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CONTAMINATION ASSESSMENT/ REMEDIAL ACTIVITIES INVESTIGATION WORK PIAN -- GROUP B NAVAL AIR STATION PENSACOLA PENSACOLA, FLORIDA

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

July, 1990

Prepared for:

DEPARTMENT OF THE NAVY
SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
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International *Specialists* in the Environment

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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:

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- 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 vhich have documented contamination will likely require the additional phases of work, and hence will comprise a full-scale 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.

[Bold items enclosed in brackets denote *changes* from original text]

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 eleven 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, GM-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 northeast of Chevalier Field and immediately south of Building 684 (Figures 2-1 and 2-2). This site occupies an area of approximately 100 by 200 feet. On the site is a small prefabricated

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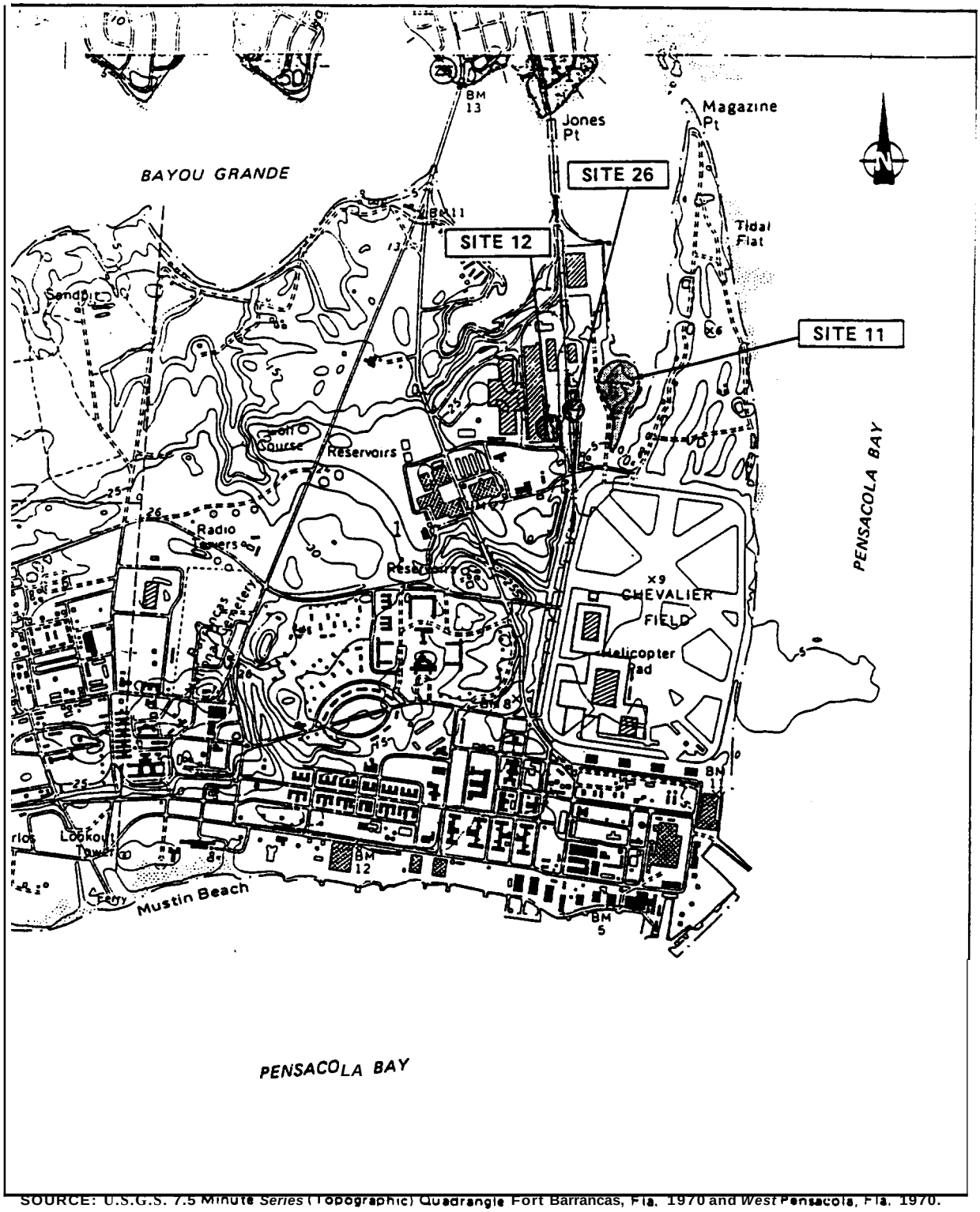

SOURCE: U.S.G.S. 7.5 Minute *Series* (Topographic) Quadrangle Fort Barrancas, Fla. 1970 and *West* Pensacola, Fla. 1970. photorevised 1987.

SCALE

0 ½ 1 MILE

0 .5 1 KILOMETER

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

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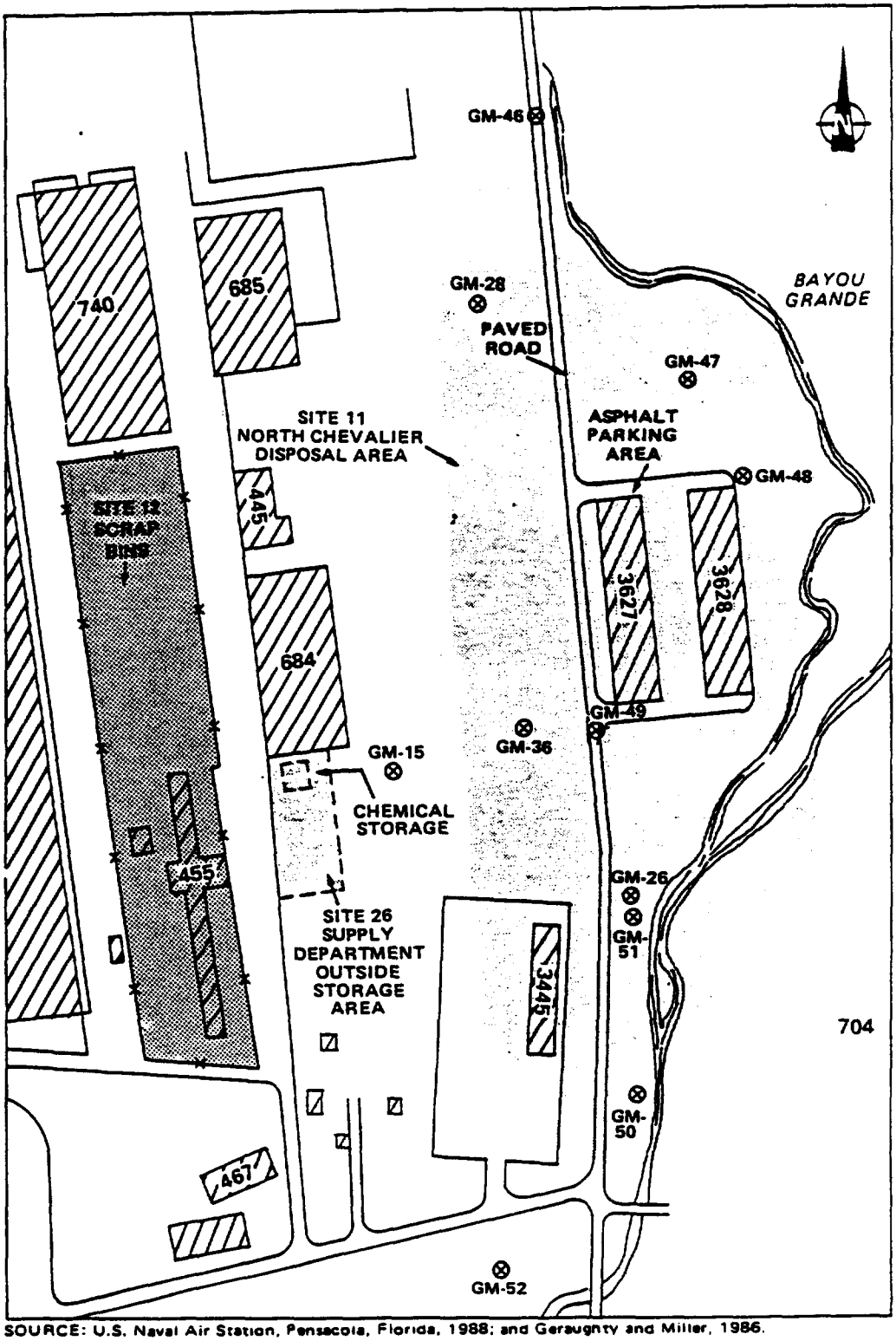

SOURCE: U.S. Naval Air Station, Pensacola, Florida, 1988; and Geraughty and Miller, 1986.

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-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
GM-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
GM-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

SOURCE: Geraghty and Miller (G & M) 1986

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[Bold items enclosed in brackets denote changes from original text]

metal building currently used by NAS Pensacola to store chemicals. The types of chemicals being stored is unknown. The east side of the site is bounded by a paved road and the west 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, GM-15, is located approximately 120 feet east of the northeast corner of the site.

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3. SITE HISTORY

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 mid-1940s. The outer site boundary (edge of shaded area in Figure 2-2) is believed to coincide with the pre-1930s 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 & M 1984). It was reported that approximately 24 cubic yards per 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 Miller (G & M) concluded that the groundwater in this site was generally contaminated with volatile organic compounds, 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 mid-1940s, 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 cubic

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TABLE 3-1

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

Compound	Well Numbers				
	GM-15	GH-26	GM-27	GH-28	GH-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	lo	0

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

Source: G & M, 1986

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TABLE 3-2

SUMMARY OF CHEMICAL ANALYSES OF GROUNDWATER SAMPLES FROM SITES 11 AND 26 TAKEN IN 1986

(ug/L)

	Well Number (GM-)									
Compound	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										
Mercury	--	--	--	--	27	--	--	--	--	NT

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

Source: G & M, 1986

[Bold items enclosed in brackets denote changes from original text]

yards (2 truck loads) per day of vet garbage was 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 from 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 were analyzed for EP toxicity metals. The results shoved that no samples exceeded EP Toxicity limits. A Verficiation 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 (dovngradient 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.

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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 (Uolfe ~~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]). igh intensity thunderstorms are common, producing as much as three to four 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

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the coast, commonly known as the sea-breeze effect (Flood and Associates 1978). Hurricanes and tornadoes are infrequent but can cause substantial damage to the nearshore environment. Six hurricanes have passed within 50 miles of Pensacola since 1980.

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5. BIOLOGICAL RESOURCES

The NAS Pensacola facility consists of approximately 5,800 acres and encompasses approximately 15 terrestrial and aquatic habitats. The majority of the land on the eastern side of the facility is developed for military use or is designated as a historical or cultural resource. However, the NAS Pensacola installation has approximately 3,500 acres in natural or 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 Uniuola paniculata (sea oats), Hydrocotyle bonariensis (beach pennywort), Ipomea stolonifera (beach morning-glory), Coccoloba uvifera (sea grape), Quercus qeminata (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 3 to 5 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), Quercus spp. (scrub oak species, geminata, champanii, myrtifolia, and

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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 man-made or biological factor. This community type can have 3 to 5 distinct habitats (Wolfe et al. 1988).

Two other community types may be found in the western portions of the NAS Pensacola facility. These are flatwoods and sandhill vegetative communities. Flatwoods vegetation occupies areas which were 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). Platwoods 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 monophylla (black titi), Cyrilla racemiflora (swamp titi), and other hydric or riparian species. Open moist savannah areas within flatwoods are dominated by the herbaceous plants Pinguicula spp. (butterwort), Sarracenia spp. (pitcher-plants), Uticularia spp. (bladderworts), Polygala spp. (milkworts), and Drosera spp. (sundews)(Wolfe et al. 1988).

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

Freshwater Wetland Vegetation. Much of the geological material underlying the NAS Pensacola facility is deep, porous sand often containing relatively impermeable clay lenses. In combination vith high annual rainfall, this geologic condition causes the formation of small

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

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

Intermittent streams found on NAS Pensacola have lost most of the original vegetation associated with this habitat. For example, at 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

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

Reptiles 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 t pr of the p tortoise, Gopherus polyphemus, can most likely be found in suitable habitats on the western portions of the facility (see Appendix C). Host all of the reptiles and amphibians that may be found on the facility can be expected to use the surface water bodies in some stage of their life cycle. Any contamination of surface water bodies can be detrimental to existing populations of reptiles and amphibians utilizing that water body.

5.1.2 Aquatic

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

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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 aerial 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

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spp., various spionids and Haploscoloplos spp.) and bivalves (Anodontia alba and Tellina spp.) during most of the year. FDER samples collected along the wastewater treatment plant outfall show a drastic drop in species abundance and diversity close to the sevage outfall (Navy 1986). This indicates that the benthic community may have been negatively influenced by the sewage outfall.

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

Fish and Shellfish. Early studies of Pensacola Bay have identified 180 bony fish species and 7 cartilaginous fish species (Cooley 1978). The 13 most abundant species were spot (Leiostomus xanthurus), pinfish (Lagodon rhomboides), atlantic croaker (Hicropogonias undulatus), gulf menhaden (Brevoortia patronus), bay anchovy (Anchoa mitchilli), longspine porgy (Stenotus caprinus), silver perch (Bairdiella chrysoura), southern hake (Urophycis floridana), inshore lizardfish (Synodus foetens), gafftopsail catfish (Bagre marinus), sand seatrout (Cynoscion arenarius), and spotted hake (Urophycis regia) (Heil 1988).

