and development;
- Groundvater sampling;

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

1100483

- o Hydrologic assessment[; and
- o Engineering Survey.]

14.[5] Field Quality Assurance/Quality Control

14.[5].1 Documentation

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

14.[5].2 Field QA/QC 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 [through 14-41.

14.[6] Decontamination and Waste Management Procedures

14.[6].1 Decontamination Procedures

All equipment decontamination procedures for sites [11, 12, and 26] will be performed in accordance with Section 6.10 of the GQAPP.

14.[6].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 monitoring well purging and development activities on sites [11, 12, and 26] will be discharged onto the ground surface away from the well, or will be containerized, labeled, and moved to a storage area on NAS Pensacola, as directed by the Navy.

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

Other investigation-derived vastes, such as potentially contaminated clothing and disposable materials, will be containerized, labeled, and moved to a storage area on NAS Pensacola.

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

1100484

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 GSHP. 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 GSMP.

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

16. GROUNDWATER MODELING

E & 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).

E & 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 6 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: PLASM, a two-dimensional, finite-difference groundwater flow model; GWTRANS, a two-dimensional, finite-difference solute transport model; FEMWATER, a finite-element groundwater model; and FEMUASTE, a finite-element solute transport model.

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

17. TREATABILITY STUDY

As indicated in tables 14-2, 14-3, and 14-4, 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 tables 14-2 [through **14-41,** 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.

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

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 Feasibility Study 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 vith EPA's 1989 documents, Risk Assessment Guidance f 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, groundwater, 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 Feasibility Study.

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

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

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. [The identification of contaminants of concern will be conducted in accordance vith the previously referenced risk assessment guidance documents (EPA 1988a, 1989b)].

10.2 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 nay 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 qualitative and/or quantitative estimate of the expected exposure levels resulting from the actual or potential release of contaminants from the site.

1100483

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, non-carcinogenic 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 for 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, retirement homes, etc.);
- 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 Feasibility Study 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 betveen the various disciplines required (e.g., hydrogeologists, chemists, risk assessors, etc.), the Navy, and the revieving regulatory agencies (i.e., FDER and EPA) and that the goal of these tasks is to produce appropriate, sufficient, and high quality data to complete the baseline risk assessment.

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

19. FEASIBILITY STUDY

Further details on the specific tasks to be performed as part of the Feasibility Study will be described in detail during the update of this work plan after the initial phases of the fieldwork have been completed. However, 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 Feasibility Study, E & E will prepare a summary of field data collected during the Remedial Investigation to compare and evaluate the concentration of the contaminants of concern with the cleanup criteria developed. E & E will prepare a qualitative and quantitative summary of contamination for the scenarios identified during risk assessment evaluation. Results of this evaluation will serve as a basis for screening applicable remedial technologies for the development and evaluation of remedial action alternatives. [All Feasibility Study tasks will be performed in accordance with EPA's current document, Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (BPA 1988b).] If any of the procedures described in this section are in conflict vith the current BPA guidance document, the methods described in the EPA guidance document will be followed.]

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

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

environment. In this summary, pathways will be outlined for each medium of concern. E 6 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 6 E will consider the relative applicability of each technology. In addition, criteria such as environmental, institutional, and public health impacts, and technical feasibility 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 of 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, ins'titutional impacts, and comparative costs will be considered.

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

1100430

19.5 Selection of Recommended Remedial Action Alternatives

During this task, E & E will select a single remedial action alternative for the remediation of the site. The alternatives assembled during the preceding task will be compared using technical, environmental, and economic criteria. E & E will consider present worth of total costs, environmental effects, technical aspects, the extent to which alternatives comply with ARARs, community effects, and other factors. 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 & 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 final Feasibility Study report will be provided to the Navy for review and comments.

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

20. REPORT

Following the Phase I investigation, E 6 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 to be 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 additional investigation is not warranted, a formal Remedial Investigation 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 summarize the Phase 11 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 investigation is complete, all results will be synthesized and presented in a Remedial Investigation report.

In addition, following any treatability studies and Feasibility Study work, formal reports will be produced for these efforts. These reports will include detailed narratives associated with 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 vritten as an independent document, complete in its ovn right, and fully supportive of the conclusions vhich it contains. Where appropriate, public participation issues will be summarized, as will IRMs 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 fieldvork status and site conditions. Current and planned activities, as well as cost tracking, will be provided.

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

1100492

21. DOCUMENT REVISION

Periodic updating of all administrative documents (GQAPP, GSMP, GHSP, GPMP, and work plans) will be necessary due to changes in site conditions and/or program conditions or requirements. The schedules shown in the GPMP and GSMP indicate document revisions approximately every two months for the GQAPP, GSMP, 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.

22. PROJECT MANAGEMENT

Project management will be an ongoing process throughout this investigation. This process includes preparation of bi-weekly 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, 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, 111, 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 11, 111, and IV are tentative. In addition, the length of time between phases is subject to the schedule in the Federal Facilities Agreement Site Management Plan (FFASHP). The schedule in the FFASMP will be updated yearly.