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

Moderate densities of the blue crab (Callinectes sapidus), shrimp (Penaeus duorarum, P. setiferus, and P. aztecus), and oysters (Crassostrea virginica) have been collected throughout Pensacola Bay

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(Heil 1989). Shrimp are caught in greater abundances near NAS 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 how 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 1980-85 (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 6 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, bluecrabs, and squid. This data, as well as the Navy's data, also suggests 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 is not available in the state of Florida 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

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90 percent of all coamercially valuable fish species are estuarine dependent during some phase of their life cycle. Shrimp, bluecrab and shellfish are known to release larvae that feed in and around estuaries until settlement. During early life history stages the juveniles reside within seagrass beds or other protected habitats until maturity. Any contamination of the water or sediments around NAS Pensacola could be detrimental to fish and shellfish population structure, or could be accumulated by the organisms residing near the facility.

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

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

Threatened and Endangered Species. A number of threatened and endangered species (listed in Appendix C) have been identified in the vicinity of the NAS Pensacola facility. 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 were recorded in an inventory conducted by FNAI (1988b) of the NAS Pensacola facility (see Appendix C). Most of these plants vere found in the area around Sherman Field and habitats to the west. Any site remediation and, more importantly, any assessment of environmental endangerment, must consider the water level requirements of rare and endangered plant species, the foraging activities of birds in the waters surrounding the NAS Pensacola facility, as well as nesting and feeding animals on the facility grounds. Complete biotic surveys may be necessary to determine

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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. Surrounding the areas of construction a sand pine scrub community is found, with an overstory dominated by pines and scrub oaks, and an understory 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 with 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 as a migration corridor.

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6. SURFACE WATER HYDROLOGY

6.1 General Occurrence and Significance of Surface Water

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

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

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

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

The discharge of surface waters into Pensacola Bay, Bayou Grande, and the coastal wetland areas presents the potential for transport of

contaminants into these systems. This could have a significant impact on seagrass and other sensitive plant communities, as well as on shell fishing, recreational fishing, and swimming in these coastal zones. Discharges, either through the surface water or groundvater, into wetland areas found on-site could also have a significant impact on the biotic communities that are dependent on those habitats.

6.2 Site-Specific Surface Water Hydrology

Tvo surface water 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 fresh-water with its source being derived largely from groundwater seepage. The small creek flows to the north into the arm of Bayou Grande which is brackish or marine. Both the portion of the creek adjacent to the sites and Bayou Grande are subject to tidal fluctuations in water levels.

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

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7. PHYSIOGRAPHY AND HYDROGEOLOGY

7.1 Physiography and Regional Hydrogeology

7.1.1 Physiography

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

7.1.2 Regional Hydrogeology

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

7.1.2.1 Surficial/Sand-and-Gravel Aquifer

The Surficial Aquifer occurs from land surface to a depth of approximately 300 feet at NAS Pensacola and is [composed] of a sequence

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of unconsolidated to poorly indurated clastic deposits (Wagner et al. 1984). In this portion of Florida the Surficial Aquifer constitutes an important source of water supply and is called the Sand-and-Gravel Aquifer (SEGS 1986). The sediments making up this aquifer belong to all or part of the Pliocene to Holocene 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 with land surface and recharge occurs principally by the direct infiltration of precipitation, the aquifer is particularly susceptible to contamination from surface sources. In the NAS Pensacola vicinity the Sand-and-Gravel Aquifer is made up of three zones based on contrasting permeabilities. These zones are referred to as the surficial zone, the low permeability zone, and the main producing zone (Wilkins ~~et al.~~ 1985).

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

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

The results of laboratory permeability tests conducted on samples from this zone indicate that vertical hydraulic conductivities are low, ranging from 4.2×10^{-5} to 9.9×10^{-2} ft/day. Thus, the low permeability zone probably functions as a confining or 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 the 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 below land surface at NAS Pensacola. This zone generally has the highest permeability characteristics due to thicker, and more persistent sand and gravel beds, and is tapped by most of the major wells in the Pensacola area (Wilkins et al. 1985). NAS Pensacola has three supply wells which produce water from this zone, however, due to high iron content in the water the wells are infrequently used (G & M 1986). The principal sources of water for NAS Pensacola are wells located at Corry Field, approximately 3 miles to the north. The thickness of the main producing zone can be highly variable; however, it is estimated to be up to about 100 feet at NAS Pensacola. Insufficient data exist for wells open to the main producing zone at NAS

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

As a result of the overlying low permeability zone groundwater within the main producing zone occurs under confined or semi-confined conditions. At one nested well location on NAS Pensacola (east of Building 648) the water level elevation in a well open to the main producing zone is approximately 7 feet lover than that in an adjacent well open to the surficial zone (G 6 M 1986). This indicates that a significant downward hydraulic gradient exists between these two zones. Thus, a considerable potential exists for vertical groundwater flov from the surficial to the main producing zone at this location. It is not known to what extent this potential exists elsewhere at NAS Pensacola.

7.1.2.2 Intermediate System

The lower limit of the Sand-and-Gravel Aquifer coincides with the top of a regionally extensive and vertically persistent hydrogeologic unit of much lower permeability. This unit is referred to as the Intermediate System. In the vicinity of NAS Pensacola the top of the Intermediate System generally lies within the sediments termed 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 (Uilkins et al. 1985). In general the Intermediate System consists of fine-grained sediments, and functions as an effective confining unit which retards the exchange of water between 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-water bearing. However, relatively thin beds of sand exist within the unit which may yield small quantities of vater. In the NAS Pensacola area the Intermediate System is approximately 1,100 feet thick and is composed of the lower portion of the Hiocene 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.

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7.1.2.3 Floridan Aquifer System

Immediately underlying the Intermediate System and occurring at a depth of approximately 1,500 feet below land surface 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 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 Site 11 area occurs from approximately 2 feet below land surface in southern portions of the site to 7.5 feet at the northern end. The depth to the water table at Site 12 is estimated at 12 to 15 feet and 12 feet at Site 26. Based on water-level data collected from these wells (G & M 1986), the direction of groundwater flow is generally to the east toward Bayou Grande, and the horizontal hydraulic gradient is approximately 0.003 (G & M 1986). G & M reported a hydraulic conductivity of 34 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.

Immediately underlying the surficial zone in the vicinity of Site 11, 12, and 26, is the low permeability zone of the Sand-and-Gravel Aquifer. Based on the cuttings from the installation of well 51, this zone is primarily comprised of green to gray sandy clayey silt with some shell fragments. No monitoring wells open to the low permeability zone exist in the vicinity of Sites 11, 12, and 26; however, based on the

lithology, this zone would be expected to function as a confining or semi-confining unit restricting the flow of groundvater between the surficial zone and the underlying main producing zone. The direction of groundwater flow vithin the low permeability zone is unknown.

The'direction of groundvater flow within the main producing zone at these sites is unknown; however, a generally southward flow is expected under ambient conditions. An NAS Pensacola supply well (Well No. 2) is located approximately 3,000 feet southwest of Sites 11, 12, and 26, and is screened between 110 and 160 feet belov land surface, and thus is open to the main producing zone. This well is utilized by NAS Pensacola for backup water supply only during periods of peak demand. During these periods of pumping, the direction of flow in the main producing zone would be tovard the supply vell. Insufficient data exists for wells open to the main producing zone to determine the horizontal hydraulic gradient in this zone at NAS Pensacola.

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8. PROJECT MANAGEMENT PLAN

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

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9. SITE MANAGEMENT PLAN

The Generic Site Management Plan (GSMP), submitted to the Navy for approval, 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.

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10. HEALTH AND SAFETY PLAN

A comprehensive General Health and Safety Plan (GHSP) and individual site-specific safety plans (SSP) have been developed to provide readily available emergency information and preventative safety measures. The GHSP, submitted to the Navy for approval, outlines health and safety procedures and protocols to be followed during all field investigations at each of the 37 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 GRSP 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).

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11. QUALITY ASSURANCE PROJECT PLAN

A Generic Quality Assurance Project Plan (GQAPP) has been prepared and submitted to the Navy for approval. 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 (SOAP).

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

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12. *AERIAL* PHOTOGRAPH ANALYSIS

Prior to the initiation of fieldwork, E & E will examine all available aerial photographs of NAS Pensacola for past and present conditions, features, and developments which may have direct relevance to the fieldwork methodology. The aerial photograph analysis task will involve assembling and stereoscopically analyzing historical photographic imagery and topographic maps available for the site area. For the purpose of supporting the development of field investigation strategies, efforts will be made to obtain photographs of an appropriate scale that will allow for analysis of past and present surface conditions, drainage, and land use. Photographs showing the history of site activities will be analyzed to obtain information regarding the evolution of site features which may 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.

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13. UTILITIES SURVEY

Prior to conducting any augering, boring, drilling, or excavation activities, E & E will locate all underground cables, pipes, utilities, or other obstructions which may become damaged or otherwise hinder fieldwork. The appropriate authorities (e.g., NAS Pensacola Public Works and Southern Bell) will be contacted to identify the location of all underground utilities in the site area. In addition, E & E will examine available maps and documents, and will 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.

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14. FIELDWORK METHODOLOGY

14.1 Phase I -- Field Screening

The primary objective of the Phase I field screening investigation is to effectively and efficiently focus the Site Characterization (Phase 11) and subsequent Extent Delineation (Phase 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 Quality Assurance/Quality Control (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 analysis, 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.

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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 with Sections 6.1.1 and 6.3.2 of the GQAPP. In the event that any "hot spots" 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 Sampling]

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 OVA air monitoring equipment. The survey will be conducted in accordance with Section 6.1.1 of the GQAPP. Measurements will be made at each established grid point, and readings will be recorded in the field logbook.

[In addition, 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 sampling will be conducted in accordance with Section 6.1.3, of the GQAPP.]

14.1.1.3 Radiation Survey

During the establishment of the geophysical survey grid network, 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 with 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.

[Bold items enclosed in brackets denote changes from original text]

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 which may be affected by off-site contaminant migrations. During the walkover survey, rare, threatened, and endangered species and their potential habitats will be identified, and an evaluation will be made of general site conditions to support viable populations of plants and animals. A habitat/biota survey will be conducted for each site, as well as an evaluation of the literature.

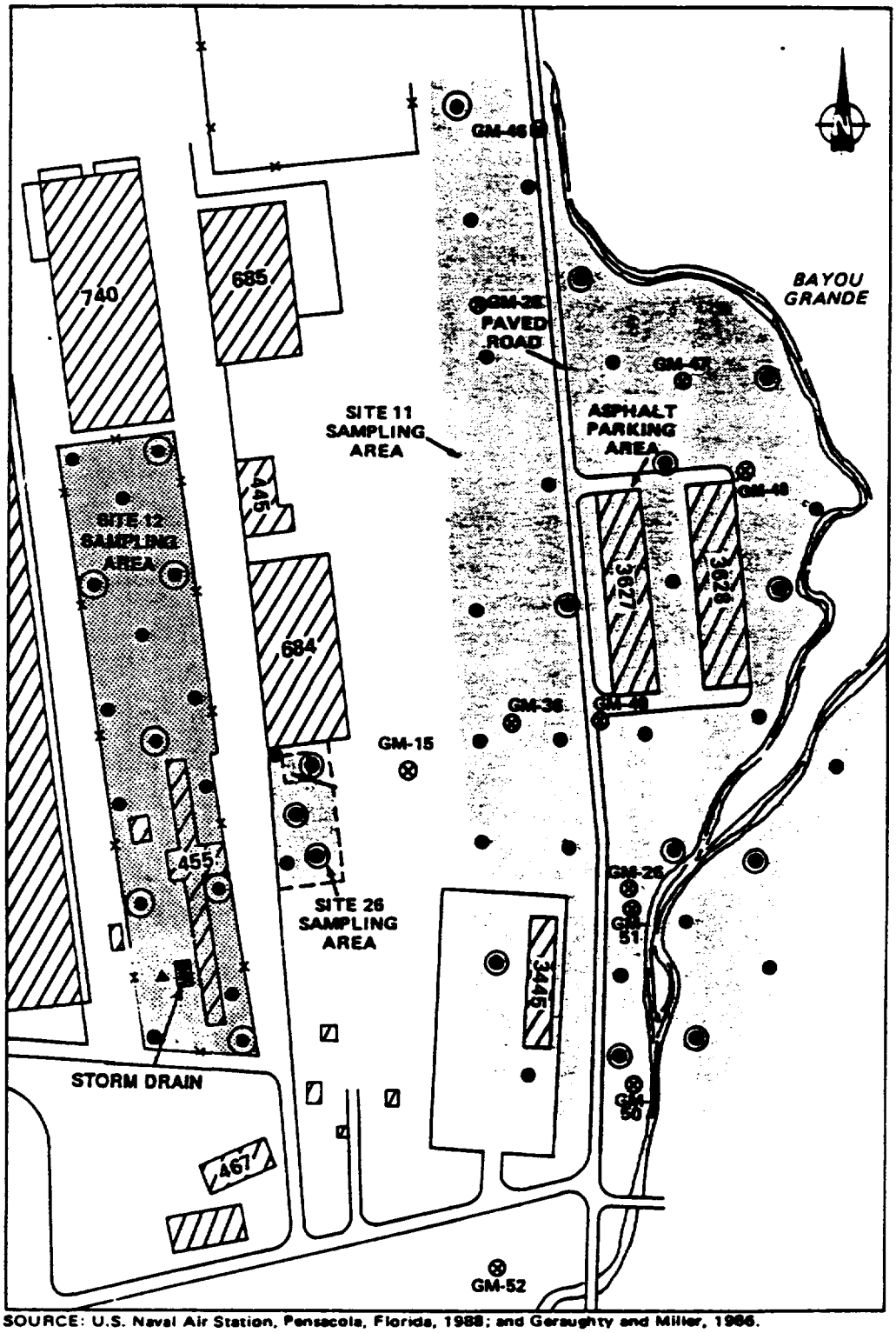
14.1.2 Geophysical Survey

At Sites 11 and 26, electromagnetic terrain conductivity (EM-31 and EM-34XL) and magnetometer (Mag) 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 EM-31 and Mag 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 obtained to identify: anomalous conditions in the landfilled areas; water table conditions; the location of potential subsurface



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
- ▨ Building
- ▲ Tentative Sediment Sample

Figure 14–1 TENTATIVE SOIL BORING AND TEMPORARY MONITORING WELL LOCATIONS, SITES 11, 12, AND 26 - PHASE I

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contaminant plumes; and the horizontal and vertical orientation of contaminant plumes, if located. Ultimately, the interpretation of this data will be a primary consideration in the development of a rationale for determining Phase I and II sample locations.