1100495

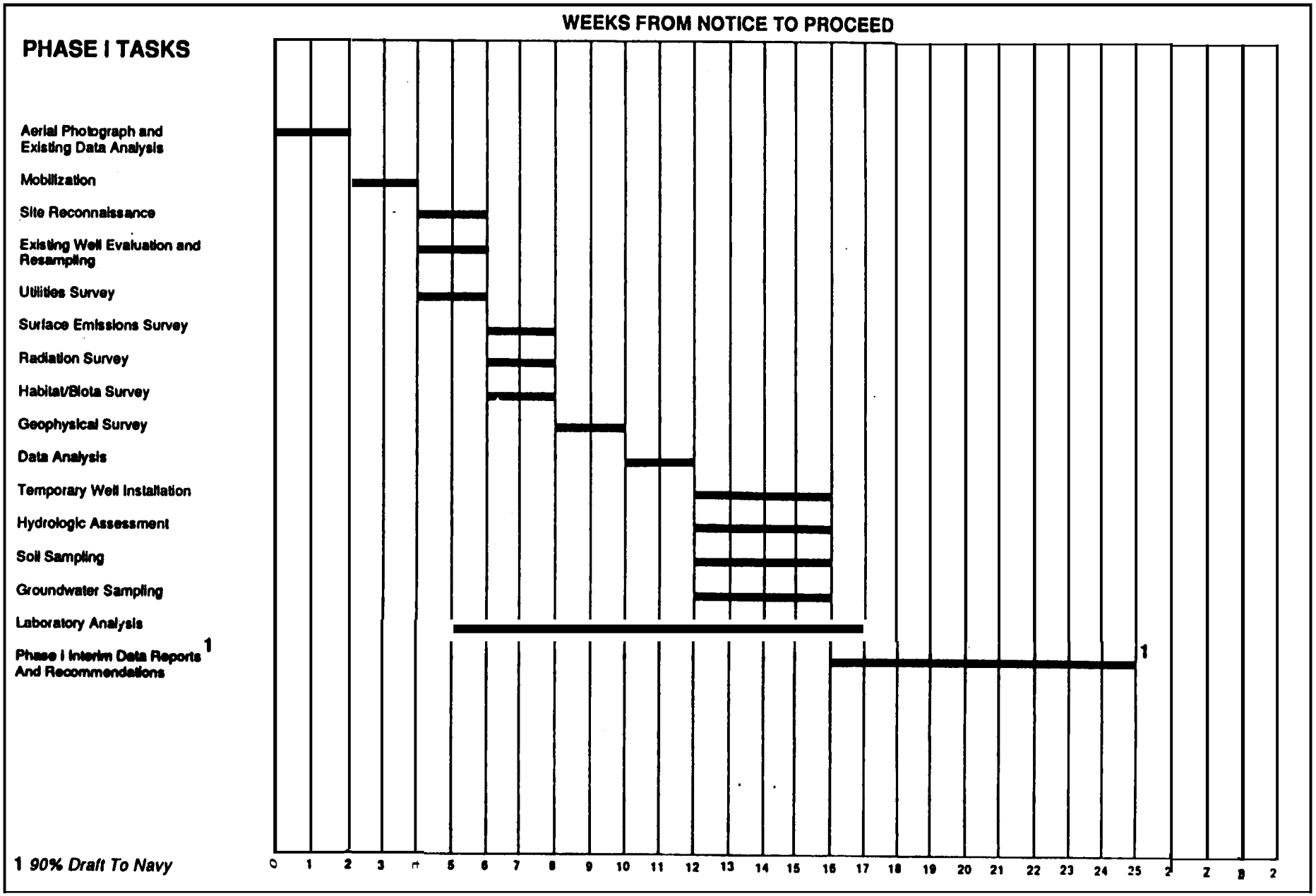


Figure 23-1 PHASE I PROJECT SCHEDULE -- GROUP B

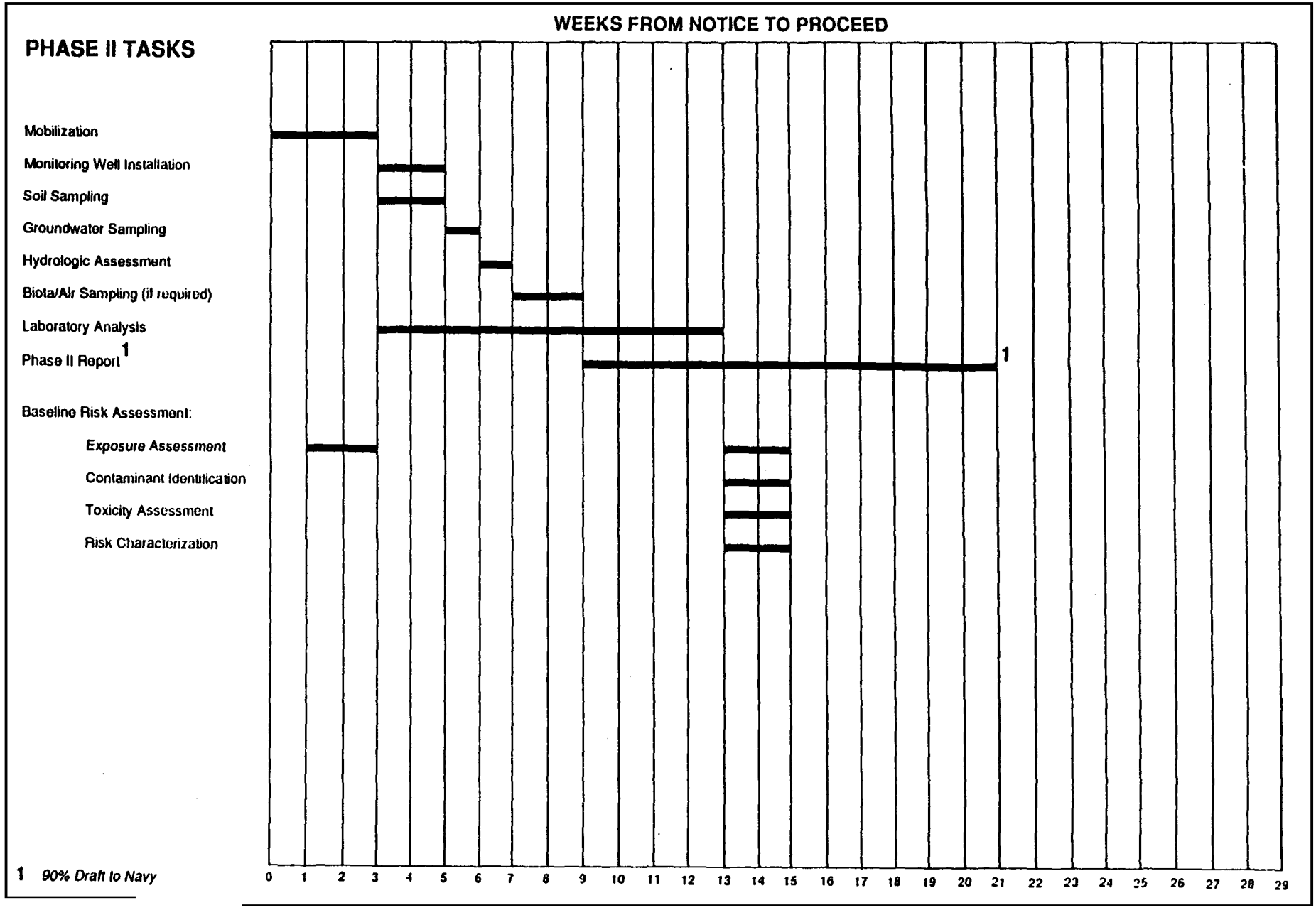


Figure 23-2 PHASE II PROJECT SCHEDULE -- GROUP B

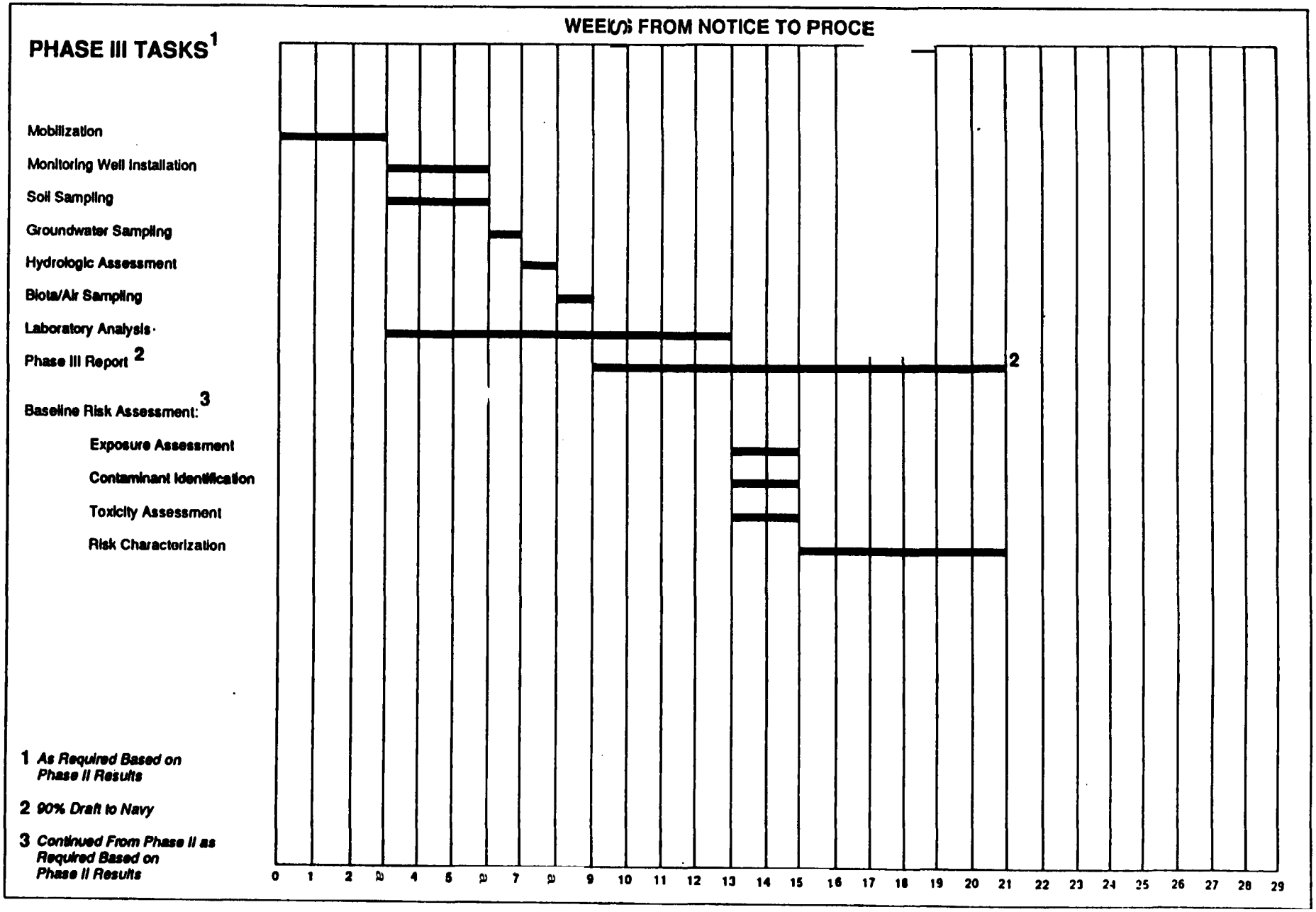


Figure 23-3 PHASE III PROJECT SCHEDULE – GROUP III

1100493

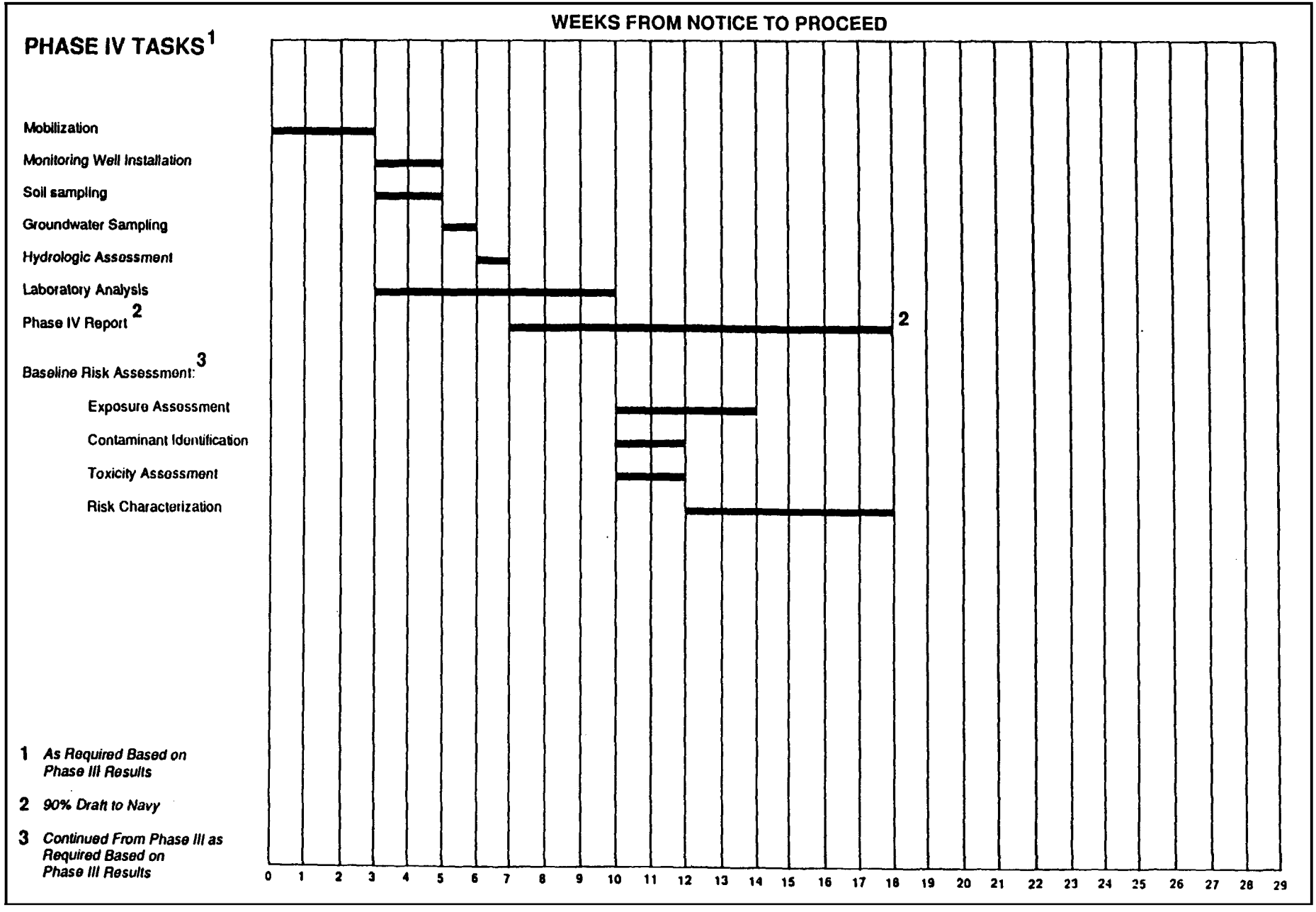


Figure 23-4 PHASE IV PROJECT SCHEDULE – GROUP B

24. REFERENCES

Barraclough, J. T. and O. T. Marsh, 1962, Aquifers and Quality of Ground Water along the Gulf Coast of Western Florida: Florida Bureau of Geology, Report of Investigations 29.

Barraclough, J. T., 1967, Ground-water Features in Escambia and Santa Rosa Counties, Florida: Florida Geological Survey, Map Series No. 26.

Brooks, H. K., 1981, Physiographic Divisions of Florida: Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, Gainesville, Florida.

Carlisle, V. W., 1960, Soil Survey of Escambia County, Florida: Series 1955, No. 8, U.S. Department of Agriculture, Washington, D.C.

Coe, C. J., 1979, Geology of the Plio-Pleistocene Sediments in Escambia and Santa Rosa Counties, Florida: Florida State University, Master Thesis.

Coffin, J. E., 1982, Summary of Ground-water and Surface-water Data for City of Pensacola and Escambia County, Florida: U. S. Geological Survey Open-file Report 82-361.

Cooke, C. W., 1939, Scenery of Florida Interpreted by a Geologist: Florida Geological Survey, Bulletin No. 17.

_____, 1945, Geology of Florida: Florida Geological Survey, Bulletin No. 29.

Cooley, N. R., ,1978, An Inventory of Estuarine Fauna in the Vicinity of Pensacola, Florida: Florida Marine Research Publications No. 31. Florida Department of Natural Resources, Marine Research Laboratory, St. Petersburg, Florida.

Driscoll, F.G., 1986, Groundwater and Wells, Second Edition: Johnson Division, St. Paul, Minnesota.

Ecology and Environment, Inc., (E & E), 19[90a], General Health and Safety Plan, Contamination Assessments and Remedial Activities, Naval Air Station Pensacola, Pensacola, Florida.

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

_____, 19[90b], General Project Hanagement Plan, Contamination Assessments and Remedial Activities, Naval Air Station Pensacola, Pensacola, Plorida.

_____, 19[90c], General Site Management Plan, Contamination Assessments and Remedial Activities, Naval Air Station Pensacola, Pensacola, Florida.

_____, 1990[d], Generic Quality Assurance Project Plan, Contamination Assessments and Remedial Activities, Naval Air Station Pensacola, Pensacola, Florida.

[_____, 1991a, Contamination Assessment/Remedial Activities Investigation, North Chevalier Disposal Area (Site 11), Naval Air Station Pensacola, Pensacoh, Florida.

_____, 1991b, Contamination Assessment/Remedial Activities Investigation, *Scrap* Bins (Site 12), Naval Air Station Pensacola, Pensacola, Florida.

_____, 1991c, Contamination Assessment/Remedial Activities Investigation, Supply Department Outside Storage (Site 26), Naval Air Station Pensacola, Pensacola, Florida.

_____, 1992a, Contamination Assessment/Remedial Activities Investigation Wuk Plan—Group A, Naval Air Station Pensacola, Pensacola, Florida.

_____, 1992b, Contamination Assessment/Remedial Activities Investigation Work Plan—Group B, Naval Air Station Pensacola, Pensacola, Florida.

_____, 1992c, General Health and Safety Plan, Contamination Assessments and Remedial Activities, Naval Air Station Pensacola, Pensacola, Florida.

_____, 19923, General Project Management Plan, Contamination Assessments and Remedial Activities, Naval Air Station Pensacola, Pensacola, Florida.

_____, 1992e, General Site Management Plan, Contamination Assessments and Remedial Activities, Naval Air Station Pensacoh, Pensacola, Florida.

_____, 1992f, Generic Quality Assurance Project Plan, Contamination Assessments and Remedial Activities, Naval Air Station Pensacola, Pensacola, Florida.]

ERM-Southeast, Inc. (ERM), 1988, Draft Site Investigation Report NIRP Site 31 at Building *649*, Naval Air Station Pensacola, Pensacola, Florida.

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

1100498

Flood and Associates, Inc., 1978, South Escambia and Santa Rosa Counties, 201 Facilities Plan, City of Pensacola, Escambia and Santa Rosa Counties, City of Gulf Breeze, Santa Rosa Island Authority, and Santa Rosa County Beach Administration.

Florida Department of Environmental Regulation (FDER), 1988[a], Unpublished Marine Sediment Data from Pensacola Bay Sediment Study, 1985-1987, Tallahassee, Florida.

[_____,1988b, Water Quality Standards, Classification of Groundvater, Usage, Reclassification, Chapter 17-3.403, Florida Administrative Code.)

Florida Natural Areas Inventory (FNAI), 1988a, Special Plants and Animals List, Escambia County, Florida, Tallahassee, Florida.

_____, 1988b, Survey of Pensacola Naval Air Station and Outlying Bronson Field for Rare and Endangered Plants, Tallahassee, Florida.

Geraghty and Miller, Inc. (G & M), 1984, Verification Study, Assessment of Potential Ground-water Pollution at Naval Air Station, Pensacola, Florida.

_____, 1986, Characterization Study, Assessment of Potential Ground-water Pollution at Naval Air Station, Pensacola, Florida.

_____, 1987a, Quarterly Report, Corrective Action Program; Wastewater Treatment Plant, NAS Pensacola, Florida.

_____, 1987b, Lithologic Logs, NAS Pensacola Wastewater Treatment Facility, Pensacola, Florida.

_____, 1988, Semi-Annual Report, Corrective-Action and Compliance-Monitoring Programs, Surge Pond Operation Permit, Wastewater Treatment Facility, Naval Air Station, Pensacola, Florida.

Green, K. Michael, 1989, personal communication, Navy Engineer in Charge.

Heil, D. C., 1989, personal communication, Florida Department of Natural Resources, Tallahassee, Florida.

Jacob, C. E. and H. H. Cooper Jr., 1940, Report on the Ground-water Resources of the Pensacola Area in Escambia County, Florida: U. S. Geological Survey, Open-file Report 400001.

Kennedy, L. R., 1982, Rainfall Summary for the Northwest Florida Water Management District: Water Resources Special Report 82-3.

Ketchen, H. G. and R. C. Staley, 1979, A Hydrographic Survey in Pensacola Bay, Florida State University, Department of Oceanography, Tallahassee, Florida.

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

Lohman, S. V., 1972, Ground-Vater Hydraulics: U. S. Geological Survey Professional Paper 708, Vashington, D.C.

Luckenbach, M. W., R. J. Diay, and L. C. Schaffner, 1988, Scientific Consultation and Analytical Services: Benthic Assessment Procedures. Project 5, Virginia Vater Control Board, Gloucester Point, Virginia.

Harsh, O. T., 1966, Geology of Escaabia and Santa Rosa Counties, Western Florida Panhandle: Florida Geological Survey, Bulletin 46, 140 p.

Husgrove, R. E., J. T. Barraclough, and O. T. Harsh, 1961, Interim Report on the Vater Resources of Escaabia and Santa Rosa Counties, Florida: Florida Geological Survey, Information Circular No. 30.

Husgrove, R. H., J. T. Earraclough, and R. G. Grantham, 1965, Vater Resources of Escambia and Santa Rosa Counties, Florida: Florida Geological Survey, Report of Investigations No. 40.

_____, 1966, Vater Resources Records of Escambia and Santa Rosa Countieq, Florida: Florida Geological Survey, Information Circular No. 50.

Naval Energy and Environmental Support Activity (NEESA), 1983, Initial Assessment Study of Naval Air Station, Pensacola, Florida. NEESA 13-015.

National Institute for Occupational Safety and Health Association, 1985, Occupational Safety and Health Guidance Hanual for Hazardous Vaste Site Activities.

Northvest Florida Vater Management District, 1981, Public Vater Supply Systems in the Coastal Areas of Escambia, Santa Rosa, Bay, Okaloosa and Walton Counties: Northvest Florida Vater Management District, Vater Resources Special Report 81-3.

Pike, E., 1989, personal communication, NAS Pensacola Public Vorks Department.

Prickett, T. A., T. G. Naymik, and C. G. Lonnquist, 1981, A Random Walk Solute Transport Model for Selected Groundvater Quality Evaluations, Bulletin 654, Illinois State Vater Survey, Champaign, Illinois.

Schropp, S. J., and ti. L. Vindoa, 1988, A Guide to the Interpretation of Metals Concentrations in Estuarine Sediments, Florida Department of Environmental Regulation, Coastal Zone Management Section, Tallahassee, Florida.

Southeastern Geological Society (SEGS), 1986, Florida Hydrogeologic Units: Southeastern Geological Society Ad Hoc Committee on Florida Eydrostratigraphic Unit Definition (SEGS), Florida Geologic Survey, Special Publication No. 28.

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

1100493

Trapp, H., Jr., 1972, Availability of Ground Water €or Public-Water Supply in the Pensacola Area, Florida - Interim Report, June 1971: U. S. Geological Survey, Open-File Report FL72002.

_____, 1973, Availability of Ground Water for Public-Water Supply in Central and Southern Escambia County, Florida - Interim Report, July 1973; U. S. Geological Survey, Open-File Report FL 72029.

_____, 1975, Hydrology of the Sand-and-Gravel Aquifer in Central and Southern Escambia County, Florida - Preliminary Report - November 1973: U. S. Geological Survey, Open-File Report FL74027.

_____, 1978, Preliminary Hydrologic Budget of the Sand-and-Gravel Aquifer under Unstressed Conditions, with a Section on Water Quality Monitoring, Pensacola, Florida: U. S. Geological Survey, Water-Resources Investigations 77-96.

U.S. Environmental Protection Agency (EPA), 1984, Standard Operating Safety Guidelines.

_____, 1985, Guidance on Remedial Investigations under CERCLA, EPA, OSWER, HWERL; EPA report #540/6-85/002; NTIS ref #PB-85-268616; OSWER Directive 9355.0-06B, U.S. EPA, Cincinnati, Ohio.

_____, 1985, Guidance on Feasibility Studies under CERCLA, EPA, OSWER, OWPE, EPA report #540/G-85/003; NTIS ref #PB-85-238-590; OSWER Directive 9355.0-05c, U.S. EPA, Washington, D.C.

_____, 1987, Data Quality Objectives for Remedial Response Activities, OSWER Directive 9335.0-7B, U.S. EPA, Washington, D.C.

_____, 1987, Compendium of Superfund Field Operations Methods, OSWER Directive 9355.0-14, EPA/540/P-87/00/a.

_____, 1988[a], CERCLA Compliance with Other Laws Manual, Draft, OSWER Directive 9234.1-01, U.S. EPA, Washington, D.C.

_____, 1988[b], Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA, Draft, OSWER Directive 9355.3-01 OERR # 68-01-7090 and 68-W8-0098, U.S. EPA, Washington, D.C.

[_____, 1989a, Risk Assessment Guidance for Superfund: Volume I - Human Health Evaluation Manual (Part A), Washington, D.C.

_____, 1989b, Risk Assessment Guidance for Superfund: Volume II - Environmental Evaluation Manual, Washington, D.C.]

U.S. Fish and Wildlife Service, 1987, Long Range Fish and Wildlife Section, Naval Air Station Pensacola and Outlying Field Bronson, Pensacola, Florida, USFWS Field Office, Panama City, Florida.

U. S. Geological Survey (USGS), 1970a, 7 1/2 Minute Topographic Map, Fort Barrancas, Florida Quadrangle.

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

_____, 1970b, 7 1/2 Minute Topographic Map, West Pcnsacola, Florida Quadrangle, Photorevised 1987.

U.S. Navy, 1986, U.S. Navy Gulf Coast Strategic Homeporting Environmental Impact Statement, Appendix IV, Pensacola, Florida. Southern Division, Naval Facilities Engineering Command, Charleston, South Carolina.

_____, 1987, General Development Map Nos. 1276829 to 1276839, U.S. Naval Air Station, Pensacola, Florida, Southern Division Naval Facilities Engineering Command, Charleston, South Carolina.

Vagner, J. R., 1982, Hydrogeology of the Northwest Florida Water Management District, in Ground Water in Florida - Proceedings of the First Annual Symposium on Florida Hydrogeology: Northvest Florida Vater Management District, Public Information Bulletin 82-2.

_____, 1989, Hydrogeologic Framevork of the Northvest Florida Water Management District.

Wagner, J. R., T. W. Allen, L. A. Clemens, and J. B. Dalton, 1984, Ambient Ground Water Monitoring Program - Phase 1: Northwest Florida Water Management District, DER Contract Number WM65.

Walton, V. C., 1970, Ground Water Resource Evaluation: McGraw-Hill Book Co., Nev York.

Water and Air Research, Inc. (WAR), 1986, Report of Collection and Analyses of Sediment, Vater, and Elutriate Samples for Navy Gulf Coast Strategic Homeporting Project, Pensacola, Florida.

Vilkins, K. T., J. R. Vagner, and T. W. Allen, 1985, Hydrogeologic Data for the Sand-and-Gravel Aquifer in Southern Escambia County, Florida: Northvest Florida Water Management District, Technical File Report 85-2.

Wolfe, S. E., J. A. Reidenauer, and D. B. Ueans, 1988, *An* Ecological Characterization of the Florida Panhandle, U.S. Fish and Wildlife Service Biological Report 88(12); Minerals Management Service OCS Study\MMS 88-0063.

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

1100500

25. FLORIDA PROFESSIONAL GEOLOGIST SEAL

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

Name: Richard J. Rudy

License Number: P.G. No. 97

State: Florida

Expiration Date: July 31, 1992

R chard

9-8-92
Date

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

APPENDIX A

SITE-SPECIFIC SAFETY PLANS

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

ecology and environaont, inc.

SITE SAFETY PLAN

Version 988

A. GENERAL INFORMATION

Projoct Title: Site 11-North Chovalior Disposal Area Projoct No.: UH1102

TDD/Pan No.:

Projoct Manager: John Barksdale Projoct Dir.: Rick Rudy

Location(s): North Chovalior Disposal Area - An 18 acre area north of Chovalior Field and West of Bayou Grande

Prepared by: Kim Walker Dato Prepared: 4-25-89

Approval by: Mary Miller Dato Approvod:

Site Safety Officer Review: Date Reviewed:

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

Proposed Dato of Field Activities: August 1989

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

Documentation/Summary:

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

B. SITE/WASTE CHARACTERISTICS

Waste Type(s):

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

Characteristic(s):

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

Other:

Physical Hazards:

Overhead [X]	Confined* Space [ ]	Below Grade [X]	Trip/Fa11 [X]
Puncture [ ]	Burn [ ]	cut [ ]	Splash [X]
Noise [X]	Other: Vehicular traffic around existing buildings. Heat/cold stress.		

*Requires completion Of additional form and special approval from the Corporato Health/Safety group. Contact RSC OK HQ.