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 as a measure to efficiently and cost-effectively provide focus for subsequent phases of site characterization and contamination 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 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.

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.]

Sail — Fifty-one soil borings will be drilled in Group B sites: 30 on Site 11; 16 on Site 12; and 5 on Site 26, as shown in 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 at Site 11 and 15 feet 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.]

[Bold items enclosed in brackets denote changes from original text]

TABLE 14-1

PHASE I SAMPLING AND ANALYTICAL REQUIREMENTS-GROUP B

SITE 11

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[g]	Total*	Analytical Suite[a,c]
Groundwater[e]	11	1	1	1	1	1	16	B

SITE 12

Medium	No. of Samples	Duplicates	Total	Analytical Suite[a,b]
[Sediment	1	1	2	A]
Soil	[48]	2	[50]	A
Groundwater[d]	[7]	1	[8]	A
TOTAL	[55]	3	[58]	

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Table 14-1 (Cont.)

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	

'Analytical suite designations are as follows:

A = Volatile organic compounds, polynuclear aromatic hydrocarbons, phenols, pesticides and total PCBs, total recoverable 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 recoverable hydrocarbons, TCL metals (total [i.e., unfiltered], and dissolved [i.e., millipore-filtered]), cyanide, total organic carbon, hardness (water only), and alkalinity (water only).]

[b]Specific constituents encompassed by the various chemical groups included within analytical suite A are identified in Tables 9-1 through 9-4 of thb Generic Quality Assurance Project Plan [(GQAPP)].

[[c]Specific constituents encompassed by tho various chemical groups included within analytical suite B are identified in Tables 9-5 through 9-13 of tho GQAPP.

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

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

'Trip blanks will bo analyzed for TCL volatile organic compounds only.

[g]Preservative blanks will be analyzed for TCL volatile organic compounds, totml recoverable hydrocarbons, dissolved TCL metals, and cyanide.]

The soil samples will be collected using either a solid stem auger extraction method or a hand-operated bucket auger. All sampling, coapositing, 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.

Groundvater -- 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 extents slightly above the water level). As shown on Figure 14-1, the locations for these wells are tentative. The interpreted results of the geophysical investigation, as well as information gained from field reconnaissance surveys and aerial photograph interpretations, will allow adjustments and finalization of the temporary shallow well network. The 21 temporary wells and 11 existing monitoring wells will be purged and sampled in accordance with Section 6.8 of the GQAPP.

14.1.4 Hydrologic Assessment

The temporary wells and existing well network will be surveyed to obtain top of casing 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 vell to determine shallow groundwater flow direction and horizontal hydraulic gradient.

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

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

[Bold items enclosed in brackets denote changes from original text)

14.2 .Phase II -- 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 II.]

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

[Bold items enclosed in brackets denote changes from original text]

Medium	BO. Of Samples	Dupli-cates	Trip Blanks[a]	Field Blanks	Rinsate Blanks	[Preservative Blanks[b]]	Total*	Analytical Suite[c,d]
Soil	15	2	[1	1	1	1	211 (6)	A C
Groundwator	[5]	1	1	[NR]	1	[NR]	8 (4)	A B
TOTAL	[20]	3	[2	1	2	1	291(10)	

SITE 12

Medium	No. of Samples	Dupli-cates	Trip Blanks[a]	Field Blanks	Rinsate Blanks	[Preservative Blanks[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)]	

Table 14-2 (Cont.)

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

[[b]Preservative blanks will bo analyzed for TCL volatile organic compounds, total recoverable hydrocarbons, dissolved TCL metals, and cyanide.]

[""Analytical suite designations are as follows:

A = TCL volatilm organic compounds plus xylene and ketones, TCL base/neutral and acid extractable organic compounds, TCL pesticides and PCBs, total recoverablm hydrocarbons, TCL mmtals (total [i.e., unfiltered], and dissolved [i.e., 'millipore-filtered]), cyanido, total organic carbon, hardness (watmr only). and alkalinity (water only).

B = total suspended solids, total Kjeldahl nitrogen, ammonia nitrogen. orthophosphatm phosphorus, dissolved oxygmn (in field), 5-day biological oxygmn dmmand (BOD_5), and chemical oxygon demand (COD).

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

[d]Specific constituents mncompassmd by thm various chemical groups included within the above-listed analytical suites arm identified in Tables 9-5 through 9-13 of thm Generic Quality Assurance Project Plan.

*Thm number of samples shown in parentheses will be analyzed for thm additional parameters indicated.

[NR = Not required.]

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 water 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 Shallow 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 vells to be

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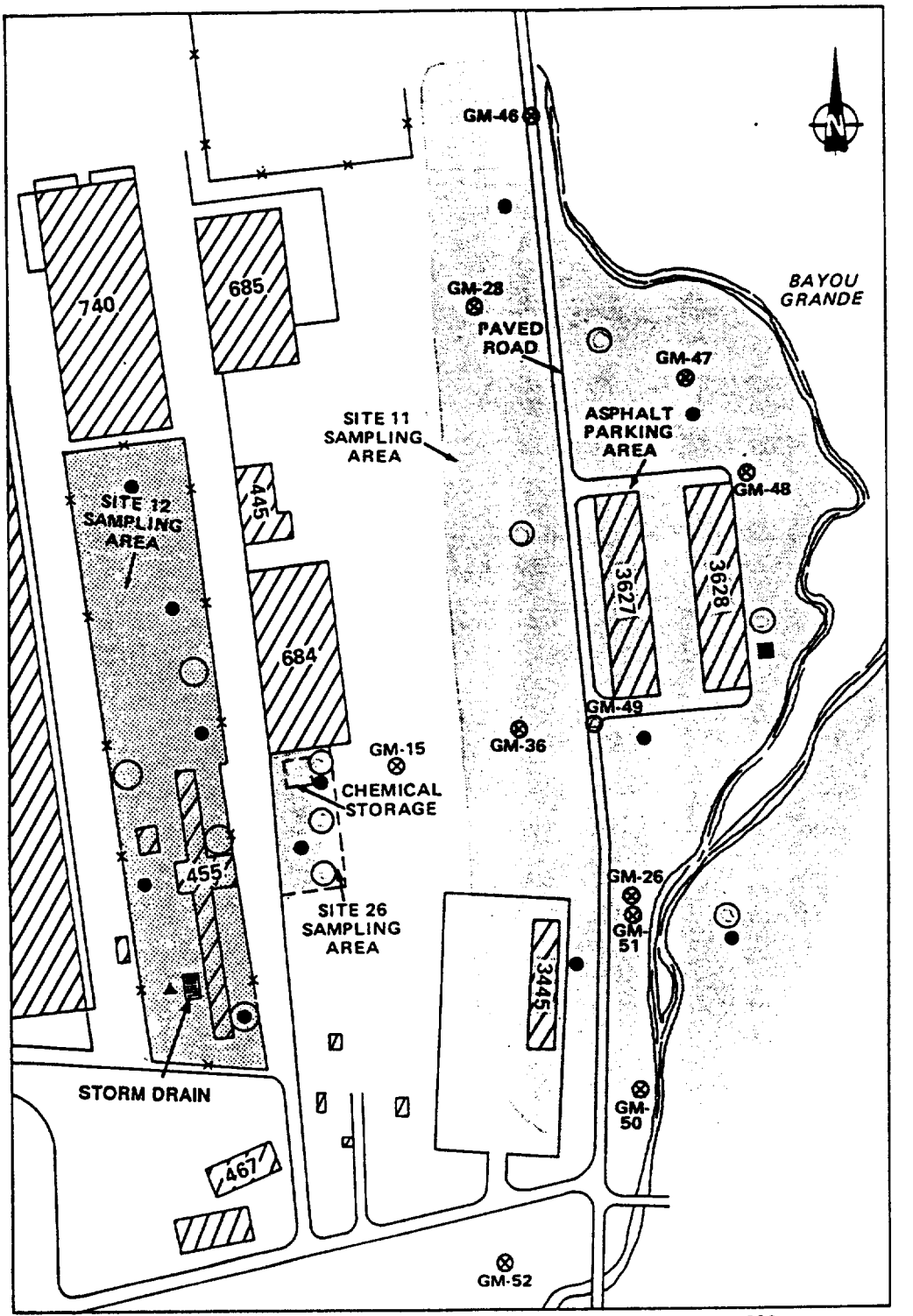

SOURCE: U.S. Naval Air Station, Pensacola, Florida, 1988 and Geraughty and Miller, 1986.

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 for 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 shown 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 groundvater contamination may be possible during Phase II by the installation of a fev 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 Groundwater Sampling

Groundwater samples will be collected from the estimated 12 newly installed permanent wells 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

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.]

14.3 Phase III - Extent Delineation
Phase III tasks will be conducted based on the results of Phases I and 11. 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.

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. [However, as for Phase 11, a separate biological sampling plan will be prepared.]

[Bold items enclosed in brackets denote changes from original text]

14.3.2 Soil Sampling

Soil sampling will be conducted in conjunction with any new shallov, intermediate or deep monitoring well installations.

14.3.3 Shallow 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 11.

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 in order 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 Phase I and II findings.

14.3.5 Groundwater 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 well head survey to obtain top of casing elevations. Water level measurements will be made for all site monitoring wells and nearby surface water 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 lov permeability zone will be further characterized during Phase III and any subsequent phases. It is intended that soil sample results, lithologic logs, isopach raps, permeability testing, aquifer testing, etc. will be utilized as required to determine the lateral extent and/or continuity of the lov permeability zone, as well as the degree to which hydraulic connection

[Bold items *enclosed* in brackets denote *changes* from original text]

exists between the surficial zone and underlying main producing zone at each site.]

14.3.7 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 in the effort of delineating the extent of contamination:

- Soil Sampling;
- Shallow Monitoring Well Installation and Development;
- Intermediate and Deep Monitoring Well Installation and Development;
- Groundwater Sampling; and
- Hydrologic Assessment

14.5 Topographic Survey and Base Hap

Following the completion of Phases III and IV, a topographic survey of the Sites 11, 12, and 26 areas will be conducted and a base map will be developed. Base map coverage, contour intervals, scale, and requirements for horizontal and vertical control will be established and approved by the Navy. The topographic base map will be developed for the requirements of remedial planning and will include the locations of surface features such as: roads, structures, nearby surface waters, monitoring wells, and above ground utilities. The location of subsurface utilities and drainage structures will be reflected on the base map as indicated on existing NAS Pensacola General Development and utilities maps, and/or as located during field investigations.

14.6 Field Quality Assurance/Quality Control

14.6.1 Documentation

Field activities and sample management will entail certain strict documentation requirements as described in Section 7.0 of the GQAPP.

[Bold items enclosed in brackets denote changes from original text]

14.6.2 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 6.12 of the GQAPP. The estimated numbers of required field QA/QC samples for Phases I .and II are shown in Tables 14-1 and 14-2.

14.7 Decontamination and Waste Management Procedures

14.7.1 Decontamination Procedures

All equipment decontamination procedures for Site 1 will be performed in accordance with Section 6.10 of the GQAPP.

14.7.2 Waste Management Procedures

All water generated during monitoring well purging and development activities on Site 1 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 wastes, 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 from original text]

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15. LABORATORY QUALITY ASSURANCE/QUALITY CONTROL

Laboratory QA/QC procedures are designed to ensure the accuracy, precision, completeness, representativeness, and comparability of all analytical data. Laboratory QA/QC has been addressed both in the Generic Quality Assurance Project Plan (GQAPP) and Generic Site Management Plan (GSMP). All phases of fieldwork will incorporate a different level of data quality and requisite laboratory QA/QC. These levels are discussed in detail in the GQAPP and QSMP'.

[Bold items enclosed in brackets denote changes from original text]

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. Two scenarios will be considered to assess the potential for off-site contamination, including:

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

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 & E will utilize parameters including transmissivity, storativity, and hydraulic conductivity from the phases of fieldwork described above.

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 FEMWASTE, a finite-element solute transport model.

[Bold items enclosed in brackets denote changes from original text]

17. TREATABILITY STUDY

As indicated, in Table 14-2, a number of the analyses to be performed on the samples collected during Phases II through IV are required in support of the treatability study. Characterization of samples in terms of parameters listed in Table 14-2, together with treatibality 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 from original text]

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 (FS) for remedial actions. The baseline risk assessment will provide an evaluation of the potential threat to human health and the environment in the absence of any remedial action, by providing the basis for determining whether or not remedial action is necessary and the justification for performing any remedial actions.

The 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 associa ed with all of the above. The complexity of the site will determine the level of effort required to conduct the baseline risk assessment. The conclusions of the baseline risk assessment will determine the level of effort required in the risk assessment to be conducted in the FS.

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

18.1 Contaminant Identification

The main purpose of this step is to screen available information on the hazardous wastes present at the site and to identify contaminants of

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

18.2 Exposure Assessment

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

1) A source mechanism of chemical release into the environment;
2) An environmental transport medium (e.g., air, groundwater, 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 risks and potential future risks if no action is taken. Therefore, as part of this evaluation a reasonable maximum exposure scenario should be developed, which reflects 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.

[Bold items enclosed in brackets denote changes from original text]

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18.3 Toxicity Assessment

This step considers: (1) the types of adverse human or environmental effects associated with contaminant exposure; (2) the relationship between the magnitude of exposure(s) and the adverse effects; and (3) related uncertainties such as the evidence for a chemical's potential carcinogenicity in humans. Typically this process relies heavily on existing toxicity information and rarely involves the development of new data on toxicity or dose-response relationships.

18.4 Risk Characterization

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

[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;

[Bold items enclosed in brackets denote changes from original text]

- 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 FS should be appropriately scaled down or eliminated. The results of the Remedial Activities Investigation and baseline risk assessment will serve as the primary basis of documenting a no further action decision.

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

[Bold items enclosed in brackets denote changes from original text]

19. FEASIBILITY STUDY

Further details on the specific tasks to be performed as part of the FS will be described in detail during the update of this workplan 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 FS, E & E will prepare a summary of field data collected during the RI to compare and evaluate the concentration of the contaminants of concern against 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 the screening of applicable remedial technologies for the development and evaluation of remedial action technologies.

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

[Bold items enclosed in brackets denote changes from original text]

19.2 Assessment of Applicable Remedial Technologies

During the assessment process, E & 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 comments as appropriate 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 & E will perform a detailed risk analysis to determine the acceptable levels of risk. This will allow 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 consideration 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 alternatives, criteria including technical feasibility, environmental and public health, institutional impacts, and comparative costs will be considered.

19.5 Selection of Recommended Remedial Action Alternatives

During this task, 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,

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when comparing alternatives. 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 FS Report

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

[Bold items enclosed in brackets denote changes from original text]

20. REPORT

[Following the Phase I investigation, E & E will prepare a Phase I Interim Data Report and Recommendations for each site. The purpose of this report is to summarize briefly 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 no further action is warranted, a formal Phase II 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 Recommendations and will only briefly summarize the Phase II results and provide recommendations for the Phase III investigation. Thus, the Phase II interim report will not be a formal document. Following production of the Phase II interim report, the work plans for the Phase III work will be updated.]

E & E will prepare a 90% draft, [for each of the above-described] reports, [which] summarizes the activities and results [of the investigation tasks performed.] Upon receipt of comments [from] the Navy concerning the 90% draft reports, E & E will prepare a draft final report for the Navy and the Technical Review Committee (TRC) review. The TRC review comments will be incorporated into final reports. Each report will be written as an independent document, complete in its own right, and fully supportive of the conclusions that it contains. [Where appropriate,] public participation issues will be summarized, as will interim remedial measures necessary to protect against continued

[Bold items enclosed in brackets denote changes from original text]

degradation of conditions at the site(s). Information used in analyses, but supplemental to the analytical results, will be provided in a series of appendices.

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

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.

(Bold items enclosed in brackets denote changes from original text]

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.

[Bold items enclosed in brackets denote changes from original text]

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 Xanagement Plan (FFASMP). The schedule in the FFASMP will be updated yearly.]

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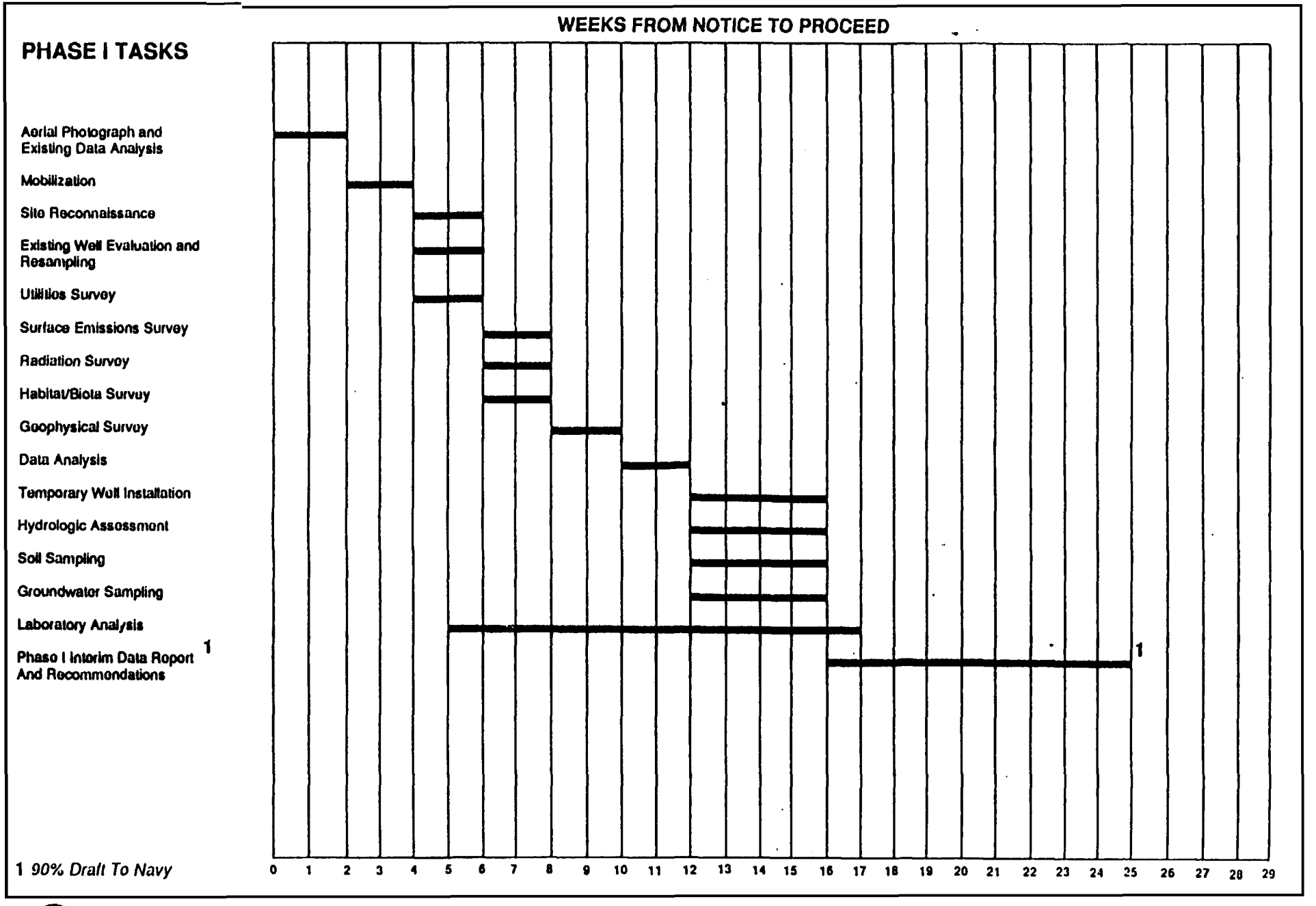