Site History/Description and Unusual Features (see Sampling Plan for detailed description): Site 11 was a low. swampy. partly submerged area where industrial wastes were disposed of and burned from tho late 1930's to tho rid-1940s. It was reported that approximately 24 cubic yards per day of refuse including wastes from aircraft engine overhauls, waste oils, lumber, and other burnablor, were disposed of thoro. Prior to 1950, oil slicks were noted in tho Bayou Grande branch following heavy rains. Samples collected on-site have exhibited heavy

Compound	PEL/TWA	of Exposure	Symptoms	Threshold	Doscription
methylene chloride	500 ppm	Inh,Ing,Con,Eye	dizzy, chest pain	214 ppm	sweetish
Isopropyl Alcohol	440 ppm	Inh,Ing,Con,Eye	drowsiness,head.	7.5-200 ppm	rubbing alcohol
Nitric Acid	2 ppm	Inh,Ing,Con,Eye	corrosive	0.3-1 ppm	acrid
chloroform	50 ppm	Inh,Ing,Con,Eye	hoad. dizzy	200 ppm	ether-like
1,1,1-trichloroethane	350 ppm	Inh,Ing,Con	nausea, vomit	20-100 ppm	ether-like
1.2-dichloroothano	50 ppm	Inh,Ing,Con,Eye	head,naus,vomit	6 ppm	sweetish
benzene	10 ppm	Inh,Ing,Con,Abs	head,euphoria,vomi	4.68 ppm	aromatic
toluene	200 ppm	Inh,Ing,Con,Abs	hoad, dizziness	0.17 ppm	aromatic
vinyl chloride	1 ppm	Inh. skin. eye	intoxication,cough	260 ppm	
ethyl benzene	100 ppr	Inh, Ing, Con	hoad, vorit. burns	140 ppm	aromatic
1,1-dichloroethane	100 ppm	Inh, Ing, Con	CNS depress,drowsy	0.085 ppm	chloroform odor
lead	50 mg/m^3	Inh, Ing, Con	vomit, diarrhea	N/A	
mercury	0.05 mg/m^3	Inh, Con, Abs	cough,thirst,naus	odorless	odorless
sulfuric acid	1 mg/m^3	Ing, Dorm, Inh	corrosive	N/A	odorless
hydrochloric acid	5 ppm	Inh, Ing, Dorm	corrosive	unknown	acrid
sodium hydroxide	2 mg/m^3	Inh, Ing, con	corrosive	N/A	odorless

D. SITE SAFETY WORK PLAN

Site Control: Attach map, 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	
Task 6				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 Ponding Reassessment of Conditions:

- Level D: O_2 <19.5% or >25%, explosive atmosphere >10% LEL, organic vapors above background levels, particulates >_____ mg/m^3, other _____
- Level C: O_2 <19.5% or >25%, oxplosive atmosphere ,258 LEL (California-20%), unknown organic vapor (in breathing zone) >1 ppm, particulates >_____ mg/m^3, other _____
- Level B: O_2 <19.5% or >25%, oxplosive atmosphere >25% LEL (California-20%), unknown organic vapors (in breathing zone) >5 ppm. particulates >_____ mg/m^3, other _____
- Level A: O_2 <19.5% or >25%, oxplosive atmosphere >25% LEL (California-20%), 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	Continuous
Radiation	Area	Mini-Rad	Continuous
Explosive Gases	Area	O_2/Explosimeter	Continuous

(Expand if necessary)

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

Trisodium phosphate wash, tap water rinse, deionized water rinse, isopropanol rinse (twice), final organic-fro. water rinse, and allow to air dry as long as possible.

Personnel Docon 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 vork.

Decon Solution monitoring Procoduros, if Applicable: Decontamination will bo performed in a well-ventilated area upwind of tho sampling zone.

Special Site Equipment, Facilities, or Procoduros (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 be employed at all times during fioldvork activities. Personnel will exercise caution in tho vicinity of nearby roadways. If above background radiation levels are encountered team members will evacuate tho sampling area, and contact tho corporate health physics group to reassess tho site.

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

All fieldwork activities will bo performed during daylight hours. Team members will take breaks as necessary to avoid heat stress and replace fluids. Cooling vests ray 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 vasto materials will be doublo baggod. drummed, labeled and transported to a designated location for final disposal by tho Navy.

Sample Handling Procoduros Including Protoctivo Wear:

During all handling of sarplos, all fiold team members will war surgical gloves. Goggles will bo worn during sample preservation with acids.

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

*All entries into exclusion zone require Buddy System use. All E & C fiold staff participate in medical monitoring prograr 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).

E. EMERGENCY INFORMATION

(Use supplemental shoots, 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 - 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 Divirion, Engineer-In-Charge -- 1-603-743-0574

Site Contact NAS Pensacola Enviromental Coordinator, R. Joyner -- 904-452-4515

SITE RESOURCES

Site Emergency Evacuation Alarm Method N/A

Water Supply Source On-sit.

Telephone Location, Number To bo determined on-site

Cellular Phone, if available N/A

Radio

Other On-sit. warehouse number to bo determined

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 Rowchurch ..... (904) 070-2336 (home)
   (904) 877-1978 (office

4. Regional Office Manager, Rick Rudy ..... (904) 093-7245 (home)
   (904) 077-1978 (office

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 roach you.
   - Your iocation.
   - Nan of 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 sorvico.

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 - homo # (716) 655-1260
   c. Assistant Corp. Safety Officer - Steven Sherman - home # (716) 688-0084

EMERGENCY ROUTES

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

Directions to hospital (include map) from Site 11

NAS Dispensary - Proceed west on Farrar Road to Murray Road (See attached map). Follow Murray load south to Uoffott Road. Turn right onto Moffett Road and continue to Fisher Street. Turn loft onto Fisher Stroot and continuo to its intersection with 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. 98 east appror. 3ai 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 this road for about 8 blocks and turn loft (north) onto E street. Tho hospital is about 6 blocks north on tho left.

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

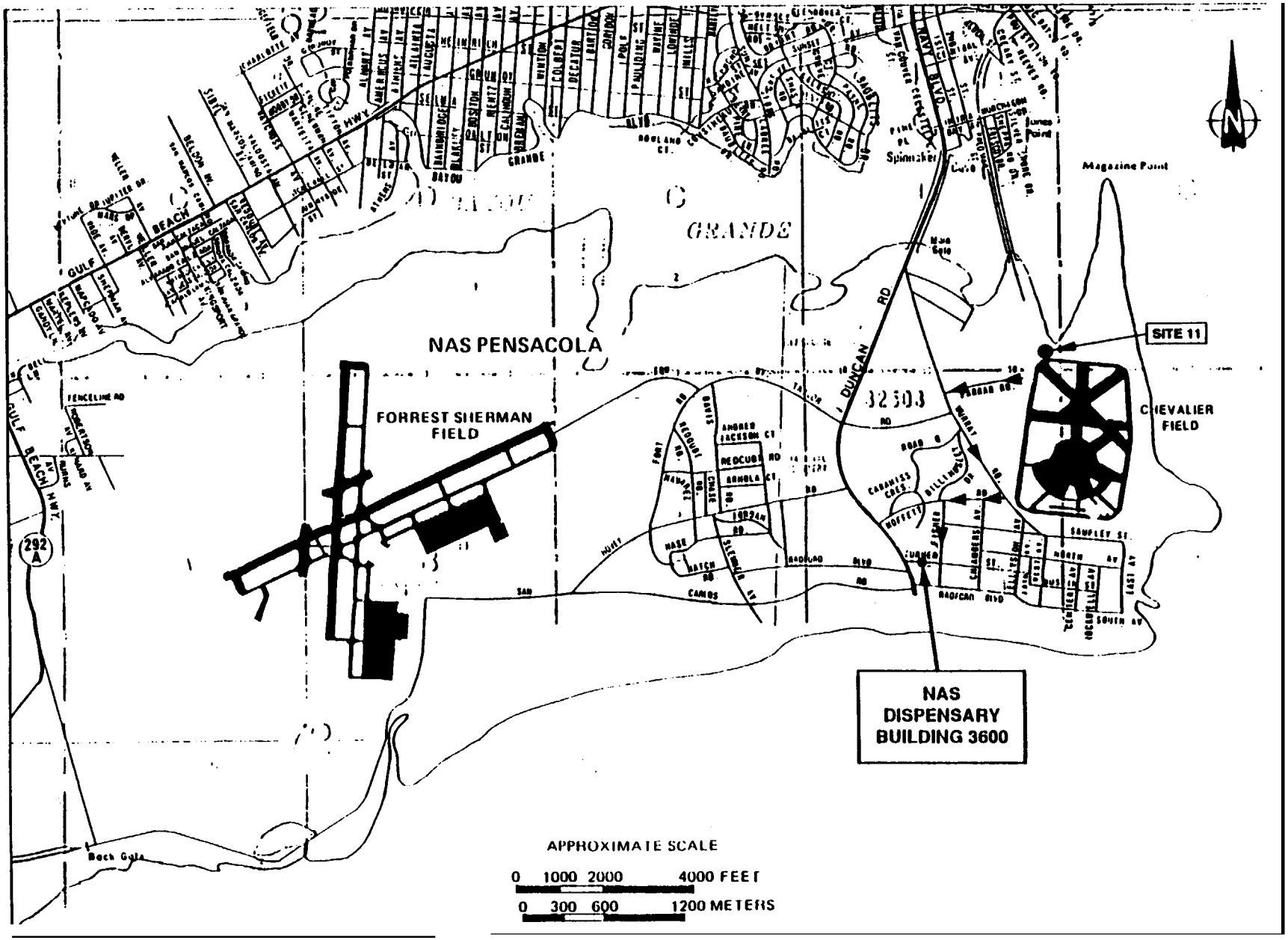
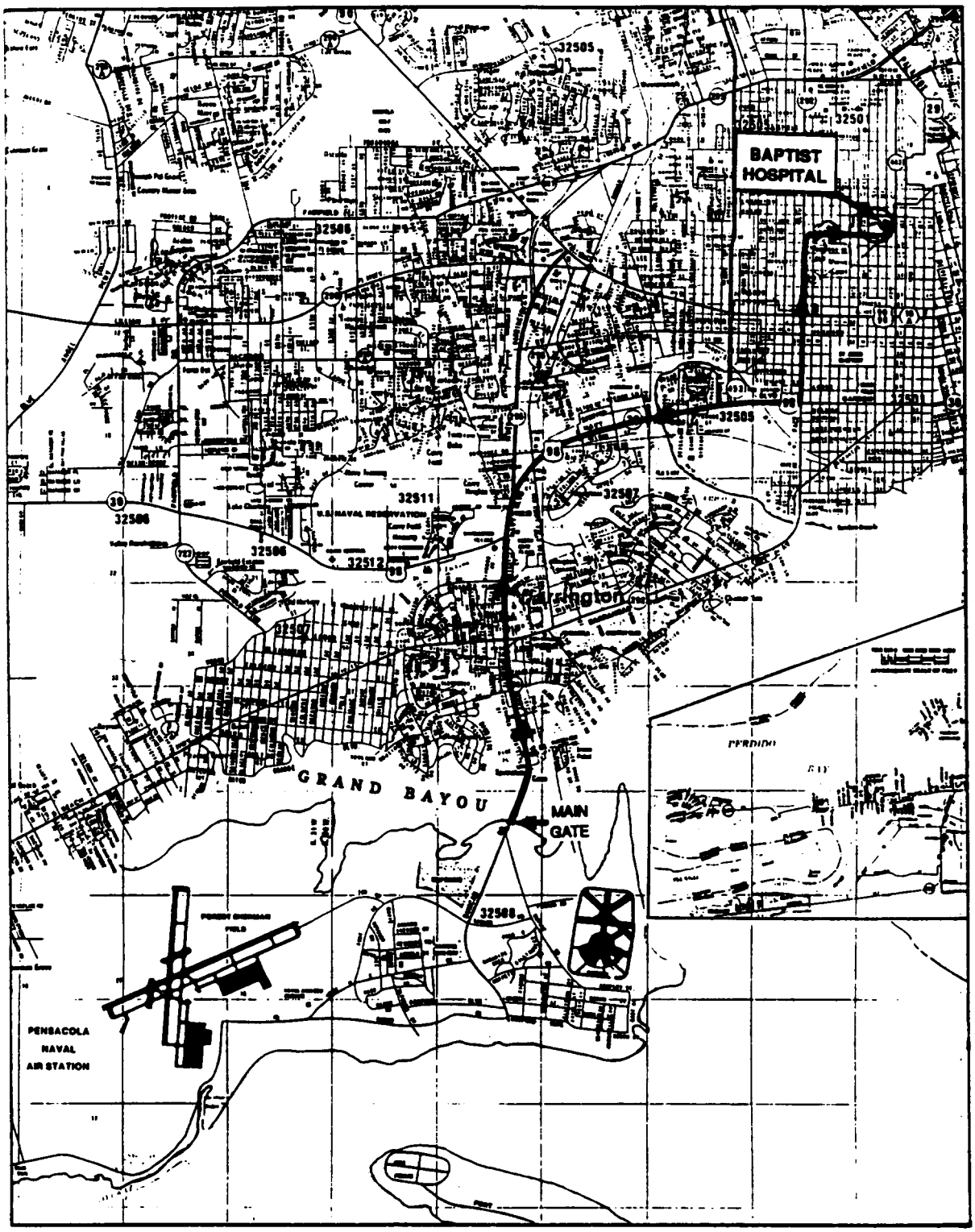


Figure A-1 LOCATION OF NAS DISPENSARY



SOURCE: Ecology and Environment, Inc., 1992

APPROXIMATE SCALE IN FEET

0 2000 4000 6000 8000

Figure A-2 LOCATION OF BAPTIST HOSPITAL

1100506

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 DUB TO HEAT AND HEAT STRESS MONITORING

REVISED JANUARY 1990

Prepared by

Ecology and Environment, Inc.
368 Pleasantview Drive
Lancaster, New York 14086

None of the information contained in this Ecology and Environment, Inc. (E 6 E), publication is to be construed as granting any right, by implication or othervise, for the manufacture, sale, or use in connection vith any method, apparatus, or product covered by letters patent, nor as insuring anyone against liability for infringement of letters patent.

Anyone vishing to use this E & E publication should first seek permission of the company. Every effort has been made by E & E to ensure the accuracy and reliability of the data contained in the document: however, the company makes no representation, varranty, or guarantee in connection vith this E 6 E publication and hereby expressly disclaims any liability or responsibility for loss or damage resulting from its use: for any violation of any Federal, State, or municipal regulation vith vhich this E 6 E publication may conflict; or for the infringement of any patent resulting from the use of the E & E publication.

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 Case 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 Care 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 TEE WORK AREA FOR HEAT STRESS CONDITIONS 6

6 DECONTAMINATION 6

1100503

1 INTRODUCTION

Field operations present a variety of hazards to the employee. During hot days or when wearing 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 ways 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 folloved in the field. Hovever, each individual must be cautious when working in conditions where heat stress is possible.

3 OBJECTIVES

The prevention of heat stress is of paramount importance for field personnel, particularly vhen 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 within 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 with 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 which 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.

recycled paper
ecology and environment

Heat 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 heat is lost by convection. Hovever, when the temperature of the surrounding air becomes equal to or rises above that of the body, all of the heat must be lost by vaporization of the moisture (sveat) from the skin surface. As the air becomes more humid (contains more moisture), vaporization fra the skin slovs down. Thus, on a day when the temperature is 95°F to 100°F, vith high humidity and little or no breeze, heat is retained vithin 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 heat are likely to occur. Such emergencies are classified in three categories: heat cramps, hut exhaustion, and heat 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 heat cramps include the folloving:

- o Muscle cramps in legs, arms, or abdomen;
- o Pain accompanying the cramps;
- o Profuse perspiration; and
- o 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 *tone.* 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 vorking in hot environments and may be associated vith hut *cramps.* Heat exhaustion is caused by the pooling of blood in the vessels of the skin. The hut is

recycled paper
1100503

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 Veak 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 while observing proper decontamination procedures. Administer cool vater, 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.

recycled paper ecology and environment

4.3.1 Symptoms

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

- o Dry, hot, and flushed skin;
- o Sudden onset;
- o Full and fast pulse:
- o Dilated pupils:
- o Early loss of consciousness;
- o Body (core) temperature's exceeding 105°F;
- o Muscle tvitching, growing into convulsions: and
- o Breathing deeply at first, later shallovly or even almost absent.

4.3.2 Emergency 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 cool environment and remove as much clothing as possible. Ensure an open airvay. Reduce body temperature promptly, preferably by vrapping the victim in a wet sheet or dousing the body vith vater. If cold packs are available, place them under the arms, around the neck, on the ankles, or any place vhere 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, Gatorade 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 the body's system. Vithout these electrolytes, body systems cannot function properly, and the represented health hazard will be increased. Therefore, vhen personnel are vorking in situations vhere the ambient temperatures and humidity are high, and especially in situations vhere levels A, B, and C of protective apparel are required, the SSO must follow the procedures lirted below:

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

recycled paper
ecology and environment
1100510

- Ensure that frequent breaks are scheduled so that overheating is less likely to occur:
- Revise vork schedules, when 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
- Cooling vests should be worn if available.
- 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 Wearing Time per Excursion (min)
Above 90	15
85 to 90	30
80 to 85	60
70 to 80	90
60 to 70	120
50 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:

- 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.
- 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 betvcen 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.

recycled paper
ecology and environment

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 ana 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 other medical emergencies, decontamination should proceed as normally as possible vithout contributing unduly to the victim's stress or injury. At a minimum, the 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 at the decontamination station to either suit up and assist in extraction or to help decontaminate and undress the victim. If other serious injuries or more life-threatening conditions exist, and the victim cannot be disrobed or decontaminated completely, the victim (or contaminated portions) should be wrapped in plastic (or other protective material) for his or her own safety as well as the safety of ambulance and hospital personnel. Carefully avoid action that would result in the victim's being further overheated.

recycled paper
Ecology and Environment
1100511

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

STANDARD OPERATING PROCEDURES
FOR
HEALTH AND SAFETY ON
DRILLING RIG OPERATIONS

REVISED: JANUARY 1990

Prepared by

Ecology and Environment, Inc.
368 Pleasantview Drive
Lancaster, Nev York 14086

None of the information contained in this Ecology and Environment, Inc. (E & E), publication is to be construed as granting any right, by implication or otherwise, for the manufacture, sale, or use in connection vith any method, apparatus, or product covered by letters patent, or as insuring anyone against liability for infringement of letters patent.