Figure 23-1 PHASE I PROJECT SCHEDULE -- GROUP B

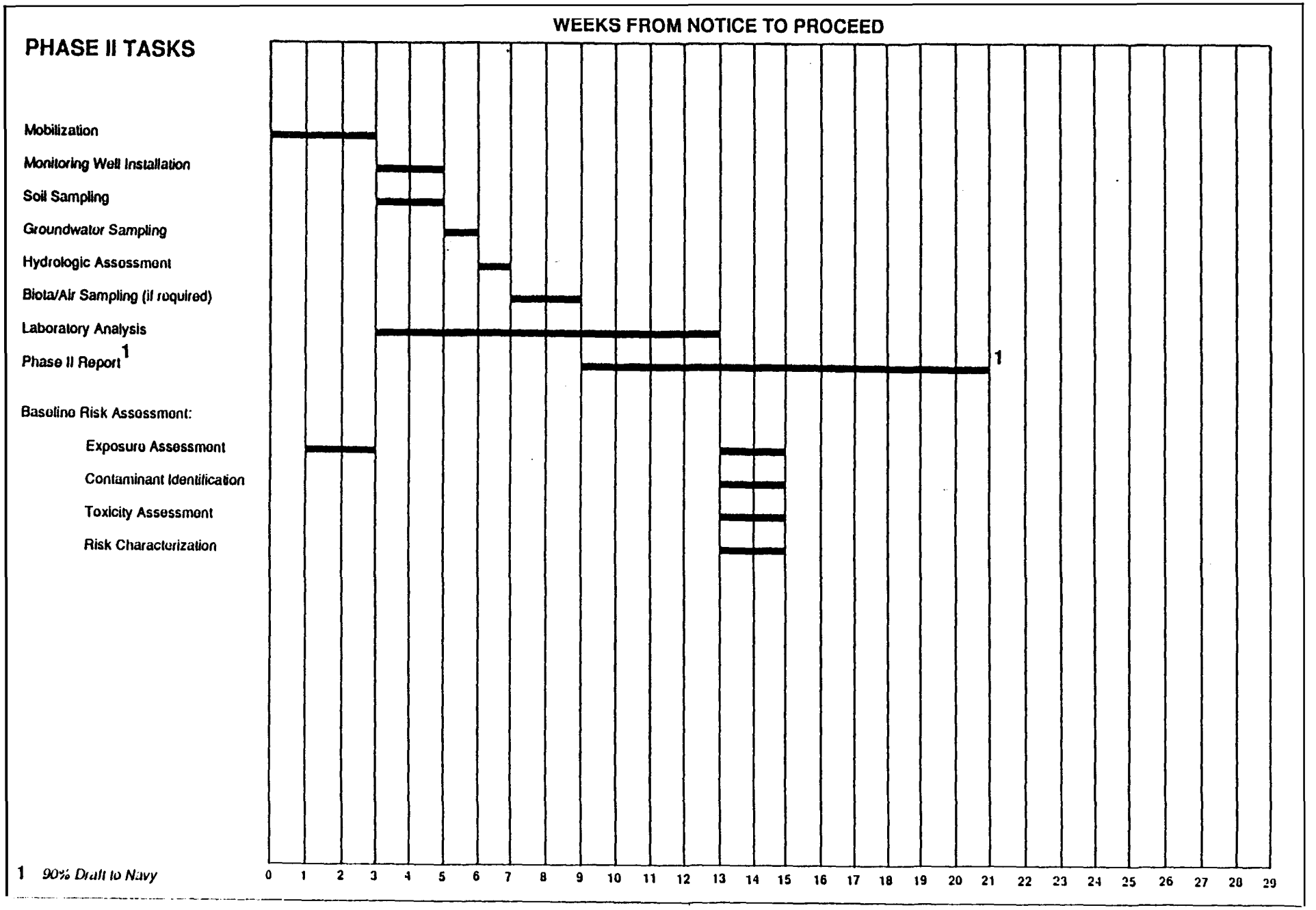

Figure 23-2 PHASE II PROJECT SCHEDULE -- GROUP B

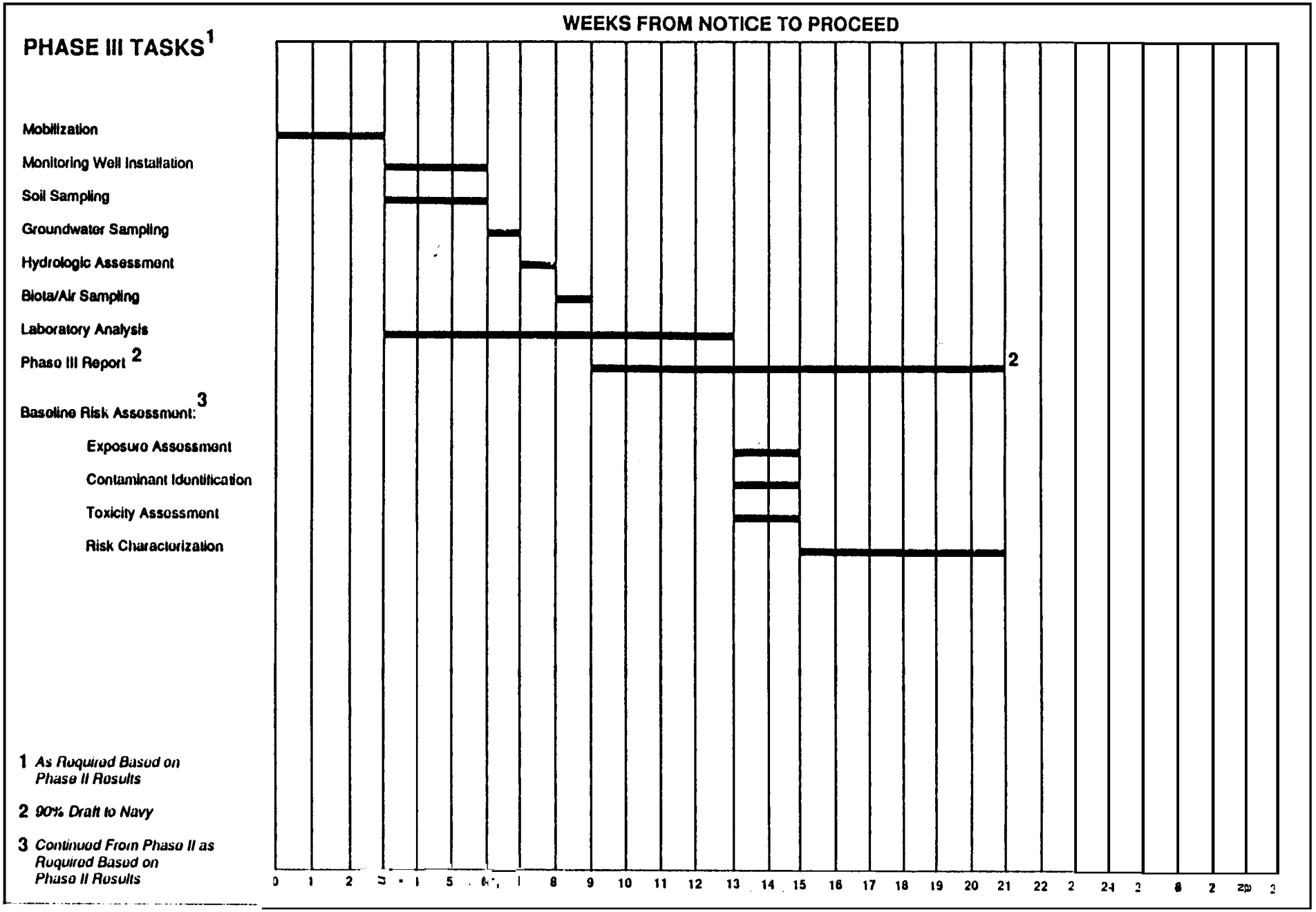

Figure 23-3 PHASE ROJECT SCHEDULE -- GROUP B

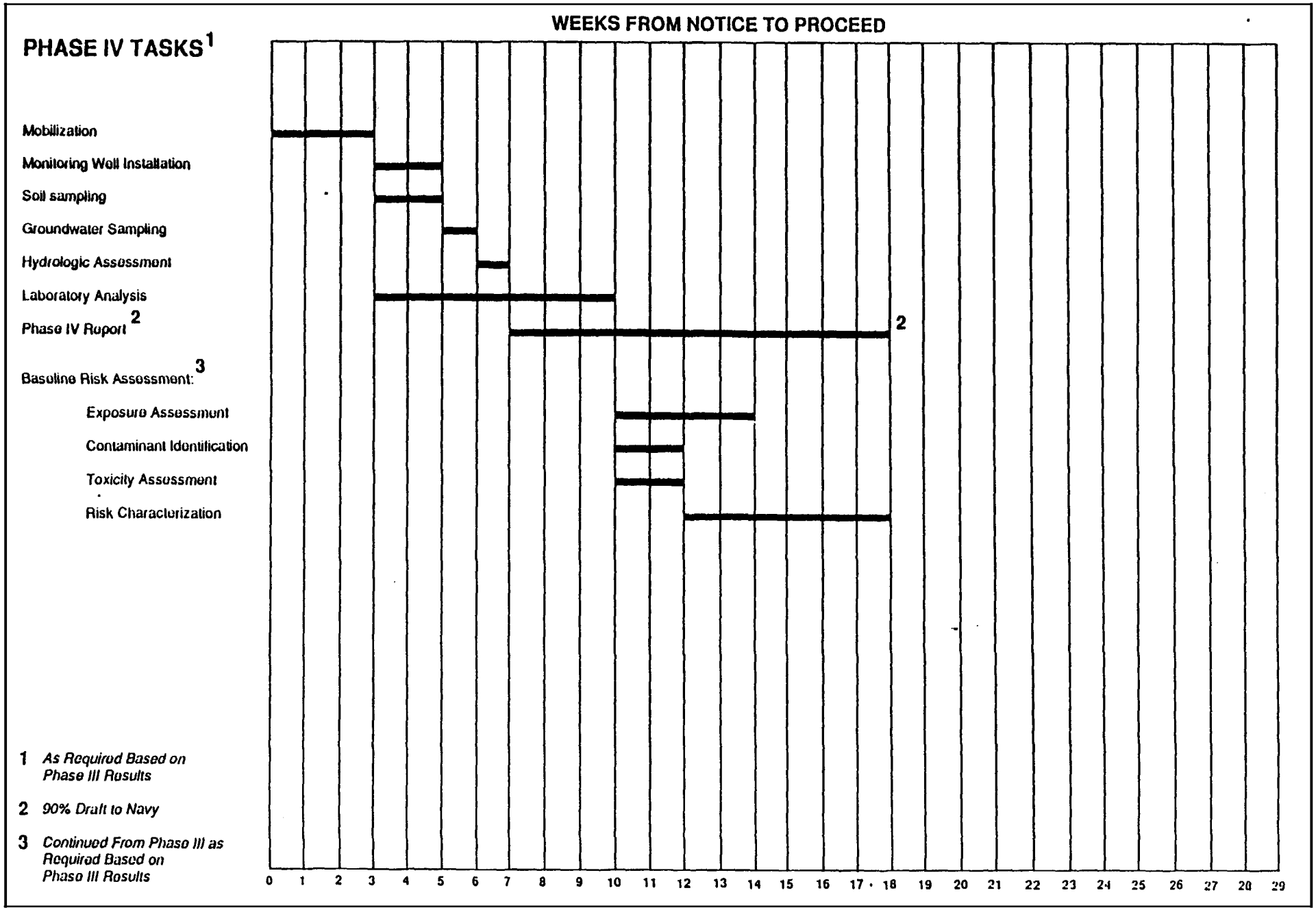

Figure 23-4 PHASE IV PROJECT SCHEDULE -- GROUP B

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APPENDIX A

SITE-SPECIFIC SAFETY PLAN

[Bold items enclosed in brackets denote changes from original text]

ecology and environment, inc.

SITE SAFETY PLAN

Version 988

A. GENERAL INFORMATION

Project Title: Site 11-North Chevalier Disposal Area Projmct No.: UH1102

TDD/Pan No.:

Project Manager: John Barksdale Projmct Dir.: Rick Rudy

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

Prepared by: Kim Walker Datm Prepared: 4-75-89

Approval by: Mary Miller MM Date Approved: 5-5-89

Site Safety Officer Review: Datm Reviewed:

Scope/Objective of Work: Field Screening will includm physical survmys, soil sampling, temporary well installation and groundwater sampling.

Proposed Date of Field Activities August 1989

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

Documentation/Summary:

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

*Requires completion of additional torr 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 11 vas a low, swampy, partly submerged area where industrial wastes were disposed of and burned from tho late 1930's to tho mid-1940s. It was reported that approximately 24 cubic yards per day of refuse including wastes from aircraft engine overhauls, vasto oils, lumber, and other burnables, 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 metal, volatile organic, and petroleum product contamination.

Locations of Chemicals/Wastes: Liquid, sludge and solid waste are buried on-sit..

Estimated Volume of Chemicals/Wastes: unknown

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

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) Decontamination Procedures - Using solvents.

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
Isopropyl Alcohol	400 ppm	" "	drowsiness,head.	7.5-200 ppm	rubbing alcohol
Nitric Acid	2 ppm	" •	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-dichloroethane	50 ppm	Inh,Ing,Con,Eye	head,naus,vomit	6 ppm	sweetish
benzene	10 ppm	Inh ,Ing,Con,Abs	head,euphoria,vomi	4.66 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 ppm	tnh, Ing, Con	hoad, vomit, burns	140 ppm	aromatic
1,1-dichloroethane	100 ppm	Inh, Ing, Con	CNS depress,drowsy	0.065 ppm	chloroform odor
load	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

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

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D. SITE SAFETY WORK PLAN

Site Control: Attach map, use back of this page, or sketch of site 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	

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) >5 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) >500 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
VOC's	Area	OVA	Continuous
Radiation	Area	Mini-Rad	Continuous
Explosive Gases	Area	O_2/Explosimeter	Continuous

Decontamination Solutions and Procedures for Equipment, Sampling Gear, etc.:
Trisodium phosphate wash, tap water rinse, isopropanol rinse, distilled water rinse, isopropanol rinse, and final distilled water rinse.

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

Decon Solution Monitoring Procedures, if Applicable: Decontamination will be performed in a — 11-ventilated area upwind of the sampling zone.

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

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

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

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

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

General Spill Control, if applicable: N/A

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

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

Sample Handling Procedures Including Protective Wear:

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

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

*All entries into exclusion zone require Buddy System use. All E & E field staff participate in medical monitoring program and have completed applicable training per 29 CFR 1910.120. Respiratory protection program wets 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 Plight)

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 NAS Pensacola Enviromental Coordinator, W. Dewayne Ray — 904-452-4515

SITE RESOURCES

Site Emergency Evacuation Alarm Method N/A

Water Supply Source On-sit.

Telephone Location, Number To bo dotorminod on-sit.

Cellular Phone, it available N/A

Radio

Other On-sit. warehouse number to bo dotorminod

EMERGENCY CONTACTS

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

2. Ecology and Environment, Lnc., Safety Director
   Paul Jonmaire ..... (716) 664-8060 (office)
   (716) 655-1260 (home)

3. Regional Office Contact .....M.Miller.... 656-2854 (home)
   877-1978 (office)

4. Office Manager..... ..... R.Rudy..... 893-7245 (home)

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.
- Nan of person injured or exposed.
- Nature of emergency.
- Action taken.

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

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

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

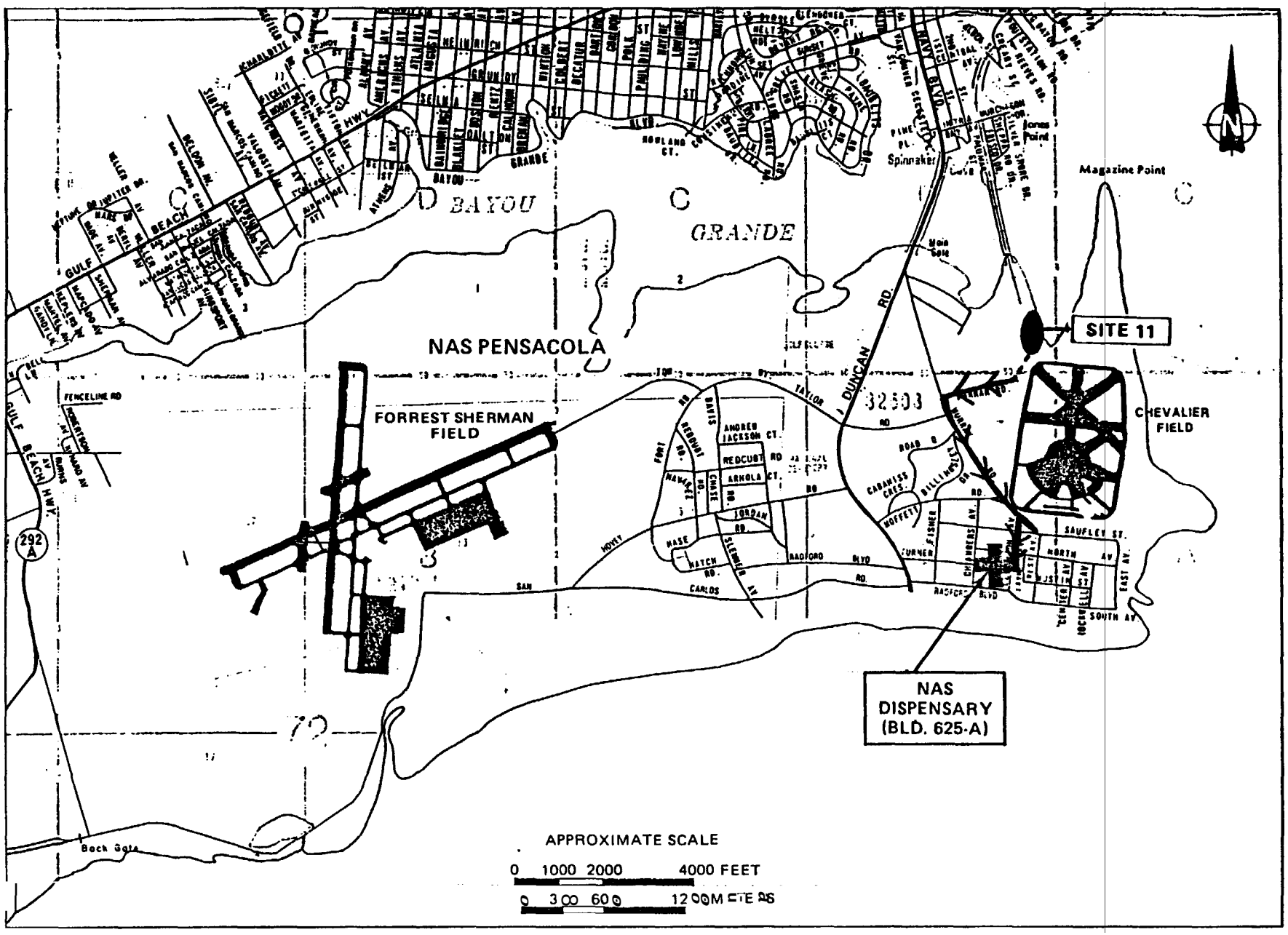
(NOTE: Field Nu mu+ Know -t(.) Prior to Start of war*)

Directions to hospital (include u p)

NAS Dispensary - Proceed to Murray Road (See attached map). Follow Murray Road South to Ellyson Avenue. Tu right onto Ellyson Avenue and continuo to it's intersection with Turner Street. Tho NAS Dispensary is located on tho northwest corner of tho intersection of Ellyson Avenue and Turner Street, in Building 625-A.