Anyone wishing to use this E & E publication should first seek permission of the company. Every effort has been made by E & E to ensure the accuracy and reliability of the data contained in the document; however, the company makes no representation, warranty, or guarantee in connection vith this E & E publication and hereby expressly disclaims any liability or responsibility for loss or damage resulting from its use; for any violation of any Federal, State, or municipal regulation vith vhich this E 6 E publication may conflict; or for the infringement of any patent resulting from the use of the E & E publication.

recycled paper
ecology and environment
1100512

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 & E DRILLER	1
2.3	RESPONSIBILITIES AND AUTHORITY OF OTHER E & E PERSONNEL.	3
3	TRAINIREQUIREMENTS FOR SITE PERSONNEL	3
3.1	E & E SITE SAFETY OFFICER	3
3.2	E & 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 & E 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 Hollow-Stem Augers	12
5.1.5	Use of Vire Line Hoists, Vire Rope, and Hoisting Equipment	13
6	REFERENCES	16

recycled paper

1 INTRODUCTION

This document is meant to be used in conjunction vith E 6 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 working on or around drilling operations.

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

2 OPERATION OF DRILLING EQUIPMENT BY E 6 E

2.1 RESPONSIBILITIES AND AUTHORITY OF SITE SAFETY OFFICER

The duties of the Site Safety Officer (SSO) on drilling sites are the *same* 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.

E & E personnel are restricted from the borehole area during active drilling. When E 6 E 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 6 E DRILLER

At the binning of each vork day, the E 6 E driller must inspect the rig to ensure the folloving 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 (visual);
- Loose belts;
- Presence of any fluid leaks;
- Any damaged hoses, cables, ropes, chains:
- Control panel is clean;
- Cantrol 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 working order;
- Rig leveled and stabilized;
- Check for veld cracks in mast; and
- Safety hooks operational.

Recycled paper
1100513

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

During the drilling operations, the folloving 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 vorn when hammers are operated.
- Javs of all vrenches 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 when raising rig mast, boom will not be raised within 25 feet of overhead utilities.
- No refueling will be permitted while equipment is running.

The Driller has authority to direct personnel within the area vhile 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 allovs penetration of the augers. No personnel are alloved in this zone pad at any time vhile drilling is actively underway.

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

2.3 RESPONSIBILITY AND AUTHORITY OF OTHER E 6 E PERSONNEL

E 6 E personnel vorking 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" vhile drilling is underway. If an E & E crew member recognizes an unsafe condition in the vork area 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, including 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 6 E field vork, the buddy system is to be enforced.

3 TRAINING REQUIREMENTS FOR SITE PERSONNEL

3.1 E 6 E SITE SAFETY OFFICER

In addition to Basic Health and Safety Training and other OSHA mandated training, first aid, CPR, end necessary training in field monitoring of personnel, an SSO should have previously worked as a team umber on field drilling projects in order to have a vorking 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.

recycled paper
ecology and environment
1100514

3.2 E 6 E DRILLER AND RELPER

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 vith E 6 E, by performing various types of drilling. This reviev will be the basis for determining vhether additional training or apprenticeship will be required before allowing this employee to act as Driller. An existing E & 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 revieved 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. Folloving successful completion of such a course, the Driller's Helper will be observed on sites for a period of approximately 6 months, during vhich time he or she will work on several drilling projects performing assorted types of drilling. The E 6 E Drilling Team will determine, based on these field observations, vhether additional training is required for this individual.

3.3 OTHER E & E DRILLING PERSONNEL

All E 6 E personnel shall have taken the basic 40-hour Health and Safety Training course. Field personnel must meet medical and respiratory fit test requirements established by E & 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 6 E's contractual documentation. This training shall be verbally verified and logged onsite by the SSO or Team Leader before starting vork.

recycled paper
ecology and environment
00080.PM3

4 SUPERVISION OF SUBCONTRACT DRILLERS

4.1 RESPONSIBILITIBS 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 with, but is not limited to, verifying each item on the folloving 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 switches must be reiterated to all site personnel.
- Outriggers, stabilizers, or jacks are in place, and the rig is level.
- 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 aad 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 vill 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.

recycled paper
energy and environment
60000.PM3
1100515

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 vhere 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 & 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 & E personnel are forbidden from entering the "super exclusion zone" around the borehole while the rig is actively drilling. The SSO must not attempt to take air readings in or around the auger while 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 draw samples from the borehole area during drilling operations.

The SSO has the ultimate authority over the Subcontractor vith regard to whether work practices meet the requirements of the SSP. Shutdovn of work 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 work shifts throughout the course of the project. Although E & 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 otherwise ill before or during work 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:

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

- o Location and operation of kill switches, fire extinguisher, and first aid kit:
- o Heat and 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 warm weather, the SSO is responsible for determining whether conditions are unsuitable for vork. Where vorkers cannot vork vith the assistance of vork modifications, cooling vests, and other cooling means, the SSO may decide that vork should not continue. The need for vorker 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 8 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 crev should observe the subcontractors and condition of their equipment at all tires, 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 that the SSO be involved so that proper log entries can be made.

E 6 B, as policy, does not provide safety equipment or monitoring instrumentation to subcontractors. Some projects, however, may be set up so that E 6 E personnel and subcontractors share the *sue* expendable supplies.

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

recycled paper
ecology and environment
1100513

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 6 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 varnings to those personnel who 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 shovn 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.
- Welding 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 vith assumed well contaminants) will be vorn as directed by the SSO and the SSP. At a minimum, steel-toed boots, hard hats, and face shields will be worn 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.

recycled paper
ecology and environment

- Electrical storms within hearing range of the job site will signal work termination until the SSO and Team Leader notify personnel otherwise.

- 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 using appropriate instrumentation prior to ground breaking.

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

- Only properly licensed staff will drive the drill rig. A daily safety check of the vehicle, following E & E protocol, will 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 with a ladder, it should be lowered for repairs.

5.1.2 Rotary and Core Drilling

The following 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 from the pump should be checked for properly installed couplings; couplings should be secured with locking devices on "quick connect" fittings or wire on "Chicago-Style" couplings.

recycled paper
1100517

- 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 lovering 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 vhile being lovered into the hole with chuck jaws.

- Drill rods should not be held or lovered into the hole vith pipe wrenches.

- 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.

-

- If vork must progress over a portable drilling fluid (mud) pit, do not attempt to stand on narrow sides or cross members. The mud pit should be equipped with 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 vorn 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 with a wire brush.

recycled paper
ecology and environment
00080.PM3

- Check the cathead periodically, when the engine is not running, for rope wear grooves. If a rope groove forms to a depth greater than 118 inch (3 mm), the cathead should be replaced.

- Always use a clean, dry, sound rope. A vet or oily rope ray "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 drum, release the rope and sound an appropriate alarm for all personnel, including the Operator, to rapidly back avay 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 may not be visibly detectable, thus the rope should always be protected from any chemical contact.

- Never wrap the rope from the cathcad (or any other rope, wire 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 with each hammer blov as the sampler or other drilling tool advances into the ground.

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

- Do not leave a cathead unattended vith the rope vrapped 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 cathcad standing on a level surface vith sound, firm-footing conditions, without distraction or disturbance.

1100518

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 dovn pressure before rotation to seat the auger head belov the ground surface.

- Check auger flights for nicks or burrs that could catch clothing during rotation, and file them down.

- Watch the auger head while slovly engaging the clutch or rotation control, and start rotation. Stay clear of the auger.

- Slovly 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 pover coupling. Do not touch the coupling or the auger with your hands, a vrench, 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 vhen 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.

- 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-hurdled shovel to move auger cuttings avay from the auger. Never use your hands or feet to move cuttings avay from the auger.

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

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

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

- All vire ropes and fittings should be visually inspected during use and thoroughly inspected at least once a veek for abrasion, broken vires, vear, reduction in rope diameter, reduction in wire diameter, fatigue, corrosion, damage f r a heat, iaproper veaving, jamming, crushing, bird caging, kinking, core protrusion, and damage to. lifting hardvare. All related equipment must conform to standards as established by the American Iron and Steel Institute Wire Rope Users Manual. Vire ropes should be replaced vhen inspection indicates excessive damage according to the Vire Rope Users Manual. All vire ropes vhich have not been vved 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 loaded according to the manufacturer's specifications.

- If a ball-bearing type hoisting svivel is vved 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 colum higher than one-half the mast height above the top of the mast (derrick). Do not hoist a rod colum vith loose tool joints urd do not make up, tighten, or loosen tool joints vhile the rod column is being 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 with hands or by tensioning the slipping device.

recycled paper

1100519

- 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 vith 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.

- Vhen stuck tools or similar loads cannot be raised with 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.

- Vhen attempting to free a mired vehicle or drill carrier, use only a vinch 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 veather.

- 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.

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

- Always wear gloves when handling vire rope.

- Polloving the installation of a nev vire rope, first lift a light load to allov the vire rope to adjust.

- 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 feet of personnel.
- Never use a hoist line to "ride" up the mast (derrick) of a drill rig.
- Replacement of vire ropes should conform to the drill rig manufacturer's specifications.

recycled paper
ecology and environment
1100530

6 REFERENCES

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

Diedrich D-50 Safety Manual.

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

Vire Rope Users Manual, American Iron and Steel Institute.

MALLINCKRODT

Material Safety Data Sheet

Mallinckrodt provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose. MALLINCKRODT MAKES NO REPRESENTATIONS, OR WARRANTIES, EITHER EXPRESS OR IMPLIED, OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE INFORMATION SET FORTH HEREIN OR TO THE PRODUCT TO WHICH THE INFORMATION REFERS. ACCORDINGLY, MALLINCKRODT WILL NOT BE RESPONSIBLE FOR DAMAGES RESULTING FROM USE OF OR RELIANCE UPON THIS INFORMATION.

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

Emergency Telephone Number: 314-982-5000

100521

HYDROCHLORICACID, 37%

PRODUCT IDENTIFICATION:

Synonyms: Muriatic acid

Formula CAS No.: 7647-01-0

Molecular Weight: 36.46 (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 CAVIL 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 least 15 minuter. If swallowed, **DO NO 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 mater 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 ran 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.

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.

Eyt 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 LDSO 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 d i t into the general work area. Please refer to the ACGIH document, "Industrial Ventilation. A Manual of Recommer Practices", most recent edition, for details.

Personal Respirators: (NIOSH Approved)
If the IDLH 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 ku. 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 n r h 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.

Mallinckrodt
Material Safety Data

Emergency Phone Number: 314-982-5000

Mallinckrodt provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. Individuals receiving this information must exercise their independent judgment in determining its appropriateness for a particular purpose.

Mallinckrodt makes no representations, or warranties, either express or implied, of merchantability, fitness for a particular purpose with respect to the information set forth herein or to the product to which the information refers. Accordingly, Mallinckrodt will not be responsible for damages resulting from use of or reliance upon this information.

Mallinckrodt, Inc., Science Products Division, P.O. Box M, Paris, KY 43061.

recycled paper

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 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.

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 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.

privileges and environment

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

Mallinckrodt
Material Safety Data

Mallinckrodt provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. Individuals receiving this information must exercise their independent judgment in determining its appropriateness for a particular purpose.

Mallinckrodt makes no representations, or warranties, either express or implied, of merchantability, fitness for a particular purpose with respect to the information set forth herein or to the product to which the information refers. Accordingly, Mallinckrodt will not be responsible for damages resulting from use of or reliance upon this information.

Emergency Phone Number: 314-982-5000

Mallinckrodt, Inc.. Science Products Division. P O Box M, Paris, KY 43061

recycled paper

ISOPROPYL ALCOHOL

PRODUCT IDENTIFICATION:

Synonyms: **2-propanol;** Kc-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 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** minulcr. **In** all **cases** call a physician.
SEE **SECTION 5.**

DOT Hazard Class: Flammable **Liquid**

product and environment

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-DUAC = 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: 2.9 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 fatcpiccc 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** 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-sulfur it 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 rand, **earth or** similar material for **disposal as** hwrdous **waste** in a RCRA approved facility.

Ensure compliance with local, state and federal regulations.

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

Material Safety Data

Emergency Phone Number: 314-982-5000

Mallinckrodt provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. Individuals receiving this information must exercise their independent judgment in determining its appropriateness for a particular purpose

Mallinckrodt makes no representations, or warranties, either express or implied, of merchantability, fitness for a particular purpose with respect to the information set forth herein or to the product to which the information refers. Accordingly, Mallinckrodt will not be responsible for damages resulting from use of or reliance upon this information.

Mallinckrodt, Inc., Science Products Division, P.O. Box M, Paris, KY 43061

1100 523

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

REC

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.
Wuh 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 Gustic Poison Act.

EMERGENCY/FIRST AID

In case **of contact,** immediately flush **skin or eyes** with plenty **of** n t e r lor at least 15 minutes. **If swallowed,** DO NOT INDUCE **VOMITING!** Give large quantities **of** n t e r or milt **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 n t e r.

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. G n 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 n t e r spray.

Special Information:
Increases the flammability of combustible, organic and readily oxidizable **materials.** In the event of a fife, **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 **Cluse** and storage. Containers may **bunt 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.**

Ab

NFPA Ratings: Health: 3 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.

recycled paper

Mallinckrodt
Material Safety Data

Emergency Phone Number: 314-982-5000

Mallinckrodt provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. Individuals receiving this information must exercise their independent judgment in determining its appropriateness for a particular purpose.

Mallinckrodt makes no representations, or warranties, either express or implied, of merchantability, fitness for a particular purpose with respect to the information set forth herein or to the product to which the information refers. Accordingly, Mallinckrodt will not be responsible for damages resulting from use of or reliance upon this information.

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

11 005 24

SODIUM HYDROXIDE

PRODUCT IDENTIFICATION:

Synonyms: Caustic soda; lye; sodium hydroxide solid; sodium 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 Pdnt: 1390°C (2534°F)

Melting Pdnt: 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 rnd upper eyelids occasionally. Get medical attention immcdiatcly.

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 awry from sources of heat, moisture and incompatibilities. Always add the caustic to water while stirring, never the reverse.

MOXI

recycled paper

Mallinckrodt
Material Safety Data

Emergency Phone Number: 314-982-5000

Mallinckrodt provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. Individuals receiving this information must exercise their independent judgment in determining its appropriateness for a particular purpose.

Mallinckrodt makes no representations, or warranties, either express or implied, of merchantability, fitness for a particular purpose with respect to the information set forth herein or to the product to which the information refers. Accordingly, Mallinckrodt will not be responsible for damages resulting from use of or reliance upon this information.

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

110325

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 3.

DOT Hazard Class: Corrosive Material

SECTION 1 Physical Data

Appearance: Colorless, oily liquid.

Odor: Odorless.

Solubility: Infinite @ 20°C.

Boiling Point: ca. 310% **(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 **is** a strong oxidizer and its heat of reaction with reducing agents or combustibles may cause ignition.

Fire Extinguishing Media:
Dry chemical, 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.

SECTION 3 Reactivity Data

Stability:
Stable 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 Flammability: *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.

Eyt 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 Explosure Limit (PEL):
1 mg/m^3 (TWA).
-ACGIH Threshold Limit Value (TLV):
1 mg/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 niay be worn.

Skin Protection:
Wear impervious protective clothing. including boots. gloves, lab coal, 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.

recycled paper

ecology and environment, inc.

HAZARD EVALUATION OF CHEMICALS

Chemical Ran Methylene Chloride Date 3/23/92

DOT Name/U.N. No. 1593 Job lo. UH8000

CAS Number 75-09-2

References Consulted (circle):

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

Toxic and Hazardous Safety Manual ACGIH Other:

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

chemical Proportior: (Synonyms: Dichloromethane, Methylene Dichloride)

Chemical formula CH_2Cl_2 Molecular Weight

Physical State Liquid Solubility (H2O) Slightly Boiling Point 104°F

Flash Point Vapor Pressure/Density 350 mm Hg Freezing Point -142°F

Specific Gravity 1.33 odor Characteristic Like chloroform Flammable Limits

Incompatabilities

Biological Properties:

TLV-TWA 50 ppm PEL 500 ppm Odor/Odor Threshold Sweet, pleasant/160 ppm

IDLH 5,000 ppm Human Aquatic Rat/Mouse

Route of Exposure oral, inh, ing, derm

Carcinogen Human/animal Teratogen Mutagen Experimental

Radiological Properties:

N/A

Handling Recommendations: (Personal protective measures)

Tyvek, gloves (PVA, Viton); any detectable concentrations-SCBA: no APR cartridgo available

Monitoring Recommendations:

OVA continuously

Disposal/W

Health Has

Inh: move

soap/water

Symptoms:

1100520

ecology and onvironront, inc.

HAZARD EVALUATION OF CHEMICALS

Chemical Name Chloroform Date 3/23/92

DOT Name/U.N. No. 1888 Job lo. UH8000

CAS Number 67-66-3

References Consulted (circle):

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

Toxic and Hazardous Safety Manual ACGIH Other:

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

Chemical Proportios: (Synonyms: METHANE TRICHLORIDE, TRICHLOROMETHANE)

Chemical Formula $CHCl_3$ Molecular Weight 119.4

Physical State Liquid solubility (H2O) 0.5 % Boiling Point 143 -F

Flash Point < 66 -F Vapor Pressure/Density 30 mm Freezing Point -43 -F

Specific Gravity 1.48 (77°F) odor Characteristic Pleasant Flammable Limits Non

Incompatabilities Strong Caustics, chemically-active metals

Biological Properties:

TLV-TWA 2 ppm PEL 2 ppm Odor/Odor Threshold

IDLH 1000 ppm Human Aquatic Rat/Mouse

Route of Exposure Inh, Abs, Ing, Con

Carcinogen Yes Teratogen Mutagen

Handling Recommendations: (Personal protective measures)

Tyvek and safety glasses with full-face respirator available for upgrade.

Monitoring Recommendations:

Continuous HNu/OVA

Disposal/Waste Treatment:

Health Hazards and First Aid:

Eye: wash immediately; skin: wash immediately; ING: immediate medical attontion - irritation from exposure requires immediate medical attontion.

Symptoms: Acute: Blurred vision, confusion, delirium, nausea, vomiting

Chronic: Tremors; convulsions: lung, liver, or kidney damage

[FS]FO5000:81

ecology and anvironwnt, inc.

HAZARD EVALUATION OF CHEMICALS

Chemical Name 1,1,1-Trichloroethane Data 3/23/92

DOT Name/U.N. No. 2831 Job No. UH8000

CAS Number 71-55-6

References Consultad (circle):

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

Toxic and Hazardous Safety Manual ACGIH Other:

Rad Health Handbook NCRP 65 io CFR 20 Handbook of Chemistry and Physics

Chemical Propartias: (Synonyms: Methyl chloroform)

Chemical Formula CH_3CCl Molecular Weight 133.4

Physical State liquid Solubility (H2O) 0.4% Boiling Point 165° F

Flash Point N/A Vapor Pressure/Density 100 mm Freezing Point -23° F

Specific Gravity 1.34 Odor Characteristic 390 ppm Flammable Limits

Incompatabilities Strong caustics or oxidizers, water

Biological Propartias:

TLV-TWA 350 ppm PEL 350 ppm Odor/Odor Thrashold chloroform like

IDLH 1,000 ppm Human Aquatic Rat/Mouse

Route of Exposure Inpaation, Inhalation, Dermal

Carcinogen Teratogen Mutagen

Radiological Propartias:

Handling Recommendations: (Personal protective measures)

Monitoring Recommendations:

OVA or HNu with tho 11.7 eV probe.

Disposal/Waste Treatment:

Health Hazards and First Aid:

INH & ING: seek medical attention promptly: DER: wash with soap and water.

Symptoms: Acute: light headed, drowsiness, headache, irritation of eyes and akin

Chronic: CNS depression

1100527

ecology and environment, inc.

HAZARD EVALUATION OF CHEMICALS

Chemical Name 1,2-Dichloroethane Date

DOT Name/U.N. No. 1184 Job No. UC3000

CAS Number 107-06-02

References Consultod (circle):

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

Toxic and Hazardous Safety Manual ACGIH Other:

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

Chomical Properties: (synonyms: Ethylene dichloride, Freon 150)

Chomical Formula $Cl_2C_2H_4$ Molecular Weight 98.96

Physical State liquid Solubility (H2O) 0.8% Boiling Point 182°F

Flash Point 55°F C.C. Vapor Pressure/Density 87 mm at 20°C Freezing Point -32°F

Specific Gravity 1.25 @ 20°C Odor Characteristic Sweet Flammable Limits 6.2% - 15.62

Incompatabilities Oxidizers, caustic., active metals

Biological Properties:

TLV-TWA LO ppm PEL 1 ppm Odor/Odor Threshold 100 ppm

IDLH 1000 ppm Human Aquatic Rat/Mouse LD_{50} .5-5 g/kg

Route of Exposure inhalation,. ingestion, contact

Carcinogon X Teratogen Mutagen

Radiological Proportios:

Handling Recommendations: (Personal protective measures)

Organic vapor/acid gas cartridge or SCBA, rubber gloves, goggles, faceshield, rubber boots

Monitoring Recommendations:

Organic vapor analyzers - continuous: explosimeter/O_2 analyzer

Disposal/Waste Treatment:

Health Hazards and First Aid:

Inhalation - remove to fresh air: contact - flush with water; got medical attention

Symptoms: Acute: Irritation, loss of equilibrium or consciournoss, headache, nausea, vomiting, dry skin

Chronic:

ecology and environment, inc.

HAZARD EVALUATION OF CHEMICALS

Chemical Name Benzene Date 3/23/92

DOT Name/U.N. NO. 1114 Job No. UH8000

CAS Number 71-43-2

References Consulted (circle):

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

Toxic and Hazardous Safety Manual ACGIH Other:

Rad Health Handbook NCRP 65 io CFR 20 Handbook of Chemistry and Physics

Chemical Proportioa: (Synonym: Benzol, Benzole, Cyclohexatriene)

Chemical Formula C_6H_6 Molecular Weight 78

Physical State Liquid Solubility (H2O) Slightly Boiling Point 176°F

Flash Point 12°F Vapor Pressure/Density 75 mm Freezing Point 42°F

Specific Gravity 0.079 Odor Characteristic 4.68 ppm Flammable Limits 1.3-7.1%

Incompatabilities Strong oxidizers, chlorine, bromine

Biological Proportioa:

TLV-TWA 10 ppm PEL 1 ppm Odor/Odor Threshold Aromatic

IDLH 100/CNS Human Aquatic Rat/Mouse 50/24H

Route of Exposure Inhalation, ingestion, eye (ocular), dermal absorption

Carcinogen Human - suspected Teratogen Mutagen Experimental

Radiological Proportioa:

Handling Recommendations: (Personal protoctivo measures)

10 ppm use SCM. Use protective clothing: excel-viton; good-neoprene, saranax; poor-butyl, natural rubber for gloves. Avoid skin/eye contact

Monitoring Recommendations:

Disposal/Waste Treatment:

Health Hazards and First Aid:

Do not induce vomiting or give vator or milk; got medical attontion immediately, remove to fresh air, give artificial respiration if needed, medical attontion, flush with water, rinse/wash skin with soap and water thoroughly

Symptoms: Acute: Skin irritant, CNS dopressant, mostly IHL, initial oxcitation followed by headache, dissiness, vomiting, delirium, severe exposure u y see tremors, blurred vision, shallow respiration, convulsions

hr Anorexia, drowsiness, anemia, blooding ----- akin, reduced blood clotting: liver, kidney, ma marrow damage, leukemia

1100528

ecology and onvironnont, inc.

HAZARD EVALUATION OF CHEMICALS

Chomical Name Toluene Date 3/23/92

DOT Name/U.N. No. 1294 Job No. UH8000

CAS Number 108-88-3

References Consulted (circle):

NIOSH/OSHA Pocket Guide Verschueren Morck Index Hazardline Chris Vol. XI

Toxic and Hazardous Safety Manual ACGIH Other:

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

Chomical Proportioa: (Synonym: Methyl benzene, Toluol, Phenyl methane)

Chomical Formula C_7H_8 Molecular Woight 92

Physical State Colorless Liquid Solubility (H2O) 0.05g/100 H_2O Boiling Point 231°F

Flash Point 40°F Vapor Pressure/Density 22mm Freezing Point -139°F

Specific Gravity 0.8669 odor Charactoristic 0.2ppm Flammable Limits 1.38 - 7.1%

Incompatabilities Strong Oxidizers, HNO_3, H_2SO_4, O_2, Peroxides, Heat

Biological Proportioa:

TLV-TWA 100 ppm PEL 200 ppm Odor/Odor Threshold Benzene-Like

IDLH 2,000 ppm Human IHL TCLD - 200 ppm Aquatic 96:100-10 ppm Rat/Mouse 4000 ppm

Route of Exposure Inhalation, Ingostion, Dermal Contact, Eye (Ocular)

Carcinogen Exporimontal Teratogen Experimental Mutagen Exporimontal

Radiological Proportioa:

Handling Recommendations: (Personal protective measures)

Impervious clothing, Viton gloves, faceshield roopirator w/organic vapor cartridgo up to 1000 ppm, >1000 ppm use APR with chemical cartridgo: 2000 ppm-SCBA

Monitoring Recommendations:

Disposal/Waste Treatment:

Concentrated: incineration; dilute discharge to municipal sewer after primary troatmont, incineration for dilute organic mixture

Health Hazards and First Aid:

Plush area with water and wash with soap: move to fresh air if inhaled; if swallowed, do not induce vomiting. Contact physician immediately.

Symptoms: Acute: Dizziness, fatigue, nausea, headache, vomiting, irritates eyes, dries skin

Chronic: Bono marrow, depression, dofatting of skin, dermatitis, kidnoy and/or liver damage if ingested

ecology and environment, inc.

HAZARD EVALUATION OF CHEMICALS

Chemical Name Vinyl Chloride Date April 13, 1909

DOT Name/U.N. No. 1006 Job No. YO 1900

CAS Number

References Consulted (circle):

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

Toxic and Hazardous Safety Manual ACGIH Other:

Rad Health Raadbook NCRP 65 io CFR 20 Handbook of Chemistry and Physics

Chemical Proportiom: (Synonyms: Chloroethylene, VC, Chloroethene)

Chemical Formula C_2H_3CL Molecular Weight 62.5

Physical State Colorless gas Solubility (H2O) Negligible Boiling Point 7°F

Flash Point -108°F Vapor Pressure/Density 2580 mm Freezing Point -245°F

Specific Gravity 0.9121 Odor Characteristic 4100 ppm Flammable Limits 3.6% - 33%

Incompatabilities Strong oxidizers, strong bases, iron, stool, copper, peroxide

Biological Proportiom:

TLV-TWA 1 ppm PEL 1 ppm Odor/Odor Threshold odorless gas, sweet

IDLH 500 ppm Human Aquatic Rat/Mouse

Route of Exposure Inh

Carcinogen Human Teratogen Mutagen Suspect

Radiological Properties:

Handling Recommendations: (Personal protective measures)

Wash immediately upon contact with skin; impervious clothing, gloves, face shield; 10 ppm app/organic ?

25 ppm 100 ppm - SCBA

Monitoring Recommendations:

PID 10:2, FID

Disposal/Waste Treatment:

N/A

Health Hazards and first Aid:

Wash skim. eyes immediately, if contaminated; move to fresh air if largo amounts are breathed in; induce vomiting if swallowed

Symptoms: Acute: Giddiness, intoxication, nausea, light headedness, CNS depression

Chronic: Liver damage, CNS depression, reproductive effects

(FS)F05000:71

1100527

ecology and onvironnont, inc.

HAZARD EVALUATION OF CHEMICALS

Chemical Name Ethylbenzene Date 3/23/92

DOT Name/U.N. No. 1175 Job No. UH8000

CAS Number 100-41-4

References Consulted (circle):

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

Toxic and Hazardous Safety Manual ACGIH Other:

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

Chemical Proportios: (Synonyms: Ethylbonrol, Phenylethane)

Chemical Formula $CH_3CH_2C_6H$ Molecular Weight 106.2

Physical State liquid Solubility (H2O) 0.01% Boiling Point 277°F

Flash Point 55°F Vapor Pressure/Density 10 mm Freezing Point -139°F

Specific Gravity 0.87 odor Charactoristic 0.1 ppm Flammable Limits

Incompatabilities Strong oxidizers

Biological Proportios:

TLV-TWA 100 ppm PEL 100 ppm Odor/Odor Throahold aromatic, oily

IDLH 2000 ppm Human Aquatic Rat/Mouse

Route of Exposure Inhalation, Ingestion

Carcinogen Teratogen Hutagen

Radiological Proportios:

Handling Recommendations: (Personal protective measures)

Tyvek or saranex coveralls; APR in dusty/ windy conditions or known high concentrations.

Monitoring Recommendations:

OVA or 10.2 ev probe on Hlu.

Disposal/Waste Treatment:

Health Hazards and rirst Aid:

ING: seek medical attontion; INH: move to fresh air, seek medical attontion: DER: wash promptly with soap and water.

Symptoms: Acute: irritation of eyes, nose, throat, skin: weakness; dizziness; drowsiness; unconsciousness

Chronic: skin rash, inflammation, dormatitis

ecology and environment, inc.

HAZARD EVALUATION OF CHEMICALS

Chemical Nan 1,1-Dichloroethane Date 3/23/92

DOT Name/U.N. No. 2362 Job No. UH8000

CAS Number 75-34-3

References Consulted (circle):

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

Toxic and Hazardous Safety Manual ACGIH Other:

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

Chemical Proportios: (Synonyms: Ethylene dichloride

Chemical Formula CHCl2CH3 Molecular Weight 96.96

Physical State Liquid Solubility (H2O) 0.8% Boiling Point 135 °F

Flash Point 22 F Vapor Pressure/Density 230 mm Freezing Point -32.3°F

Specific Gravity 1.253 Odor Charactristic 5 ppm Flammable Limit. 6.2

Incompatabilities Strong oxidizers, caustics, chemically active metals

Biological Proportios:

TLV-TWA 100 ppm PEL 100 ppm Odor/Odor Threshold Sweet

IDLH 4,000 ppm Human Aquatic Rat/Mouse 400 mg/kg

Route of Exposure Inhalation, contact, ingestion, eye (occular)

Carcinogen X Toratogen Mutagen

Radiological Proportios:

Handling Recommendations: (Personal protective measures)

Disposable coveralls (Saranex), full face mask, impermeable gloves, respirators with organic cartridges

Monitoring Recommendations:

Disposal/Waste Treatment:

Health Hazards and First Aid:

Ingestion - induce vomiting. Contact - flush with copious amounts of water. Got medical attention.

Inhalation- remove to fresh air.

Symptoms: Acute: Nausea, vomiting, drunkenness, CNS depression, coneal injury, chemical burns.

Chronic: Liver & kidney damage.

1100530

ecology and environment, inc.

HAZARD EVALUATION OF CHEMICALS

Chemical Name: Lead Date: 3/23/92

DOT Name/U.N. no.: 2291 Job No.: UH8000

CAS Number: 7439-92-1

References Consulted (circle):

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

Toxic and Hazardous Safety Manual ACGIH Other:

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

Chemical Properties: (Synonym: Plumbum)

Chemical Formula: Pb Molecular Weight: 207.2

Physical State: solid Solubility (H2O): insoluble boiling Point: 3164 F

Flash Point: N/A Vapor Pressure/Density: 0 mm Freezing Point: N/A

Specific Gravity: 11.34 Odor Characteristic: N/A Flammable Limits: N/A

Incompatabilities: Strong oxidizers, hydrogen peroxide, acids

Biological Properties:

TLV-TWA: .100 mg/m3 PEL: .050 mg/m3 Odor/Odor Threshold: N/A

IDLH: 700 mg/m3 Human: Aquatic: Rat/Mouse:

Route of Exposure: Inhalation, Ingestion, Dermal

Carcinogen: --- Teratogen: --- Mutagen: ---

Radiological Properties:

Handling Recommendations: (Personal protective measures)

5 mg/m^3 high efficiency particulate respirator; other concentrations- SCBA; avoid skin contact or ingostion.

Monitoring Recommendations:

Disposal/Waste Treatment:

Health Hazards and First Aid:

ING: Give water, induce vomiting, medical attontion immediately; INH: move to fresh air. medical attention: DER: wash with soap and water promptly.

Symptoms: Acute: stomach distress, vomiting, diarrhea, black stool, headache, dizziness, metallic taste

Chronic: muscle weakness, joint/muscle pain, insomnia, coma, death

ecology and environment, inc.

HAZARD EVALUATION OF CHEMICALS

Chemical Name Mercury Date 3/2 3/9 2

DOT Name/U.N. No. 2809 Job No.

CAS Number 7439-97-6

References Consulted (circle):

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

Toxic and Hazardous Safety Manual ACGIH Other:

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

Chemical Properties: (Synonyms: Colloidal mercury, Metallic mercury, Quicksilver)

Chemical Formula Hg Molecular Weight 200

Physical State liquid Solubility (H2O) Insoluble Boiling Point 674° F

Flash Point N/A Vapor Pressure/Density 0.0012 mm Freezing Point -38° F

Specific Gravity 13.6 Odor Characteristic N/A Flammable Limits Non

Incompatabilities Acetylene, ammonia, chlorine dioxide, azides, calcium, sodium carbide, lithium, rubidium, and copper

biological Properties:

TLV-TWA 0.05 mg/m3 PEL 0.05 mg/m3 Odor/Odor Threshold odorless

IDLH 28 mg/m^3 Human Aquatic Rat/Mouse

Route of Exposure Ingestion, Inhalation, Dermal

Carcinogen Teratogen Mutagen

Radiological Properties:

Handling Recommendations: (Personal protective measures)

Monitoring Recommendations:

Disposal/Waste Treatment:

Health Hazards and First Aid:

INH & ING: seek medical attention promptly: DER: wash with soap and water.

Symptoms: Acute: cough; chest pain: temor; indecision; headache; weak; irrition of eyes and skin

Chronic: GI tract depression

1100531

ecology and environment, inc.

SITE SAFETY PLAN

Version 988

A. GENERAL INFORMATION

Project Title: Site 12 - Scrap Bins

Project No.: UH1102

TDD/Pan No.:

Project Manager: John Barksdale

Project Dir.: Rick Rudy

Location(s): Scrap Bins - located approximately 800 ft. NW of Chevalier Field and 600 foot W of Site 11

Prepared by: Kim Walker

Date Prepared: 4-25-89

Approval by: Mary Miller

Date Approvod:

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: August 1989

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

Documentation/Summary:

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

B. SITE/WASTE CHARACTERISTICS

Waste Type(s):

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

Characteristic(s):

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

Other:

Physical Hazards:

Overhead [X]	Confined' Space [ ]	Below Grade [ ]	Trip/Fall [X]
Puncture [ ]	Burn [ ]	cut [ ]	Splash [X]
Noise [X]	Other: Vehicular traffic around existing buildings. Heat/cold stress.		

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

Site History/Description and Unusual Features (see Sampling Plan for detailed description): From tho early 1930's to tho mid-1940's. garbago from NAS Pensacola was placed in scrap bins and stored in this area (industrial wastes were sent to tho North Chevalier Disposal Area). Approximately 16 cubic yards (2 truck loads) per day of wet garbago was stored here before being hauled off and used as livestock food. Thoro is no evidence of hazardous material disposal at this site. Tho majority of tho site area is covered with a largo concrete pad. where heavy equipment is currently kept.