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 Blrd. 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 8 block8 and turn loft (north) onto E street. The hospital is about 6 blocks north on tho loft.

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


NAS PENSACOLA
FORREST SHERMAN FIELD
CHEVALIER FIELD
SITE 11
NAS DISPENSARY (BLD. 625-A)
BAYOU GRANDE
Magazine Point
Spinnaker
Jones Point
GULF BEACH HWY.
FENCELINE RD
DUNCAN RD.
TAYLOR
HOYT
SAN CARLOS
BADFORD BLVD
NAVY BLVD
32503
APPROXIMATE SCALE
0 1000 2000 4000 FEET
0 300 600 1200M SITE 25

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.
* Rake 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.

ECOLOGY AND ENVIRONMENT, INC.,

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

Field operations during the summer months can create a variety of hazards to the employee. Heat cramps, heat exhaustion, and heat stroke can be experienced and, if not remedied, can threaten life or health. Therefore, it is important that all employees be able to recognize symptoms of these conditions and be capable of arresting the problem as quickly as possible.

THE EFFECTS OF HEAT

As the result of normal oxidation processes within the body, a predictable amount of heat is generated. If the heat is liberated as it is formed, there is no change in body temperature. If the heat is liberated more rapidly, the body cools to a point at which 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. When such a condition exists, it produces a vicious 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.

Heat produced within the body is brought to the surface largely by the bloodstream and escapes to the cooler surroundings by conduction and radiation. If air movement or a breeze strikes the body, additional heat is lost by convaction. However, 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 or sweat front the skin surface. As the air becomes more humid (contains more moisture), vaporization from the skin slows down. Thus, on a day when the temperature is 95 to 100°F, with high humidity and little or no breeze, conditions are ideal for the retention of heat within the body. It is on such a day or, more commonly, a succession of such days (a heat wave) that medical emergencies due to heat are likely to occur. Such emergencies are classified in three categories: heat cramps, heat exhaustion, and heat stroke.

HEAT CRAMPS

Heat cramps usually affect people who work in hot environments and perspire a great deal. Loss of salt from the body causes very painful cramps of the leg and abdominal muscles. Heat cramps also may result from drinking iced water or other drinks either too quickly or in too large a quantity.

<u>Heat Cramp Symptoms</u>. The symptoms of heat cramp are:

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

Heat Cramp Emergency Care. Remove the patient to a cool place. Give him sips of liquids such as "Catorade" or its equivalent. Apply rim-ual pressure to the cramped muscle. Remove the patient to a hospital if there is any indication of a more serious problem.

HEAT EXHAUSTION

Heat exhaustion occurs in individuals working in hot anvironmcnts. and may be associated with heat cramps. Heat exhaustion is caused by the pooling of blood in the vessels of the skin. The heat is transported from the interior of the body to the surface by the 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. loner extremities when an individual is in an upright position. may lead to an inadequate return of blood to the heart and eventually to physical collapse.

Heat E Symptoms. The symptoms of heat tion are:

- Weak pulse;
- Rapid and usually shallow breathing;
- Generalized weakness;
- Pale, clammy skin;
- Profuse pertpiration;
- Dizziness;
- Unconsciousness; and
- Appearance of having fainted (the patient responds to the same treatment administered in cases of fainting).

Heat Exhaustion Emergency Care, Remove the patient to a cool place and remove as much clothing as possible. Administer cool water, "Catorade," or its equivalent. If possible, fan the patient continually to remove heat by convection, but do not allow chilling or over-cooling. Treat the patient for shock, and remove him to a medical facility if there is any indication of a more serious problem.

HEAT STROKE

Heat stroke is a profound disturbance of the heat-regulating mechanism, associated with 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% mortality rate. Alcoholics are extremely susceptible.

Heat Stroke Symptoms. The symptoms of heat stroke are:

- Sudden onset:
- Dry, hot, and flushed skin;
- Dilated pupils;
- Early loss of consciousness:
- Full and fast pulse;
- Breathing deep at first, later shallow and even almost absent;
- Muscle twitching, growing into convulsions; and
- Body temperature reaching 105 to 106°F or higher.

Heat Stroke Emergency Care. Remember that this Is a true emergency. Transportation to a medical facility should not be delayed. Remove the patient to a cool environment If possible, and remove as inuch clothing as possible. Assure an open airway, Reduce body temperature promptly--preferably by wrapping in a wet sheet or else by dousing the body with water. If cold packs are available, place them under the arms, around the 'neck, at the ankles, or at any place where blood vessels that lie close to the skin can be cooled. Protect the patient from Injury during convulsions. especially from tongue biting.

AVOIDANCE OF WEAT-RELATED EMERGENCIES

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 system. Without these electrolytes, body systems cannot function properly, thereby increasing the represented health hazard. Therefore, when personnel are working In situations where the ambient temperatures and humidity are hlgh--and especially in situations where protection Levels A B, and C art required--the site safety officer must:

- Assure that all employees drink plenty of fluids ("Gatorade" or its equivalent);
- Assure that frequent breaks are scheduled so overheating does not occur; and
- Revise work 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).

If protective clothing must be worn, especially Levels A and 8, the suggested guidelines for ambient temperature and maximum wearing time per excursion are:

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

One method of measuring the effectiveness of employees' rest-recovery regime is by monitoring the heart rate. The "Brouha guideline" is one such method:

- During a three-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 h at 110 beats/minute or less and the deceleration between the first, second, and third minuter is at kart 10 beats/minute, the work-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.

Mallinckrodt
Material Safety Data

Emernencv Phone Number: **311-982-5000**

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

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

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

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

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

SECTION 3 Reactivity Data

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

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

Hazardous Polymerization:
Will not occur.

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

SECTION 4 Leak/Spill Disposal Information

Remove all **sources** *of* ignition. Ventilate area **of** leak **or** spill. Clean-up personnel require protective clothing and respiratory protection **from** vapors. Small spills may **be** absorbed **on** paper towels and evaporated in a fume hood. Allow enough time 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 **an** be collected **as** hazardous waste and atomized in a suitable **RCRA** approved combustion chamber, **or** absorbed with vermiculite, dry sand, earth or similar material for disposal as hazardous waste in a **RCRA** approved facility.

Ensure compliance with local, state and federal regulations.

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

SECTION 5 Health Hazard Information

A. EXPOSURE / HEALTH EFFECTS

Inhalation:
May cause irritation of the nose and throat. Exposure to high concentrations has a narcotic effect, producing symptoms of drowsiness, headache, staggering, unconsciousness and possibly death.

Ingestion:
May cause drowsiness, unconsciousness, and death. Gastrointestinal pain, cramps, nausea, vomiting, and diarrhea may also result. The single lethal dose for a human adult = about 250 mls (SAX Sixth edition).

Skin Contact:
Has a defatting action of the skin that can cause irritation. May cause irritation with a stinging effect and burning sensation.

Eye Contact:
Vapors may irritate the eyes. Splashes may cause severe irritation, possible corneal burn and eye damage.

Chronic Exposure:
Prolonged contact with skin may cause mild irritation, drying, cracking, or contact dermatitis may develop.

Aggravation 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:
Give water to drink Induce vomiting if medical help not is immediately available. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Skin Exposure:
Remove any contaminated clothing. Wash skin with soap or mild detergent and water for at least 15 minutes. Get medical attention if irritation develops or persists.

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: 5840 mg/kg. Skin rabbit LD50: 13 **gm/kg. Inhalation rat LC50: 16000 ppm/8H.** Mutation references cited Aquatic Toxicity rating TLm96: 1000-10 ppm.

SECTION 6 Occupational Control Measures

Airborne Exposure Limits:
-OSHA Permissible Exposure Limit (PEL):
400 ppm (TWA).
-ACGIH Threshold Limit Value (TLV):
400 ppm (TWA); 500 ppm (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 a full facepiece chemical cartridge respirator may be worn, in general, up to the maximum use concentration specified by the respirator supplier. 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

Protect against physical damage. Store in a cool, dry well-ventilated location, away from any area where the fire hazard may be acute. Outside or detached storage is preferred. Separate from oxidizing materials. Containers should be bonded and grounded for transfers to avoid static sparks. Storage and use areas should be NO Smoking areas. Use non-sparking type tools and equipment.

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Mallin (·odt
Material Safety Data

Emergency Phone Number: 314-982-5000

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

NITRIC ACID, 70%

PRODUCT IDENTIFICATION:

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

Formula CAS No: 7697-37-2

Molecular Weight: 63.00

Chemical Formula: HNO_3

Hazardous Ingredients: Not Applicable

PRECAUTIONARY MEASURES

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

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

EMERGENCY/FIRST AID

In case of contact, immediately flush skin or eyes with plenty of water for at least 15 minutes. If swallowed, DO NOT INDUCE VOMITING! Give large quantities of water or milk if available. Sever give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In all cases call a physician.
SEE SECTION 5.

DOT Hazard Class: Oxidizer

SECTION 1 Physical Data

Appearance: Clear, colorless to slightly yellow liquid.

Odor: Suffocating acrid.

Solubility: Infinite in water.

Boiling Point: 122°C (252°F)

Melting Point: -34°C (-29°F)

Specific Gravity: 141

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

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

Evaporation Rate: No information found.

SECTION 2 Fire nod Explosion Information

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

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

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

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

SECTION 3 Reactivity Data

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

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

Hazardous Polymerization:
Will not occur.

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

SECTION 4 Leak/Spill Disposal Information

Isolate or enclose the area of the leak or spill. Clean-up personnel should wear protective clothing and respiratory equipment suitable for toric 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 a d lot sizes: Neutralize with alkaline material, pick up with absorbent material (and, 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.

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 bums. Concentrated solutions cause deep ulcers and stain skin a yellow or yellow-brown color.

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

Chronic Exposure:
Long-term exposure to concentrated vapors may a w e 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 minuter while removing contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes beforr reuse. Get medical attention immediately.

Eye Exposure:
Wash eyes with plenty of water for at least 15 minuter. 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)

Ventiletion 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 quickdrench 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**

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

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.

PRE RY 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.

EN F ATD

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

DOT Hazard Class: ***Corrosive* Material**

SECTION 1 Physical Data

Appearance: **Colorless,** oily liquid.

Odor: Odorless.

Solubility: Infinite @ 20°C.

Boiling Point: ca. 310°C **(590°F)**

Melting Point: **ca.** -14°C (6°F).

Specific Gravity: **1.84**

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

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

Evaporation Rate: **No information found.**

SECTION 2 Fire and Explosion Information

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

Explosion:
Not combustible, but substance **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. Rinse 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.

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

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

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

B. FIRST AID

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

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

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

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

C. TOXICITY DATA (RTECS, 1982)

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

SECTION 6 Occupational Control Measures

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

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

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

SECTION 7 Storage and Special Information

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

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HAZARD EVALUATION OF CHEMICALS

Chemical Name: Ethylbenzene

Date:

CAS Number: 100-41-4

REFERENCES CONSULTED: NIOSH/OSHA Pocket Guide

CHMICAL PROPERTIES: (Synonyms: Phenylethane, ethylbenzol)

Chemical Formula: $C_2H_5C_6H_5$

Molecular Weight: 106

Physical Stater Liquid

Solubility (H_2O): 0.015%

Boiling Point: 277°F

Flash Point: 59°F

Vapor Pressure/Density: 7.1 mm/3.7

Freezing Point: -139°F

Specific Gravity: 0.067

Odor/Odor Threshold: 140 ppm

Flammable Limits: 6.75, 1.0%

Incompatabilities: Strong oxidizers, ozone, oxygen, chlorine trifluoride

BIOLOGICAL PROPERTIES:

TLV-TWA: 100 ppm

Odor Characteristics: Aromatic

Route of Exposure: Inhalation, direct cantact, ingestion

PEL: 100 ppm

IDLH: 2000 ppm

Rat/Mouse: LD_{50} (oral) 3500 mg/kg

Human: TC_{LO} 100 ppm/8 hr

HANDLING RECOMMENDATIONS: (Personal protective measures)

Wear impervious clothing, glovea, and boots; eye protection (face shields); respirators with cartridges worn at 100 ppm; SCBAs required at 2000 ppm

HEALTH HAZARDS AND FIRST AID:

If inhaled, move to fresh air: give artificial respiration if breathing stopped; if skin contact, wash with soap (mild detergent) and water; in eyes, wash immediately with large amounts of water; if ingested, no vomiting, remove by gastric levage

SYMPTOMS:

Acute: Nose and throat irritation, dizziness, difficulty breathing, depression, vomiting, unconsciousness, skin irritation, burns, eye irritation, headache, sleepiness, coma

Chronic: Skin rash, eye irritation, nose end throat irritation, reproductive effects in experimental animals

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Chemical Fact Sheet*

Version 2

MERCURY (metallic)

the information in this sheet applies to workplace exposure resulting from processing, manufacturing, storing or handling and is not designed for the population at large. Any generalization beyond occupational exposures should not be made. The best industrial hygiene practice is to maintain concentrations of all chemicals at levels as low as is practical.

Chemical Name: Hydrargyrum; CAS 7439-97-6.