Locations of Chemicals/Wastes: Solid wastes were retained on-sit. temporarily.

Estimated Volume of Chemicals/Wastes: unknown

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 - Automobile Hazards, Using portable drill rig:

3) Soil Sampling - Using portable drill rig;

4) Groundwater Sampling - Splash, automobiles

5) Docontamination Procedures - using solvents.

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

Chemical Hazard Evaluation:

Compound	PEL/TWA	Route of Exposure	Acute symptoms	Odor Threshold	Odor Doscription
Isopropyl Alcohol	440 ppm	Inh, Ing, Con	drowsiness,head.	7.5-200 ppm	rubbing alcohol
Nitric Acid	2 ppm	Inh, Ing, Con	corrosive	0.3-1 ppm	acrid
Sulfuric Acid	1 mg/m^3	Ing. Dorm, Inh	corrosive	N/A	odorless
Hydrochloric Acid	5 ppm	Inh, Ing, Dorm	corrosive	Unknown	acrid
Sodium Hydroxide	2 mg/m^3	Inh. Ing, Con	corrosive	N/A	odorloss

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

D. SITE SAFETY WORK PLAN

Site Control: Attach map, 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 Lor 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
Task 6				X

(Expand if necessary)

Modification's: Modified level D with tyveck, neoptene 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:

- Level D: O_2 <19.5% or >25%, explosive atmosphere >10% LEL, organic vapors above background levels. particulates >—— mg/m^3, other _____
- 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 _____
- 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 _____
- 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):

Contaminant of Interest	Type of Sample (area, personal)	Monitoring Equipment	Frequency of Sampling
vocs	Area	OVA	Continuous
Radiation	Area	Mini-Rad	Continuous
Explosive Gases	Area	02/Explosimeter	Continuous

Docontamination Solutions and Procedures for Equipment, Sampling Gear, ctc.:

Trisodium phosphate wash, tap water rinse, deionized water rinse, isopropanol rinse (twice), final organic-€reo water rinse, and allow to air dry as long as possible.

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.

Docon Solution Monitoring Procoduros, if Applicable: Docontamination will bo performed in a well-ventilated area upwind of tho sampling zone.

Special Site Equipront, Facilities, or Procoduros (Sanitary Facilities and Lighting Must Moot 29 CPR 1910.120):

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

Site Entry Procoduros and Special Considerations: E & E's "Buddy System" will be employed at all times during fieldwork activities. Personnel will exercise caution in tho vicinity of nearby roadways. If above background radiation levels are encountered team members will evacuate tho sampling area, and contact tho corporato health physics group to reassess tho site.

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

All fieldwork activities will bo porformod 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 bo double baggod, drummed, labeled and transported to a designated location for final disposal by tho Navy.

Sample Handling Procedures Including Protoctivo Wear:

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

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

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

E. EMERGENCY INFORMATION

(Use supplemental rhoets, 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 - 904-452-2733, Baptist Hospital 904-434-4811 (Life ?light)

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 -- 1-803-743-0574

Site Contact N M Pensacola Enviromental Coordinator, Ron Joyner -- 904-452-4515

SIR RESOURCES

Site Emergency Evacuation Alarm Method N/A

Water Supply Source On-site

Telephone Location, Number To bo determined on-sit.

Cellular Phone, if available N/A

Radio

Other On-sit. warehouse number to bo determined

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 Nowchurch ..... 904) 878-2336 (home)
   9041 877-1978 (office)

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

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 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 tho information given to tho answering service.

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

   a. 24 hour hotline - (716) 604-8940
   b. Corporato Safety Director - Paul Jonmaire - homo # (716) 655-1260
   c. Assistant Corp. Safety Officer - Steven Sherman - how # (716) 688-0084

EMERGENCY ROUTES

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

Directions to hospital (include rap) from Site 12

NAS Dispensary - Proceed west on Farrar Road (see attached map) to nurray Road. Follow nurray Road south to Moffett Road. Turn right onto Moffett Road and continuo to Fisher Stroot. Turn loft onto Fisher Stroot and continuo to its intersection with Turner Stroot. The 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. 98 east approx. 3mi to Pace Blvd. Turn loft (north) on Pace Blvd. and proceed approx. lmi to Cervantes St. (Hwy. 90). Turn right on Cervantes/Hwy. 90 and follow this road for about 0 blocks and turn loft (north) onto C street. The hospital is about 6 blocks north on tho loft.

Emergency Egress Routes to Got Off-Sit. Emergency egress routes will bo located if emergency exit routos become blocked by construction, otc.

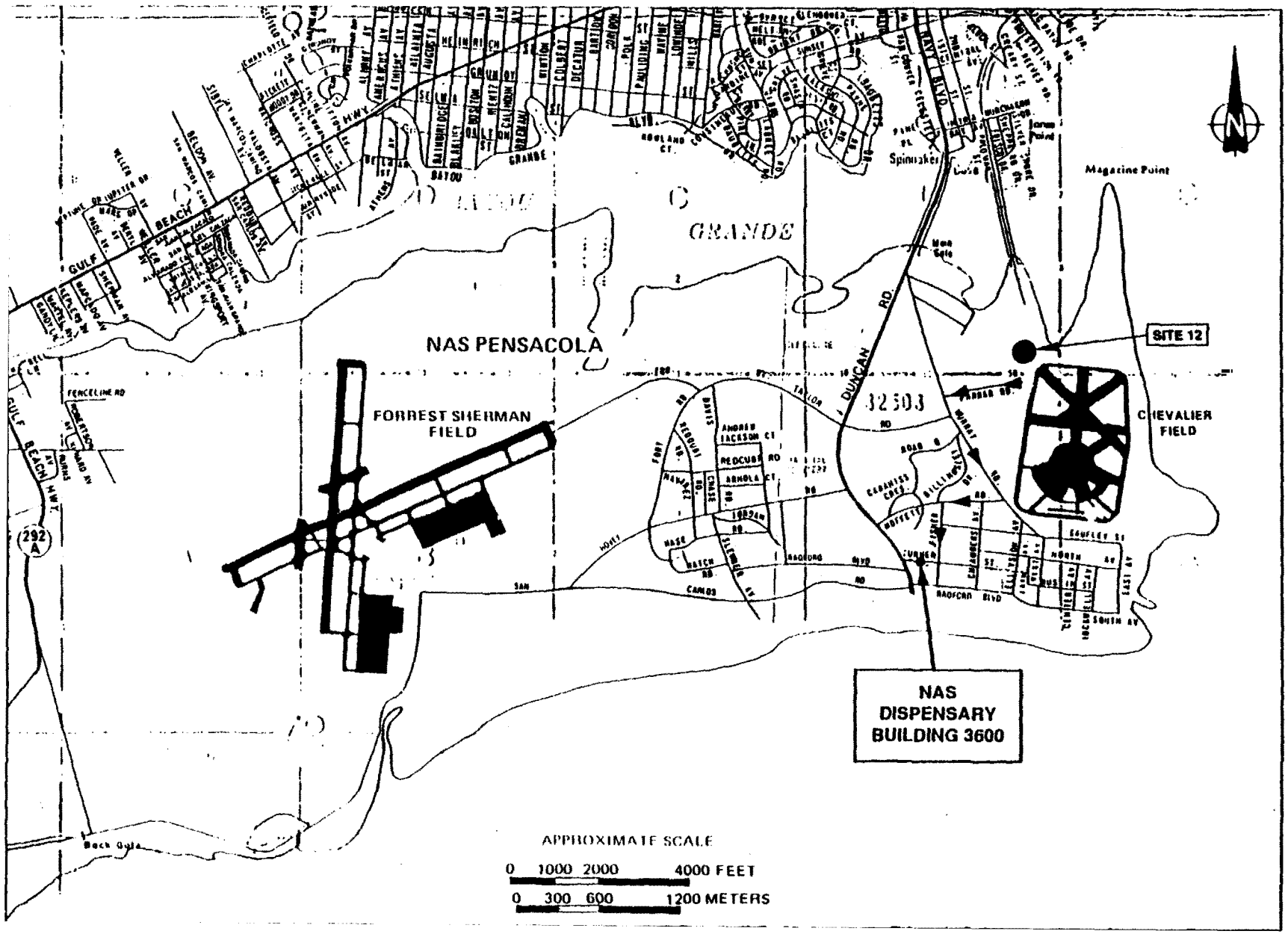


Figure A-3 LOCATION OF NAS DISPENSARY

ecology and environment, inc.

SITE SAFETY PLAN

Version 388

A. GENERAL INFORMATION

Project Title: Site 26-Supply Department Outside Storage

Project No.: UH1102

TDD/Pan No.:

Project Manager: John Barksdale

Project Dir.: Rick Rudy

Location(s): Supply Department Outside Storage - Immediately south of Bldg. 648

Prepared by: Kim Walker

Date Prepared: 4-25-89

Approval by: Mary Miller

Date Approved:

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: August 1989

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

Documentation/Summary:

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

B. SITE/WASTE CHARACTERISTICS

waste Type(s):

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

Characteristic(s):

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

Other:

Physical Hazards:

Overhead	[X]	Confined* space	[ ]	Below Grade	[ ]	Trip/Fa11	[X]
Puncture	[ ]	Burn	[ ]	Cut	[ ]	Splash	[X]
Noise	[X]	Other:	Vehicular traffic around existing buildings. Heat/cold stress.				

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

Site History/Description and Unusual Features (see Sampling Plan for detailed description): Site 26 was used from tho mid-1950's until 1964 for outdoor storage of industrial chemicals, including paint strippers and acids. Analysis of soil samples colloctod at tho site for EP toxicity metals did not reveal any evidence of tho of heavy metals. However, groundwater colloctod from a well hydraulically downgradient from tho site exhibited trace levels of chlorinated solvents.

Locations of Chemicals/Wastes: Unknown

Estimated Volume of Chemicals/Wastes: unknown

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 Inatallation - Autowbilo Hazards, Using portable drill rig:

3) Soil Sampling - Using portable drill rig:

4) Groundwater Sampling - Splash, automobiles

5) Decontamination Procedures - Using solvents;

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

Chemical Hazard Evaluation:

Compound	PEL/TWA	Route of Exposure	Acute Symptoms	Odor Threshold	Odor Description
methylene chloride	500 ppm	inh,ing,con,eye	dizzy,chest pain	214 ppm	sweetish
1,1,2-trichloroethane	10 ppm	inh, ing, con	head,vertigo,naus	20-100 ppm	ether-like
1.2-dichloroothano	50 ppm	inh,ing,con,eye	naus,vomit,head	6 ppm	aweetish
nitric acid	2 ppm		corrosive	0.3-1 ppm	acrid
1,1,1,2-tetrachloroethane	N/A	inh,ing,con,abs	nausea,vomit	5 ppm	ether-like
isopropyl alcohol	440 ppm	Inh,Abs	drowsiness,head	7.5-200 ppm	rubbing alcohol
sulfuric acid	1 mg/m^3	Ing, Dorm, Inh	corrosive	N/A	odorless
hydrochloric acid	5 ppm	Inh, Ing, Dorm	corrosive	Unknown	acrid
sodium hydroxido	2 mg/m^3	Inh, Ing, Con	corrosive	N/A	odorloaa

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

D. SIR SAFETY WORK PLAN

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

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
Task 6				X

(Expand if necessary)

Modifications: Modified level D with tyveck. neoprene gloves and boots, safety glasses, APR available vhen level C upgrade is nocossary based on OVA readings.

Action Levels for Evacuation of Work Zone Pending Reassessment of Conditions:

- Level D: O_2 <19.5% or >25%, explosive atmosphere >10% LEL, organic vapors above background levels, particulates > ____ mg/m^3, other _____

c vapor (n _____

c vapors in _____

c vapors _____

contaminant of Interest	Typo of Sample (area, personal)	Monitoring Equipment	Prequoncy of Sampling
vocs	Area	OVA	Continuous
Radiation	Area	Mini-Rad	Continuous
Explosive Gases	Area	O_2/Explosimeter	Continuous

(Expand if necessary)

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

Trisodium phosphato wash, tap water rinse, deionized water rinse, isopropanol rinse (twice), final organic-free water rinse, and allow to air dry as long as possible.

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

Decon Solution Monitoring Procoduros, if Applicable: Docontamination will bo performed in a well-ventilated area upwind of the 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 Procoduros and Special Considerations: E L E's "Buddy System" will bo employed at a11 times during fieldwork activities. Personnel will exercise caution in tho vicinity of nearby roadways. If above background radiation levels are encountered team members will evacuate tho sampling area, and contact tho corporato health physics group to reassess tho site.

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

All fiolduork rctivitios will bo porformod during daylight hours. Team members will trko 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., oxpondablos, decon waste, cuttings):

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

Sample Handling Procoduros 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 bo determined	Team Leader
	Site Safety Officer/Sampler
	Geologist/Sampler
	Sampler

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

E. EMERGENCY INFORMATION

(Use supplemental shoots, if necessary)

LOCAL RESOURCES

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

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

Hospital Emergency Room NAS Dispensary - 904-452-2733, Baptist Hospital 904-434-4811 (Life Flight)

Poiron Control Center

Police (include local, county sheriff, state) 911

Fire Department 911

Airport

U.S. Coast Guard Emergency - 904-453-8178, General Information 904-453-8281

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

Fed. Express 1-800-238-5355

Cliont Contact U.S. Navy Southern Division, Engsnoor-In-Chargo -- 1-803-743-0574

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

SITE RESOURCES

Site Emergency Evacuation Alarm Method N/A

Water Supply Source On-sit.

Telephone Location, Number To bo determined on-site

Cellular Phone, if available N/A

Radio

Other On-site 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 Jonmairs ..... (716) 684-8060 (offico)
   (716) 655-1260 (homo)

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

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

MEDTOX HOTLINE

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

   What to report:

   - Stat.: "this is an emergency."
   - Your name, reqion, and st.
   - 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 tho information given to tho answering service.

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

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

EMERGENCY ROUTES

(NOTE: Field h a m must Know Route(s) Prior to Start Of Work)

Directions to hospital (include map) fro8 Site 26

NAS Dispensary - Proceed west on Farrar Road to Murray Road (see attached map). Follow Murray Road south to Moffett Road. Turn right onto Moffett Road and continuo to Fisher Stroot. Turn loft onto Fisher Stroot and continuo to its intersection with Turner Stroot. The NAS Dispensary is located on Turner Stroot in Building 3600.

Baptist Hospital - Take Duncan Road (Navy Blvd.) north to exit tho bx. Navy blvd. becomes HWY 98 and curves to tho east. Follow Navy Blvd./Hwy. 98 east appror. 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 this road for about 8 blocks and turn loft (north) onto E street. Tho hospital is about 6 blocks north on the loft.

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

1100538

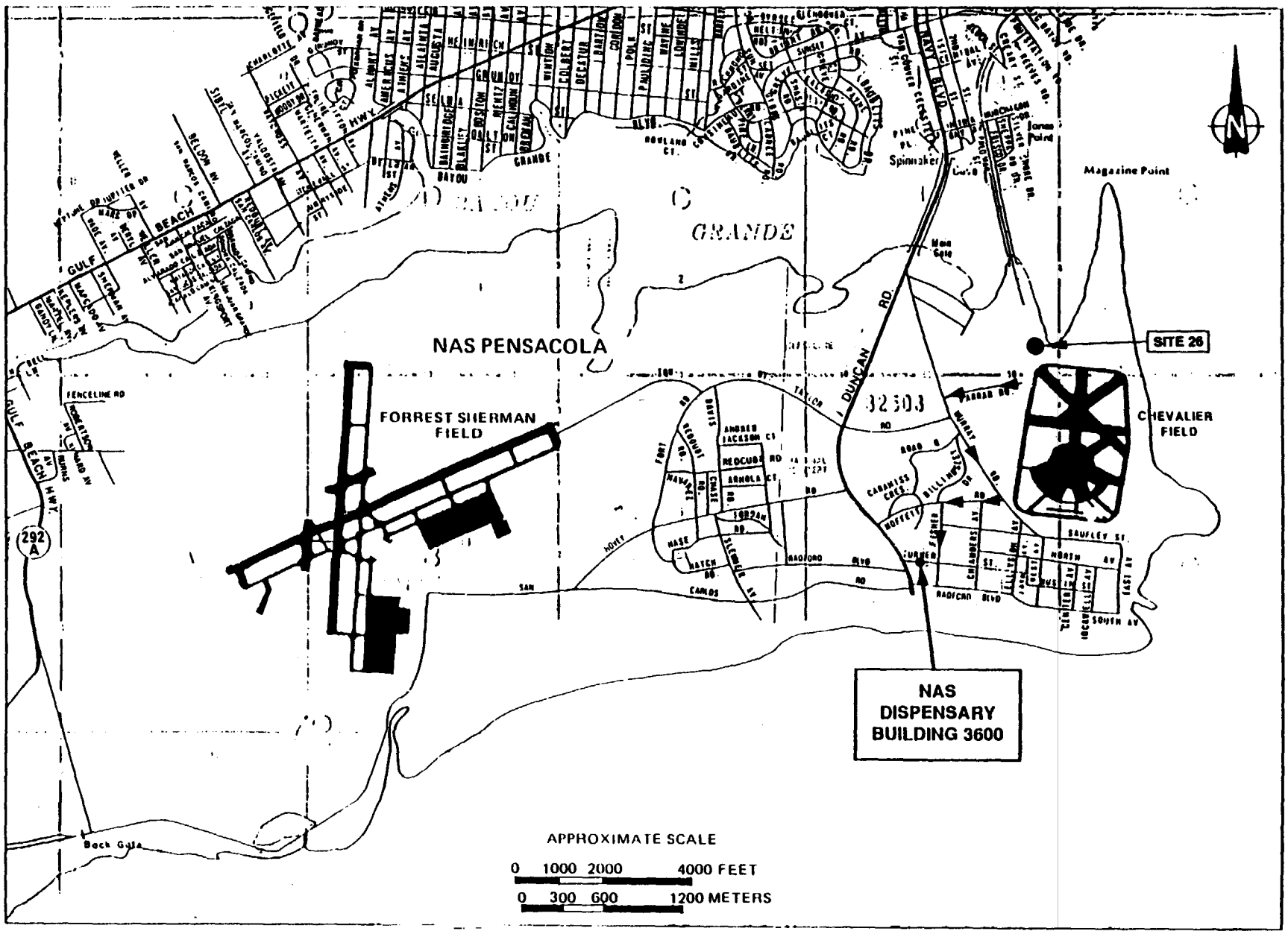


Figure A-4 LOCATION OF NAS DISPENSARY

ecology and onvironwnt, inc.

HAZARD EVALUATION OF CHEMICALS

Chemical Name 1,1,2-Trichloroethane Date 3/23/92

DOT Name/U.N. Ao. 2831 Job No.

CAS Number 79-00-5

References Consultod (circle):

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

Toxic and Hazardous Safety Manual ACGIH Other:

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

Chemical Properties: (Synonyms: beta-Trichloroethane, Vinyl trichloride)

Chemical Formula $CHCl_2CH_2Cl$ Molecular Weight 133.4

Physical State liquid Solubility (H2O) 0.4% Boiling Point 237° F

Flash Point N/A Vapor Pressure/Density 19 mm Freezing Point -34° F

Specific Gravity 1.44 odor Characteristic Flammable Limits

Incompatabilities Strong caustics or oxidizers, chemically-active metals

Biological Properties:

TLV-TWA 10 ppm PEL 10 ppm Odor/Odor Threshold chloroform like

IDLH 500 ppm Human Aquatic Rat/Mouse

Route of Exposure Ingostion, Inhalation, Dermal

Carcinogen X Toratogon Mutagen

Radiological Properties:

Handling Recommendations: (Personal protective measures)

Monitoring Recommendations:

OVA or HNu with tho 11.7 eV probe.

Disposal/Waste Treatment:

Health Hazards and First Aid:

INH & ING: seek medical attention promptly: DER: wash with soap and water.

Symptoms: Acute: light headed, drowsiness, headache, irritation of eyes and skin

Chronic: CNS doprossion, liver or kidney damage

1100530

ecology and environment, inc.

HAZARD EVALUATION OF CHEMICALS

Chemical Name 1,1,1,2-Tetrachloroethane Date 7/06/92

DOT Name/U.N. no. Job No.

CAS Number 630-20-6

References Consulted (circle):

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

Toxic and Hazardous Safety Manual ACGIH Other:

Rad Health Handbook NCRP 65 10 CIA 20 Handbook of Chemistry and Physics

Chemical Properties: (Synonyms:)

Chemical Formula $CHCl_2CHCl_2$ Molecular Weight 167.9

Physical State Liquid Solubility (H_2O) 0.30 % Boiling Point 296°F

Flash Point N/A Vapor Pressure/Density 9 mm ?rooting Point - 331

Specific Gravity 1.59 Odor Characteristic -- Flammable Limits N/A

Incompatabilities Chemically-active metals, strong caustics, fuming sulfuric acid

Biological Properties:

TLV-TWA None PEL None Odor/Odor Threshold

IDLH Human Aquatic -- Rat/Mouse --

Route of Exposure Inhalation, ingoation, direct contact.

Carcinogen experimenta1 Teratogen Mutagen

Radiological Properties:

Handling Recommendations: (Personal protective measures)

Impervious clothing, gloves, and boots should bo worn: eye protection; respirators with cartridges worn at levels of high concentrations

Monitoring Recommendations:

Disposal/Waste Treatment:

N/A

Health Hazards and First Aid:

Remove from exposure; perform artificial respiration if necessary; wash skin with soap and water; irrigate eyes with water; if swallowed, induce vomiting.

Symptoms: Acute: Irritation of eyes, nose, or throat: nausea; flushed face: vertigo, dizziness; incoherence; headache; akin blisters.

Chronic: Liver damage; impaired memory; numbness of extremities; impaired vision.

APPENDIX B

SITE-SPECIFIC QUALITY ASSURANCE PROJECT PLANS

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

Section 1.0 -- Title Page

Vork Plan Group: B
Site No.: 11
Site Name: North Chevalier Disposal Area

Prepared by: Amy Twitty
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: John D. Barksdale
J. Barksdale

E & E Regional QA/QC Coordinator: Kimberly R. Walker
K. Walker

E & E ASC Director: Gary Halter for
~~Xxxxxxxxx~~ W.F. Hall, Ph.

E & E QA/QC Project Officer: K. Walker for Marcia Meredith
M. Meredith

Section 2.0 --Table of Contents

		Page	Date
Section 1.0	--Title Page	1	6-23-92
Section 2.0	--Table of Contents	2	6-23-92
Section 3.0	--Project Summary	3	6-23-92
Section 4.0	--Project Organization and Responsibility	5	11-1-91
Section 5.0	--QA/QC Objectives for Measurement Data	5	6-23-92
Section 6.0	--Fieldwork and Sampling Procedures	8	11-1-91
Section 7.0	--Sample Custody	8	11-1-91
Section 8.0	--Calibration Procedures and Frequency	8	11-1-91
Section 9.0	--Analytical Procedures	8	11-1-91
Section 10.0	--Data Reduction, Validation, and Reporting	9	11-1-91
Section 11.0	--Internal Quality Control Checks	9	11-1-91
Section 12.0	--Performance and Systems Audits	9	11-1-91
Section 13.0	--Preventive Maintenance	10	11-1-91
Section 14.0	--Procedures Used to Assess Accuracy, Precision, and Completeness of Data	10	11-1-91
Section 15.0	--Corrective Action	10	11-1-91
Section 16.0	--Quality Assurance Reports to Management	10	11-1-91
Appendix A	--Additional Personnel Biographies	11	11-1-91

Section 3.0 -- Project Summary

Work Plan Group: B

Site No.: 11

Site Name: North Chevalier Disposal Area

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
- X Radiation Survey
- X Habitat/Biota Survey
- ___ Asbestos Survey (in Rubble)
- X Hydrologic Assessment

Geophysical Survey (check all that apply):

- X Electromagnetic Conductivity:
  - X EM-31 X EM-34
- X 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	___	X Polynuclear Aromatic Hydrocarbons
Soil	30	X Phenols
Groundwater	11	___ Organophosphorus Pesticides
Duplicates	3	___ Chlorinated Herbicides
Trip Blanks	___	___ Carbamates
Field Blanks	___	X Pesticides/Polychlorinated Biphenyls
Rinsate Blanks	___	X Total Recoverable Hydrocarbons
Other	___	X Metals
		___ Gross Alpha

Section 3.0 -- Project Summary (Continued)

Phase II -- Characterization

PLANNED NUMBER OF SAMPLES

Surface Water	___	Air	___	Duplicates	16
Sediment	___	Biota:		Trip Blanks	10
Soil	140	Flora	___	Field Blanks	4
Groundvater	41	Fauna	___	Rinsate Blanks	10
				Preservative Blanks	1

CATEGORIES OF ANALYSES

X Purgeable Aromatics
X Purgeable Halocarbons
X Base/Neutral Extractables
X Acid Extractables
___ Polynuclear Aromatic Hydrocarbons
X Dioxins
X Organophosphorus Pesticides
X Herbicides
X Pesticides
X Polychlorinated Biphenyls
X Total Recoverable Petroleum Eydrocarbons
X Metals
X Cyanide
X Sulfide

Additional analytical categories are identified belov:

X Gross Alpha
X Gross Beta
X Gamma Scan
X Total Organic Carbon
X Grain Size
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 Hardness (water only)
X BTU Content
X Ash Content
X Total Organic Halogens
X Sulfur
X Ignitability
X Cation Exchange Capacity
X Permeability
X Sulfide

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 Hanager:
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 Heasurement 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/H	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/H	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/H	N/M
Copper	S/W	--	N/H	N/M	N/M	N/M
Lead	S/W	--	N/M	N/H	N/M	N/M
Nickel	S/W	--	N/H	N/M	N/M	N/M
Silver	S/W	--	N/H	N/M	N/M	N/M
Zinc	S/W	--	N/M	N/H	N/M	N/M
laboratory Analyses						
TCL Purgeables	S/W	EPA 8240/624	N/M	N/M	N/H	N/M
TCL BNAs	S/W	EPA 8270/625	N/M	N/H	N/M	N/M
TCL Pesticides & PCBs	S/W	EPA 8080/608	N/M	N/H	N/M	N/M
Total Recoverable Petroleum Hydrocarbons	S/W	EPA 418.1	N/H	N/M	N/M	N/M
Dioxins	S/W	EPA 8280	N/M	N/M	N/M	N/H
Organophosphorus Pesticides	S/W	EPA 8140	N/M	N/M	N/M	N/M
Herbicides	S/W	EPA 8150 (Hod)	N/M	N/H	N/M	N/M
Gross Alpha	S/W	EPA 900.0	N/H	N/M	N/M	N/M
Gross Beta	S/W	EPA 900.0	TBD	TBD	TBD	TBD
Gamma Scan	S/W	EPA 901.1	TBD	TBD	TBD	TBD
TAL Hetals:						
Aluminum	S/W	EPA 6010	N/M	N/H	N/M	N/M
Antimony	S/W	EPA 6010	N/M	N/M	N/H	N/M
Arsenic	S/W	EPA 7060	N/M	N/M	N/H	N/M
Barium	S/W	EPA 6010	N/M	N/M	N/H	N/M
Beryllium	S/W	EPA 6010	N/M	N/H	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/M	N/M	N/M	N/M
Chromium	S/W	EPA 6010	N/H	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

Group/Site Nos.: B/11
Site Name: N.C.D.A.
Revision No.: 2
Date: 6-23-92

Analyte	Media	Method No.	A	P	C	DL
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
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/H
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
Sulfide	S/W	EPA 376.1	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 350.2	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
Permeability	S	ASTM 2430	N/M	N/M	N/M	N/M
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 and/or surface water
N/M = No Modifications from GQAPP
TBD = To Be Determined

* With the exception of Total Recoverable Petroleum Hydrocarbons and Gross Alpha, 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 below:

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 GQAPP. Modifications to these procedures are described below:

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 belov:

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 below:

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 below:

No Modifications

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 Modifications

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

Vork Plan Group: B
Site No.: 12
Site Name: Scrap Bins

Prepared by: Amy Twitty
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: John D. Barksdale
J. Barksdale

E & E Regional QA/QC Coordinator: Kimberly A. Walker
K. Walker

E & E ASC Director: Gary Hohn for
xxxxxxxxxx W.E. Hall, Ph

E & E QA/QC Project Officer: K. Walker for Marcia Meredith
M. Meredith

Section 2.0 --Table of Contents

		Page	Date
Section 1.0	--Title Page	1	6-23-92
Section 2.0	--Table of Contents	2	6-23-92
Section 3.0	--Project Summary	3	6-23-92
Section 4.0	--Project Organization and Responsibility	5	11-1-91
Section 5.0	--QA/QC Objectives for Measurement Data	5	6-23-92
Section 6.0	--Fieldwork and Sampling Procedures	8	11-1-91
Section 7.0	--Sample Custody	8	11-1-91
Section 8.0	--Calibration Procedures and Frequency	8	11-1-91
Section 9.0	--Analytical Procedures	8	11-1-91
Section 10.0	--Data Reduction, Validation, and Reporting	9	11-1-91
Section 11.0	--Internal Quality Control Checks	9	11-1-91
Section 12.0	--Performance and Systems Audits	9	11-1-91
Section 13.0	--Preventive Maintenance	10	11-1-91
Section 14.0	--Procedures Used to Assess Accuracy, Precision, and Completeness of Data	10	11-1-91
Section 15.0	--Corrective Action	10	11-1-91
Section 16.0	--Quality Assurance Reports to Management	10	11-1-91
Appendix A	--Additional Personnel Biographies	11	11-1-91

1100543

Section 3.0 -- Project Summary

Work Plan Group: B

Site No.: 12

Site Name: Scrap Bins

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
- X Radiation Survey
- X Habitat/Biota Survey
- ___ Asbestos Survey (in Rubble)
- X Hydrologic Assessment

Geophysical Survey (check all that apply):

- ___ Electromagnetic Conductivity:
  - ___ EM-31 ___ EH-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	___	X	Polynuclear Aromatic Hydrocarbons
Soil	30	X	Phenols
Groundwater	5	___	Organophosphorus Pesticides
Duplicates	3	___	Chlorinated Herbicides
Trip Blanks	___	___	Carbamates
Field Blanks	___	X	Pesticides/Polychlorinated Biphenyls
Rinsate Blanks	___	X	Total Recoverable Hydrocarbons
Other	___	X	Metals
			Gross Alpha

Section 3.0 -- Project Summary (Continued)

Phase II -- Characterization

PLANNED NUMBER OF SAMPLES

Surface Water	1	Air	___	Duplicates	11
Sediment	7	Biota:		Trip Blanks	5
Soil	74	Flora	___	Field Blanks	1
Groundwater	8	Fauna	___	Rinsate Blanks	4
				Preservative Blanks	1

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 belov:

- X Gross Alpha
- X Gross Beta
- X Gamma Scan
- X Total Organic Carbon
- X Grain Size
- 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 Hardness (vater only)
- X BTU Content
- X Ash Content
- X Total Organic Halogens
- X Sulfur
- X Ignitability
- X Cation Exchange Capacity

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/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/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/H	N/M	N/M	N/M
Copper	S/W	--	N/H	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/H	N/M	N/M	N/M
Zinc	S/W	--	N/H	N/M	N/H	N/M
Laboratory Analyses						
TCL Purgeables	S/W	EPA 8240/624	N/U	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/H	N/M	N/M
Total Recoverable Petroleum Hydrocarbons	S/W	EPA 418.1	N/M	N/M	N/M	N/M
Gross Alpha	S/W	EPA 900.0	N/M	N/M	N/M	N/M
Gross Beta	S/W	EPA 900.0	TBD	TBD	TBD	TBD
Gamma Scan	S/W	EPA 901.1	TBD	TBD	TBD	TBD
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/M	N/M	N/M	N/M
Cadmium	S/W	EPA 6010	N/M	N/H	N/M	N/M
Calcium	S/W	EPA 6010	N/M	N/M	N/M	N/M
Chromium	S/W	EPA 6010	N/H	N/M	N/M	N/M
Cobalt	S/W	EPA 6010	N/M	N/H	N/M	N/M
Copper	S/W	EPA 6010	N/M	N/M	N/M	N/M
Iran	S/W	EPA 6010	N/U	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/H	N/M	N/M

Analyte	Media	Method No.	A	P	C	DL
Manganese	S/W	EPA 6010	N/M	N/M	N/M	N/M
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/H	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/H
Nitrogen-Ammonia	S/W	EPA 350.2	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	FPA 410.4	N/M	N/M	N/M	N/M
pH	U	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
U = Groundwater and/or surface water
N/M = No Modifications from GQAPP
TBD = To Be Determined

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

Section 6.0 -- Fieldvork and Sampling Procedures

Fieldwork and sampling procedures are presented in Section 6.0 of the GQAPP. Uodifications to these procedures are described below:

No Modifications

Section 7.0 -- Sample Custody

Sample custody procedures are presented in Section 7.0 of the GQAPP. Hodifications 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 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

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. 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. Hodifications 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. Modifications to these procedures are described belov:

No Hodifications

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: B
Site No.: 26
Site Name: Supply Department Outside Storage

Prepared by : Amy Twitty
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: John D. Barksdale
J. Barksdale

E & E Regional QA/QC Coordinator: Kimberly A. Walker
K. Walker

E & E ASC Director: Gary Hall for
xxxxxxxxxx W.E. Hall, Ph.