Trade Names: Quicksilver, liquid silver and others.

Uses: Used in the manufacture of scientific instruments, in electrical equipment, synthetic silk, solder, electrolytic processes, metal plating, tanning, dyeing, textiles. photography, photoengraving, paints and pigments-

PHYSICAL INFORMATION

Appearance: A silvery-white, heavy liquid.

Odor: Odorless.

Behavior in Water: Does not mix. Will sink.

Evaporation: Slow. but even at room temperature, may evaporate to cause symptoms as listed under inhalation.

HEALTH HAZARD INFORMATION

OSHA Standard: 01 mg/m^3.

NIOSH Recommended Limit: Average 8 hour exposure -- 0.05 mg/m^3.

ACGIH Recommended Limit: Average 8 hour exposure -- 0.05 mg/m^3.

Short Term Exposure:

Inhalation: Exposure to levels below 1 mg/m^3 has been shown to produce nonspecific symptoms such as shyness, insomnia, anxiety and loss of appetite. At higher levels (1-3 mg/m^3 for 2-5 hours) may cause headache, salivation, metallic taste, chills, cough, fever, tremors, abdominal cramps, diarrhea, nausea, vomiting, tightness in the chest, difficult breathing, fatigue, irritation and possible lung tissue damage. Symptoms may begin several hours after exposure and may last a week. Large doses may result in flu-like symptoms, which, in severe cases, may result in death due to pneumonia.

Skin: Can be absorbed through the skin. May cause irritation. Prolonged contact vich skin can result in symptoms listed above.

Eyes: Can cause eye irritation.

Ingestion: Generally does not produce ill effects.

Long Term Exposure:

Mercury accumulates in the brain quickly during exposure but is released from the brain very slowly. This will result in a buildup in brain tissue over a long time. The liver and kidneys may also be damaged by mercury accumulation.

It may cause headache, dizziness. restlessness, irritability, sleepness, tremors, defective muscle control, increased salivation. loose teeth, irriraticn of the gums with a blue line between teeth and gums, loss of appetite, nausea, vomiting. diarrhea, liver damage, changes in urine, raised red areas and blisters of skin, impaired memory and possible permanent brain damage.

Frequency of complaints and severity of symptoms increase vith levels of exposure, most notably above 0.1 mg/m^3. However, many of these symptoms have ken reported at levels below recommended limits due to the accumulation of mercury over long term exposure.

*Prepared by the Bureau of Toric Substance Assessment, New York State Department of Health. For ar explanation of the terms and abbreviations used, see Toxic Substances: How Toxic is Toxic. available from the New York State Department of Health.

EMERGENCY AND FIRST AID INSTRUCTIONS

Inhalation: Get to fresh air. Give artificial respiration if breathing has stopped. Give oxyger if breathing is difficult. Keep warm and at rest. Get medical attention immediately.

Skin: Remove any liquid soaked clothing. Wash affected area with soap and water. Get medical attention if necessary.

Eyes: Immediately wash eyes with large amounts of water. Get medical attention immediately. Contact lenses should not be worn when working with this material.

Ingestion: Seek medical attention.

to Physician: Gastric lavage with 58 solution of sodium formaldehyde sulfoxalate or 2-51 solution of sodium bicarbonate, Administer BAL (dimercaprol) intramuscularly as a 10% solutio in oil. Urine mercury determination may be useful as an index of absorption.

FIRE AND EXPLOSION INFORMATION

General: Not flammable.

REACTIVITY

Materials to Avoid: Reacts with nitrates, chlorates, hot sulfuric acid, ammonia gas, acetylenes, alkalies and dry bromine.

Conditions to Avoid: Heat will speed up the rate of evaporation, increasing risk due to inhalation.

PROTECTIVE MEASURES

Storage and Handling: Store in well-ventilated area, in small amounts, in closed polyethylene bottles.

Engineering Controls: Provide adequate ventilation in both storage tanks and work areas and enclose operations where possible. Eyewash stations, showers and sinks should be available. Provide separate storage for work and street clothes. Flooring should not be able to absorb mercury or have cracks and spaces.

Protective Clothing (Should not be substituted for proper handling and engineering controls): Wea full body vcrk clothes with a minimum of seams, no pleats or cuffs, made from a material that will not readily absorb mercury. Also wear protective shoes, or shoe covers, rubber gloves an goggles if there is any danger of splashing. Clothing, shots, gloves and goggles should be changed or washed daily. Laundering should be provided by the employer.

Protective Equipment: For levels up to 0.5 mg/m^3 use a supplied-air respirator, a self-contained breathing apparatus or a chemical cartridge respirator with cartridges providin protection against mercury vapors. For levels up to 1.25 mg/m^3 use a supplied-air respirator operated in continuous-flow mode or a powered air-purifying respirator providing protection against mercury vapors. For levels up to 2.5 mg/m^3 use any of the above vith a Cull facepiece or a gas mask vith a canister providing protection against mercury vapors. For levels up to 28 mg/m^3 use a Type C supplied-air respirator operated in a positive pressure mode. For levels above 28 mg/m^{3}m or at unknown concentrations use a self-contained breathing apparatus vith a full facepiece operated in a positive pressure mode or a combination Type C supplied-air respirator vith an auxiliary self-contained breathing apparatus, both with a full facepiece and operated in a positive pressure mode. For escape from a contaminated area use a ?as mask with a canister providing protection against mercury vapors or an escape self-contained breathing apparatus. par firefighting use a gas mask providing protection against mercury vapors or an escape self-contained breathing apparatus.

PROCEDURES FOR SPILLS AND LEAKS

Get a11 workers out of spill area. Wearing protective equipment and clothing, clean up the spill with an industrial vacuum cleaner vith a charcoal filter to absorb mercury vapor. For mercury spilled in cracks cover with zinc dust to form an amalgam, or cover wth calcium polysulfide with excess sulfur. Do not sweep or use compressed air to blow mercury droplets as it can increase air cncentrations. Store contaminated or waste mercury in tightly covered or vapor-proof containers Fending removal. For final disposal contact your regional office of the New York State Department of Environmental Consacvation.

For more information:
Contact the Industrial Hygienist or Safety Officer at your worksite or the New York State Department of Health, Bureau of Toxic Substance Assessment, 2 University Place, Albany, New York 12203.

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Chemical Fact Sheet* Version 3

LEAD (Metallic and Inorganic Compounds)

The information in this sheet applies to workplace exposure resulting from processing, manufacturing, storing or handling and is not designed for the population at large. Any generalization beyond occupational exposures should not be made. The best industrial hygiene practice is to maintain concentrations of all chemicals at levels as low as is practical.

Chemical Names: Lead, CAS 7439-92-1; lead carbonate, CAS 598-63-0; lead chloride, CAS 7758-95-4; lead monoxide, CAS 1317-36-8; lead sulfide, CAS 1314-87-0; and others.

Trade Names: C.I. Pigment Metal 4, C.I. 77575, Lead flake, Whole lead, Litharge and others.

Uses: tank linings, piping and other chemical reaction equipment; petroleum refining; manufacture of gasoline additives; pigments for paint; storage batteries, solder and fusible alloys; radiation shielding and others.

PHYSICAL INFORMATION

Appearance: Bluish white to silvery grey solid (lead metal).

Odor: None.

Behavior in Water: Insoluble.

HEALTH HAZARD INFORMATION

OSHA Standard: Average 8 hour exposure — 0.05 mg/m^3 (lead).

NIOSH Recommended Limit: Average 10 hour day or 40 hour week exposure — 0.1 mg/m^3 (lead).

ACGIH Recommended Limit: Average 8 hour exposure -- 0.15 mg/m^3 (lead).

NOTE: Blood-lead level is a good indicator of total lead exposure. Current OSHA regulations require that if an individual has a blood-load level greater than or equal to .050 mg lead per 100 ml. blood, he or she must be removed from all exposures to lead and cannot return to the exposure environment until the blood level falls to .040 mg lead per 100 ml. blood or less.

Short Term Exposure:

Note: Lead is a cumulative poison. Increasing amounts can build up in the body eventually reaching a point where symptoms and disability occur. Lead dust carried home on contaminated clothing can result in exposure and symptoms in other family members. Standards only protect for inhalation exposure, extra precautions should be taken if skin exposure also occurs.

Inhalation: The effects of exposure to fumes and dusts of inorganic lead may not develop quickly. Symptoms may include decreased physical fitness, fatigue, sleep disturbance, headache, aching bones, and muscles, constipation, abdominal pains and decreased appetite. These effects are reported to be reversible if exposure ceases. Inhalation of large amounts of lead may lead to seizures, coma and death.

Skin: May cause irritation.

Eyes: May cause irritation.

Ingestion: See effects listed for inhalation. Ingestion of large amounts of lead may lead to seizures, coma and death.

Long Term Exposure:

Lead can accumulate in the body over a period of time. Therefore, long term exposures to lower levels can result in a build up of lead in the body and more severe symptoms. These may include anemia, pale skin, a blue line at the gum margin, decreased hand-grip strength, abdominal pain, severe constipation, nausea, vomiting, and paralysis of the wrist joint. Prolonged exposure may also result in kidney damage. If the nervous system is affected, usually due to very high exposures, the resulting effects include severe headache, convulsions, coma, delirium and death. In non-fatal cases, recovery is slow and not always complete. Alcohol ingestion and physical exertion may bring on symptoms. Continuous exposure a n result in decreased fertility. Elevated lead exposure of either parent before pregnancy a n increase the chances of miscarriage or birth defects. Exposure of the mother during pregnancy a n cause birth defects.

*Prepared by the Bureau of Toxic Substance Assessment, New York State Department of Health. For an explanation of the terms and abbreviations used, see "Toxic Substances: How Toxic is Toxic" available from the New York State Department of Health.

EMERGENCY AND FIRST AID INSTRUCTIONS

Inhalation: Move person to fresh air. Give artificial respitaton as needed. Get medical attention immediately.

Skin: Wash area vith plenty of soap and water. Remove any contaminated clothing.

Eyes: Rinse eyes vith plenty of water for 15 minutes. Seek medical attention, if necessary.

Ingestion: If person is conscious, give water. Seek medical attention.

Note to Physician: Whole blood lead levels, circulating plasma/erythrocyte lead ,concentration ratio. urine ALA. and erythrocyte protoporphyrin fluorescent microscopy nay all be useful in monitoring or assessing lead exposure. Chelating agents such as edetate disodium calcium and penicillamine are generally useful in the therapy of acute lead intoxification.

FIRE AND EXPLOSION INFORMATION

General: lot combustible. If exposed to fire, may release toxic fumes or sulfur and lead oxides.

Extinguisher: Use extinguisher appropriate to burninq material. When fighting fire, wear a self-contained breathing apparatus with a full facepiece and operated in positive pressure mode.

REACTIVITY

Materials to Avoid: Reacts violently with potassium.

to Avoid: Excessive heat.

PROTECTIVE MEASURES

Storage and Handling: Store in an area away from heat and keep separate from potassium.

Controls: Adequate ventilation. sinks, showers and eyewash stations should be prwvided.

Protective Clothing (Should not be substituted for proper handling and engineering controls)
Full body work clothing should be worn including bump caps or hard hats, rubber gloves, and eye protection. Employees should routinely wash their skin thoroughly and change clothing at the end of each work shift.

Protective Equipment: For levels up to 0.5 mg/m³ use a supplied-air respirator, a self-contained breathing apparatus or an air-purifying respirator with high-efficiency particulate filter. For levels up to 1.25 mg/m³ use a supplied-air respirator operated in continuous flow mode or a powered arr-purifying respirator with high efficiency particulate filters. For levels up to 2.5 mg/m³ use any of the above with a full facepiece. For levels up to 50 mg/m³ use a Type C supplied-air respirator operated in a positive pressure mode. For levels up to 100 mg/m³ use a Type C supplied-air respiratoc vith a full facepiece operated in a positive pressure made. par levels greater r 100 mg/m³ or in use a self-contained becathinq apparatus with full facepiece operated in a positive-pressure mode or a combination Type C supplied-air respirator with an auxiliary self-contained breathing apparatus, both vith a full facepiece and operated in a positive pressure node. par escape from a contaminated area use a respiratoc with high-efficiency particulate filters or an escape self-contained breathing apparatus.

Miscellaneous: No eating, drinking, or smoking in areas where the dusts or fumes of lead or its compounds are present.

PROCEDURES FOR SPILLS AND LEAKS

Get all workers out of spill area. Put on necessary protective equipment including respirators. If spill is a solution cover with absorbent and shovel into suitable container. If spill is in powder form, vacuum whenever possible to avoid raising dust by sweeping or blowing, place in suitable container. For final disposal contact your regional office of the New York State Department of Environmental Conservation.

Foe more information:
Contact the Industrial Hygienist or Safety Officer at your worksite or the New York State Department of Health, Bureau of Toxic Substance Assessment, 2 University Place, Albany, New York 12203.

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Chemical Pact Sheet* Version 2

VINYL CHLORIDE

The info —— tion in this sheet applies to workplace exposure resulting from processing, manufacturing, storing or handling and is not designed for the population at large. Any generalization beyond occupational exposures should not be made, The best industrial hygiene practice is to maintain concentrations of all chemicals at levels as low as is practical.

Chemical Names: Chloroethylene, chloroethene, ethylene monochloride, monochloroethene, monochloroethylene; CAS 75-01-4.

Trade Names: VC, VCM, Troviduer, and others.

Uses: In the manufacture of plastics, as a refrigerant, and in organic synthesis.