E & B QA/QC Project Officer: K. Walker for Marcia Meredith
M. Meredith

Section 2.0 — Table of Contents

		Page	Date
Section 1.0	— Title Page	1	6-23-92
Section 2.0	— Table of Contents	2	6-23-92
Section 3.0	— Project Summary	3	6-23-92
Section 4.0	— Project Organization and Responsibility	5	11-1-91
Section 5.0	— QA/QC Objectives for Measurement Data	5	6-23-92
Section 6.0	— Fieldwork and Sampling Procedures	8	11-1-91
Section 7.0	— Sample Custody	8	11-1-91
Section 8.0	— Calibration Procedures and Frequency	8	11-1-91
Section 9.0	— Analytical Procedures	8	11-1-91
Section 10.0	— Data Reduction, Validation, and Reporting	9	11-1-91
Section 11.0	— Internal Quality Control Checks	9	11-1-91
Section 12.0	— Performance and Systems Audits	9	11-1-91
Section 13.0	— Preventive Maintenance	10	11-1-91
Section 14.0	— Procedures Used to Assess Accuracy, Precision, and Completeness of Data	10	11-1-91
Section 15.0	— Corrective Action	10	11-1-91
Section 16.0	— Quality Assurance Reports to Management	10	11-1-91
Appendix A	— Additional Personnel Biographies	11	11-1-91

Section 3.0 -- Project *Summary*

Work Plan Group: B

Site No.: 26

Site Name: Supply Department Outside Storage

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):

- X Electromagnetic Conductivity:
  - X EM-31 X EM-34
- X 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	___	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 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	__	Biota:		Trip Blanks	2
Soil	44	Flora	__	Field Blanks	1
Groundwater	5	Fauna	__	Rinsate Blanks	2
				Preservative Blanks	1

CATEGORIES OF ANALYSES

- X Purgeable Aromatics
- X Purgeable Halocarbons
- X Base/Neutral Extractables
- X Acid Extractables
- __ Polynuclear Aromatic Aydrocarbons
- X Dioxins
- X Organophosphorus Pesticides
- X Herbicides
- X Pesticides
- X Polychlorinated Biphenyls
- X Total Recoverable Petroleum Eydrocarbons
- X Metals
- X Cyanide
- X Sulfide

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
- X Sulfide

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/H	N/M	N/M
Polychlorinated Biphenyls	S/W	--	N/M	N/M	N/M	N/M
Total Recoverable Petroleum Eydrocarbons	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/H	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/H
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						
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/H	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
Dioxins	S/W	EPA 8280	N/M	N/M	N/M	N/M
Organophosphorus Pesticides	S/W	EPA 8140	N/M	N/M	N/M	N/M
Etrbicides	S/W	EPA 8150 (Mod)/509B	N/M	N/M	N/M	N/M
Gross Alpha	S/W	EPA 900.0	N/M	N/M	N/M	N/M
Gross Beta	S/W	EPA 900.0	TBD	TBD	TBD	TBD
Gamma scan	S/W	EPA 901.1	TBD	TBD	TBD	TBD
TAL, Hetals:						
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/H	N/M	N/M
Barium	S/W	EPA 6010	N/M	N/M	N/M	N/H
Beryl lium	S/W	EPA 6010	N/M	N/M	N/M	N/M
Boron	S/W	EPA 6010	N/H	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/H	N/M	N/H
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

Analyte	Xedia	Method No.	A	P	C	DL
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
Mercury	S/W	EPA 7471/7470	N/M	N/H	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/H	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/H	N/H
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/H
Sulfide	S/W	EPA 376.1	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 350.2	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/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	ASTH D-422-63	N/M	N/M	N/M	N/M
BTU Content	S	ASTM D-2015-77	N/M	N/H	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/H	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/H	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 and/or surface water
N/M = No Modifications from GOAPP
TBD = To Be Determined

* With the exception of Total Recoverable Petroleum Hydrocarbons and Gross Alpha, 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 below:

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 below:

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

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 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 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 belov:

No Modifications

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 C

THREATENED AND ENDANGERED FLORA AND FAUNA ASSOCIATED WITH NAS PENSACOWL

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

APPENDIX C

THREATENED AND ENDANGERED FLORA AND FAUNA OBSERVED OR LIKELY TO OCCUR WITHIN THE NAS PENSACOLA FACILITY OR NEARBY

Scientific Name	Common Name	Base status.	status[b] FGFWFC (or FDA)	status[b] USFWS	Habitat
FISHES					
Acipenser oxyrhynchus	Atlantic sturgeon	M	SSC	u R 2	Gulf coast, estuarine
Ammocrypta asprella	Crystal darter	U	T	u R 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 mississippionsis	American alligator	R	SSC	T(S/A)	Swamps, marshes, ponds
Caretta caretta carotta	Loggorhoad turtlo	M?	T	T	Marine, coastal
Chelonia mydas mydas	Green turtlo	M?	E	E	Marine, coastal
Dermochelys coriacea	Loathorback turtlo	M	E	E	Marine, coastal
Drymarchon corais coupori	Eastern indigo snake	P	T	T	Open areas near water
Eretmochelys imbricata	Hawksbill turtlo	M?	E	E	Marine, coastal
Gopherus polyphemus	Gopher tortoise	P	SSC	UR 1	Sandy coastal plains
Graptemys pulchra	Alabama nap turtlo	U	SSC		Swamps, streams, marshes, ponds
Lepidochelys kempi	Atlantic ridley turtlo	M?	E	E	Marine, coastal
Rana areolata aesopus	Florida gopher frog	P	SSC	u R 2	Sand hill communities
Macroclemys temmincki	Alligator snapping turtle	SR	SSC	UR 2	Swamps, marshes, ponds

14(NASP)UH1102:T0394/1883/2

Key at end of table.

Table Appendix C (Cont.)

Scientific Name	Common Name	Base Status[a]	Status[b] FGFWFC (or IDA)	Status[b] USFWS	Habitat
MAMMALS					
Mustela vison lutensis	Florida mink	U		I m 2	Terrestrial habitat.
Peromyscus polionotus trissyllopsis	Perdido Key beach mouse	N/A	T	E	Beach dunes
Trichechus manatus latirostris	West Indian manatee	M	E	E	Atlantic and Gulf coaata
BIRDS					
Charadrius melodus	Piping plover	P	T	T	Open, dry, sandy beaches
Charadrius alexandrinus	Snowy plover	P	T	u 1 2	Open, dry, sandy beaches
Dendroida dominica stoddardi	Stoddard's yellow throated warbler	P–u		I m 2	Wooded habitata
Dendroica kirtlandii	Kirtland's warbler	U	E	E	Wooded habitat.
Haematopus palliatus	American oystercatcher	U	SSC		Coastal habitat.
Egretta rufescens	Reddish egret	P–u	SSC	UR 2	Freshwater/coastal wetlands
Egretta caerulea	Little blue heron	P–u	SSC		Freshwater/coastal wetlands
Egretta thula	Snowy egret	P–u	SSC		Freshwater/coastal wotlanda
Grus canadensis pratensis	Florida sandhill crane	U	T		Freshwater wotlanda
Falco peregrinus tundrius	Arctic peregrine falcon	M	E	T	Winters on coaata
Falco sparverius paulus	Southeastern kestrel	R	T	u 1 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, coaata

14[NASP]UH1102:T0394/1883/2

Key at end of table.

1 4 0 0 5 6 1

Table Appendix C (Cont.)

Scientific Name	Common Name	Base Status[a]	Status[b] FGFWFC (or FDA)	Status[b] USFWS	Habitat
Picoides borealis	Red-cockaded woodpockor	P-u	T	E	Cavity nests/old pine stands
Vermivora bachmanii	Bachmann's warbler	U	E	E	Woodod habitats
Campephilus principalir	Ivory-billed woodpockor	U	E	E	Wooded habitats
Sterna antillarum	Least tern	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		u R 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		u R 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	u R 5	Hoist, *woody* habitats

14[NASP]UH1102:T0394/1883/2

Key at end of table.

Table Appendix C (Cont.)

Scientific Name	Common Name	Base Status[a]	statu. [b] FGFWFC (or FDA)	USFWS	Habitat
Sarracenia leucophylla	White-top pitcherplant	R	E		Open acid bogs
Sarracenia rubra	Sweet pitchorplant	U	E	M 2	Acid bogs/slash pine woods
Stewartia malacodnedron	Silky camellia	U	E		Slopes ot wooded ravines

14[NASP]UH1102:T0394/1883/2

Key:

[a]Status of species on the 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 = Not expected to occur on tho NAS Pensacola facility.

[b]State and federal status:
E = Endangorod.
T = Threatened.
T(S/A = Threatened duo to similarity in appearance.
AC = Agency concern; not currently listed or a candidate for listing.
UR 1 = Under review for federal listing with substantial evidence indicating at least some degree of biological vulnerability and/or throat.
u R 2 = Under review, insufficient biological data available.
UR 5 = Candidate species but taxa bas 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 1966.

110053 2

APPENDIX D

JUNE 1990 SECTION 14.2
PEASE 11--CHARACTERIZATION

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

14.2 Phase 11--Characterization

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

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

The actual Phase II sampling locations, especially with respect to the Phase I locations, will primarily be a function of how uniform the Phase I results were with respect to contaminant type, magnitude, and distribution across the site.'

Phase II investigation of Sites 11, 12, and 26 will involve the collection of soil and groundwater samples. Additional permanent, shallow monitoring wells will 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.

Surface water and sediment samples collected from Bayou Grande in areas adjacent to these sites are addressed in the work plan for Site 30, Phases I and 11.

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

During the Phase II investigations of Sites 11 and 26, which are covered by RCRA requirements, at least one sample per contaminated medium will also be analyzed for Appendix IX parameters (40 CFR, Part *264).* These samples will be collected from the area of highest

TABLE 14-2

PHASE II SAMPLING AND ANALYTICAL REQUIREMENTS-GROUP B

SITE 11

Medium	No. of Samples	Dupli-cates	Trip Blanks[a]	Field Blanks	Rinsate Blanks	Preservative Blank.[b]	Total	Analytical Suite[c,d]
Soil	15	2	1	1	1	1	21 (6)	A C
Groundwater	5	1	1	NR	1	NR	8 (4)	A B
TOTAL	20	3	2	1	2	1	29(10)	

S M 12

Medium	No. of Samples	Dupli-cates	Trip Blanks[a]	Field Blank.	Rinsate Blank.	Preservative Blank.[b]	Total	Analytical Suite[c,d]
Soil	25	2	1	1	1	1	31 (10)	A C
Groundwater	4	1	1	NR	1	NR	7 (1)	A B
TOTAL	29	3	2	1	2	1	38(11)	

SITE 26

Medium	No. of Samples	Dupli-cates	Trip Blanks[a]	Field Blanks	Rinsate Blanks	Preservative Blanks[b]	Total	Analytical Suite[c,d]
Soil	10	1	1	1	1	1	15 (10)	A C
Groundwater	3	1	1	NR	1	NR	6 (1)	A B
Sediment	1	1	NR	NR	NR	NR	2 (1)	A C
TOTAL	14	3	2	1	2	1	23(12)	

14[NASP]UH1102:T0394/173/11

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

1100564

Table 14-2 (Cont.)

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

[b]Preservative blanks will bo analyzed for TCL volatilo organic compounds, total rocovorablo hydrocarbons, dissolved TCL metals, and cyanide.

[c]Analytical suite designations are as follows:

A = TCL volatilo organic compounds plus xylene and ketones TCL base/neutral and acid extractable organic conpounds, TCL pesticides and PCBs total recoverable hydrocarbons, TCL metals (total [i.e., unfiltered], and dissolved [i.e., millipore-filtered]), cyanido, total organic carbon, hardness (water only), and alkalinity water only).

B = total suspended solids, total Kjoldahl nitrogen, ammonia nitrogon, orthophorphato phosphorus, dissolvod oxygen fin field), 5-day biological oxygen demand (BOD_5), and chorical oxygon demand (COD).

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

[d]Specific constituents encompassed by the various chemical groups included within tho above-listed analytical suites are identified in Tables 9-5 through 9-13 of tho Generic Quality Assurance Projoct Plan.

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

NR = Not required.

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

contamination for each medium as determined during the Phase I investigation. Additional Appendix IX samples may be required depending on the extent of contamination detected.

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 Soil Sampling

Soil samples will be collected from the tentative locations shown in Figure 14-2. At each location, samples will be collected from the following composite intervals; surface to 0.5 feet, 0.5 to 2.5 feet, and every 2.5 feet thereafter to the vater table or to a maximum of 10 feet. Samples deeper than 10 feet will be collected only if deeper contamination is indicated during Phase I.

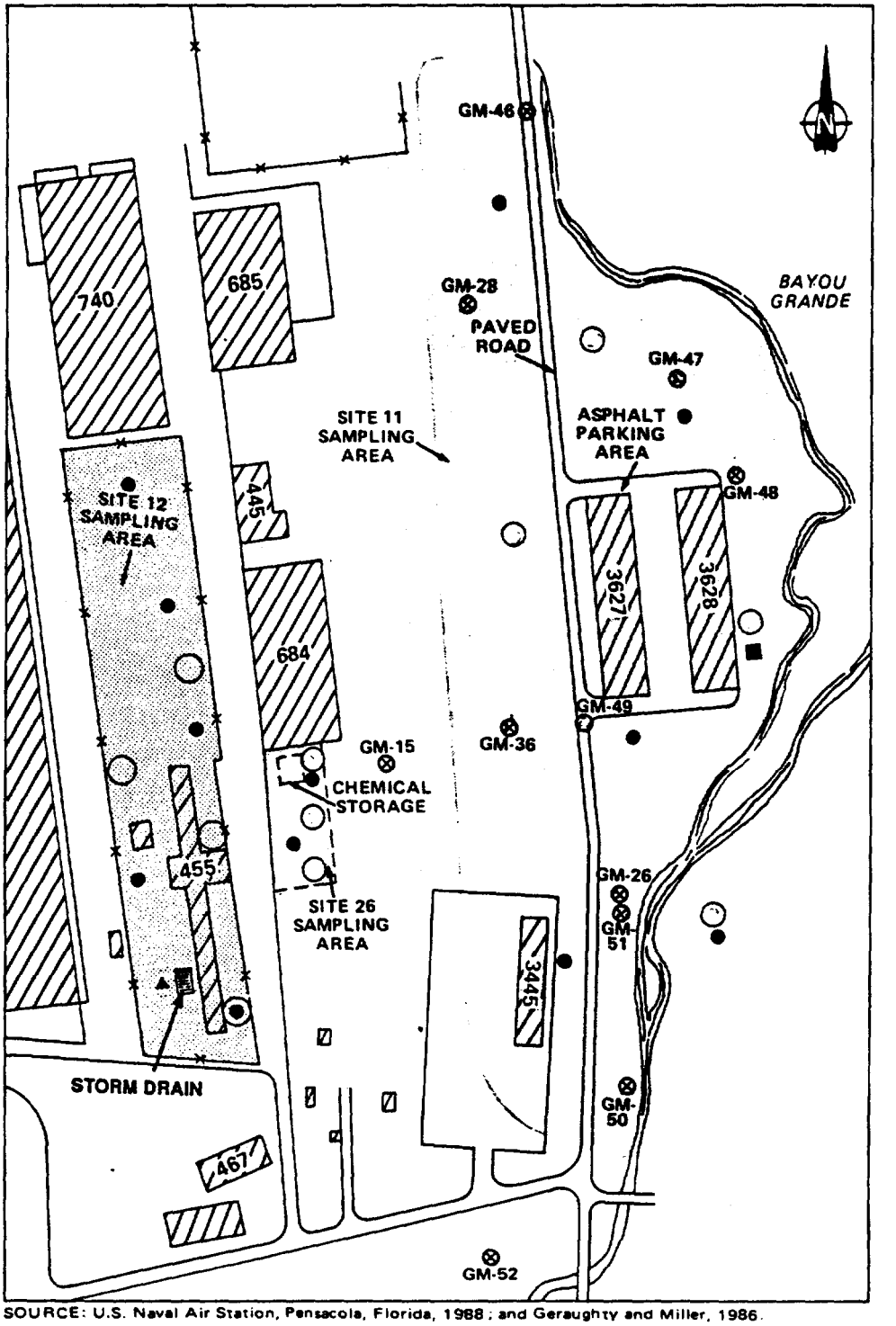
For planning purposes, three soil samples are assumed at each soil boring location for Site 11 and five samples at each location for Sites 12 and 26. Assuming ten locations in Phase II (5 on Site 11, 3 on Site 12, and 2 on Site 26), a total of 50 soil samples is tentatively projected.

The soil samples will be collected using a split-spoon sampling device or with hand operated bucket augers. All sampling, compositing, and lithologic logging will be performed in accordance with Section 6.6 of the GQAPP. Equipment decontamination will be performed in accordance with Section 6.10 of the GQAPP.

14.2.3 Shallov Monitoring Well Installation and Development

The actual number and locations for monitoring wells to be installed in Phase II will be determined based on Phase I findings. For planning purposes, the number of permanent shallow monitoring wells to be

1100565



SOURCE: U.S. Naval Air Station, Pensacola, Florida, 1988; and Geraughty and Miller, 1986.

SCALE

0 100 200 400 600 FEET

KEY:

- ⊕ Existing Monitoring Well
- ▲ Tentative Sediment Sample
- ● Tentative Soil Boring
- ○ Tentative Shallow Monitoring Well
- ■ Tentative Intermediate Depth Monitoring Well
- Building

Figure 14–2 TENTATIVE SOIL BORING AND SHALLOW MONITORING WELL LOCATIONS, SITES 11, 12, AND 26 - PHASE II

installed is ten (4 on Site 11, 3 on Site 12, and 3 on Site 26). As a measure to investigate the potential €or groundwater contamination by "sinker" solvents, one well will also be installed to greater depth during Phase II at Site 11. For planning purposes, a completion depth of 40 feet is assumed. The intermediate-depth monitoring well will be clustered with a shallow monitoring well in order to enable determination of vertical hydraulic gradient.

Tentative shallow monitoring well locations are shovn in Figure 14-2 all shallow wells will be constructed of two-inch PVC, and bracket the water table with 10 feet of screen. Fifteen-foot-deep wells are anticipated at Site 11 and 25-foot-deep wells at Sites 12 and 26. The wells will be installed utilizing hollow-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 wells 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.

14.2.4 Groundvater Sampling

Groundwater samples will be collected from the estimated 12 newly installed permanent vells at the locations shown on Figure 14-2. The purging and sampling of wells will be conducted in accordance with Sections 6.8 and 6.10 of the GQAPP.

14.2.5 Hydrologic Assessment

Well head elevations will be surveyed for all newly installed monitoring wells and water levels will be measured in all wells.

Limited aquifer testing will be conducted on all newly installed and existing monitoring wells. These will consist primarily of performing. short-duration specific capacity tests during development of the newly installed monitoring wells and slug or specific capacity tests on the

1100566

existing monitoring wells. Specific capacity and slug tests are particularly useful for deriving first estimates of aquifer hydraulic properties (i.e., hydraulic conductivity, transmissivity).

The advantages of conducting specific capacity tests in conjunction with well development is that the test itself does not generate additional potentially contaminated water which requires disposal. Slug testing does not generate any potentially contaminated water.
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.

14.2.6 Sediment Sampling

One sediment sample is tentatively proposed to be collected from the storm drain at Site 12, as shown on Figure 14-2. The sediment sample will be collected in accordance with Section 6.9.2 of the GQAPP and the analytical requirements are shown in Table 14-2.

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 sampling, and the Phase I shallow soil sampling.