PHYSICAL INFORMATION

Appearance: Colorless gas: ray be liquified by refrigeration or pressurization.

Odor: Faint, sweet, ether-like, **Minimum Detectable bv Odor:** 4000 ppm.

Behavior in Water: Slightly soluble, **Evaporation:** Rapid.

HEALTH HAZARD INFORMATION

OSHA Standard: Average 8 hour exposure -- 1 ppm.

NIOSH Recommended Limit: Lowest reliably detectable level.

ACGIH Recommended Limit: Average 8 hour exposure -- 5 ppm.

Short Term Exposure:

Inhalation: Exposure at 8,000 ppm for 5 minutes can cause a feeling of intoxication, tiredness, drowsiness, abdominal pain, numbness and tingling in fingers and toes, pains in joints, coughing, sneering, irritability and loss or' appetite and weight.

Skin: Contact with liquid nay cause frostbite: contact with vapor may cause irritation and rash. Absorption is possible through the skin.

Eyes: Can cause severe and immediate irritation,

Ingestion: None found.

Long Term Exposure:

May cause club-like swelling and shortening of finqer tips. Skin may become thickened and stiff with coarse, whitish patches, Bones and joints of arms and legs may suffer damage, Liver and spleen damage may occur. Not all symptoms disappear after exposure stops,

Vinyl chloride has caused liver cancer in occupationally exposed individuals.

*Prepared by the Bureau of Toxic Substance Assessment, New York State Department of Health. For an explanation of the terms and abbreviations used, sea "Toxic Substances: How Toxic is Toxic' available from the New Yotk State Department of Health.

AND FIRST AID INSTRUCTIONS

Inhalation: Move person to fresh air. Give artificial respiration or oxygen as required. Seek medical attention.

Skin: Remove soaked clothing. Wash affected area with soap and water for at least 5 minutes. Seek medical attention if necessary.

Eyes: wash with running water for at least 15 minutes, Seek medical attention,

Ingestion: Seek immediate medical attention.

FIRE AND EXPLOSION INFORMATION

General: Flammable. Fumes may travel long distances and flash back- Ignites at -108°F (-78°C).

Explosive Limits: upper -- 33%, Lower -- 3%.

Extinguisher: Stop flw of gas, Use water to keep fire exposed containers cool.

REACTIVITY

to Avoid: High temperatures may causa breakdown to phosgene and hydrochloric acid. Avoid sources of ignition,

Materials to Avoid: Lonq contact with air may result in formation of unstable peroxides which are explosive, Corrosive to iron at high temperatures in the presence of water.

PROTECTIVE MEASURES

Storage and Handling: Protect against physical damage. Outside or detached storage preferred, Indoors, store in a cool, dry, well-ventilated area away from sources of ignition.

Engineering Controls: Provide ventilation or process enclosures. Sinks, shovers and eyewash stations should be readily available.

Protective Clothing (Should not be substituted for proper handling and engineering controls): Goggles, gloves and impervious clothing should be worn if contact with vinyl chloride is possible.

Protective Equipment: For any detectable levels use a self-contained breathing apparatus with a full facepiece operated in a positive pressure mode or a supplied-air resirator with an auxiliary self-contained breathing apparatus, both with a full facepiece and operated in a positive pressure mode. For escape from a contaminated area use a gas mask providing protection against vinyl chloride or an escape self-contained breathinq apparatus,

PROCEDURES FOR SPILLS AND LEAKS

Get all workers out of the spill area. Put on respirator and other protective clothinq. Establish ventilation to keep levels below explosive limit. Remove possible sources of ignition. Move leaking cylinders to safe place in open air. For final disposal contact your regional office of the New York State Department of Environmental Conservation.

For more information:

Contact the Industrial Ryqienist or Safety Officer at your uorksite or the New York State Department of Health, Bureau of Toxic Substance Assessment, 2 University Place, Albany, New York 12203.

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Chemical Pact Sheet*

Version 2

TOLUENE

The information in this sheet applies to workplace exposure resulting from processing, manufacturing, rtotinq or handling and is not designed for the population at large, Any generalization beyond occupational exposures should not be made. The best industrial hygiene practice is to maintain concentrations of all chemicals at levels as low as is practical,

Chemical Names: Methylbenzene, methylbenzol, phenylmethane, toluol; CAS 108-88-3.

Trade Names: Methacide, Antisal I and others.

Uses: Used in the manufacture of benzoic acid, benzaldehyde, explosives, dyes and adhesives.

PHYSICAL INFORMATION

Appearance: Clear, colorless liquid.

Odor: Strong, pleasant, **Minimum Detectable by Odor:** 40 ppm.

Behavior in Water: Only a very small amount will mix, the rest will float.

Evaporation: Liquid evaporates very slowly.

HEALTH HAZARD INFORMATION

OSHA Standard: Average 8 hour exposure limit -- 200 ppm.

NIOSH Recommended Limit: Average 8 hour exposure -- 100 ppm.

ACGIH Recommended Limit: Average 8 hour exposure -- 100 ppm.

Short Term Exposure:

Inhalation: 100 ppm exposure can cause dizziness, drowsiness and hallucinations. 100-200 ppm can cause depression. 200-500 ppm can cause headaches, nausea, loss of appetite, loss of energy, loss of coordination and coma. In addition to the above, death has resulted from exposure to 10,000 ppm for an unknown time.

Skin: Can cause dryness and irritation. Absorption may cause or increase the severity of symptoms listed above.

Eyes: Can cause irritation at 300 ppm.

Ingestion: Can cause a burning sensation in the mouth and stomach, upper abdominal pain, cough, hoarseness, headache, nausea, loss of appetite, loss of energy, loss of coordination and coma.

Long Term Exposure:

Levels below 200 ppm may produce headache, tiredness and nausea. Pra 200 to 750 ppm symptoms may include insomnia, irritability, dizziness, some loss of memory, loss of appetite, a feeling of drunkeness and disturbed menstruation. Levels up to 1,500 ppm may cause heart palpitations and loss of coordination. Blood effects and anemia have been reported but are probably due to contamination by benzene. Most of these effects are believed to go away when exposure stops.

Prepared by the Bureau of Toxic Substance Assessment, New York State Department of Health. For an explanation of the terms and abbreviations used, see "Toxic Substances: How Toxic is Toric" available from the New York State Department of Health.

EMERGENCY AND FIRST AID INSTRUCTIONS

Inhalation: Get person to fresh air Keep warm and quiet. Give artificial respiration, if necessary. Seek medical attention, if necessary.

Skin: Take off clothing soaked with liquid. Wash contaminated area with soap and water for at least 5 minutes. Seek medical attention, if necessary.

Eyes: Wash with large amounts of water for at least 15 minutes. Seek immediate medical attention.

Ingestion: Do not induce vomiting. Give one or two ounces of mineral oil. Seek immediate medical attention. Note: Never force an unconscious person to drink.

Note to Physician: Exposure to toluene at levels greater then 200 ppm may result in hippuric acid levels above 5 gm/liter urine. After elevated exposure, toluene may also be detected in blood.

EXPLOSION INFORMATION

General: Flammable liquid. Fumes may spread a considerable distance and flash back. Will ignite at 4.4°C, 40°F.

Explosive Limits: Upper Limit -- 7.01, Lower Limit -- 1.27%.

Extinguisher: Water spray, carbon dioxide, dry chemical or foam.

REACTIVITY

Materials to Avoid: Reacts violently with chlorine, permanganate and dichromate.

Conditions to Avoid: Sourcas of ignition.

PROTECTIVE MEASURES

Storage and Handling: Store outdoors or in a detached building, if possible. If indoors, store in a standard flammable liquid storaqe room or cabinet. Protect containers from physical damage.

Engineering Controls: Use in well-ventilated area. Eyewash stations, sinks and showers should be readily available.

Protective Clothing (Should not be substituted for proper handling and engineering controls): If direct contact is likely, vear viton, PVA, NBR or polyethylene clothing.

Protective Equipment: For levels up to 1000 ppm use a chemical cartridge respirator with organic vapor cartridges, a supplied-air respirator, a self-contained breathinq apparatus or a powered air-purifying respirator with organic vapor cartridges. For levels up to 2,000 ppm use a qas mask with an organic vapor canister, a supplied-air respirator with a full facepiece, a self-contained breathinq apparatus with a full facepiece or a supplied-air respirator operated in continuous flow mode. For levels above 2000 ppm or at unknown concentrations use a self-contained breathinq apparatus with a full facepiece operated in a positive pressure mode or a Type C supplied-air respirator with an auxiliary self-contained breathing apparatus, both with a full facepiece and operated in a positive pressure mode. For escape from a contaminated area use a gas mask with an organic vapor canister or an escape self-contained breathinq appnratua.

PROCEDURES FOR SPILLS OR LEAKS

Get all workers out of the spill area. Put on a respirator and other protective clothinq. Spread sand or other absorbent material over liquid to absorb it. Shovel into buckets, take to a safe place in the open air. Wash area of spill with soap and water. For final disposal contact your regional office of the N.Y.S. Department of Environmental Conservation.

For more information:

Contact the Industrial Hygienist or Safety Officer at your worksite or the Ncv York State Department of Health, Bureau of Toxic Substance Assessment, 2 University Place, Albany, New York 12203.

BENZENE

The information in this sheet applies to workplace exposure resulting from processing, manufacturing, storing or handling and is not designed for the population at large. Any generalization beyond occupational exposures should not be made. The best industrial hygiene practice is to maintain concentrations of all chemicals at levels as low as is practical.

Chemical Names: Benzol, phenyl hydride, cyclohexatriene; CAS 71-43-2.

Trade Names: Benzole, Benzolene, Carbon Oil, Carbon Naphtha, Mineral Naphtha, Motor Benzol, Nitration Benzene, Phene, Pyrobenzol and others.

Uses: In the manufacture of styrene, phenol, detergents, organic chemicals, pesticides, plastics and resins, synthetic rubber, aviation fuel, pharmaceuticals, dyes, explosives, gasoline, flavors and perfumes, paints and coatings. Used in the industrial processing of nylon, certain food products and photographic chemicals.

PHYSICAL INFORMATION

Appearance: Colorless liquid.

Odor: Strong, pleasant. **Minimum Detectable by Odor:** 5 ppm.

Behavior in Water: Slightly soluble, floats.

Evaporation: Rapid.

HEALTH HAZARD INFORMATION

OSHA Standard: Average 8 hour exposure limit — 10 ppm.

NIOSH Recommended Limit: 1 ppm.

ACGIH Recommended Limit: Average 8 hour exposure limit — 10 ppm.

Inhalation: Benzene may produce both nerve and blood effects. Irritation of the nose, throat and lungs may occur (3,000 ppm may be tolerated for only 30 to 60 minutes). Lung congestion may occur. Nerve effects may include an exaggerated feeling of well-being, excitement, headache, dizziness and slurred speech. At high levels, slowed breathing and death may result. Death has occurred at 20,000 ppm for 5 to 10 minutes, or 7,500 ppm for 30 minutes.

Skin: Irritation may occur, with redness and blistering if not promptly removed. Benzene is poorly absorbed. Whole body exposure for 30 minutes has been reported with no health effects.

Eyes: May cause severe irritation.

Ingestion: May cause irritation of mouth, throat and stomach. Symptoms are similar to those listed under inhalation. One tablespoon may cause collapse, bronchitis, pneumonia and death.

Long Term Exposure:

May cause loss of appetite, nausea, weight loss, fatigue, muscle weakness, headache, dizziness, nervousness and irritability. Mild anemia has been reported from exposures of 25 ppm for several years and 100 ppm for 3 months. At levels between 100 and 200 ppm for periods of 6 months, or more, severe irreversible blood changes and damage to liver and heart may occur. Temporary partial paralysis has been reported.

Benzene is a known human carcinogen. Exposure has been linked to increased risk of several forms of leukemia. Periodic blood tests of occupationally exposed individuals should be conducted.

*Prepared by the Bureau of Toxic Substance Assessment, New York State Department of Health. For an explanation of the terms and abbreviations used, see "Toxic Substances: How Toxic is Toxic" available from the New York State Department of Health.

EMERGENCY AND FIRST AID INSTRUCTIONS

Inhalation: Remove to fresh air. Give artificial respiration or oxygen if necessary. Seek medical attention.

Skin: Remove soiled clothing immediately. Wash thoroughly with soap and water for at least 5 minutes. Seek medical attention, if necessary.

Eyes: Irrigate yes vith water for at least 15 minutes. Seek medical attention.

Ingestion: Do not try to induce vomiting. Seek medical attention immediately.

Note to Physician: Severe exposure may require supportive measures for pulmonary edema.

FIRE AND EXPLOSION INFORMATION

General: Flammable, vapor may spread considerable distance to a source of ignition and flash back. Ignites at -11°C (12°F).

Explosive Limit: Upper — 7.1%, Lower — 1.3%.

Extinguisher: Carbon dioxide, dry chemical or foam.

REACTIVITY

Materials to Avoid: Contact vitb stronq oxidizers, or iron in the presence of chlorine or bromine.

Conditions to Avoid: Exposure to sources of ignition.

Storage and Handling: Protect containers against physical damage. Storage preferred in an outdoor or detached building. If storage is indoor, use a standard flammable liquid storage room.

Engineering Controls: Use only vith efficient ventilation.

Protective Clothing (Should not be substituted for proper handling and engineering controls): If direct contact is likely, wear protective rubber clothing, gloves and eye goggles.

Protective Equipment: For any detectable levels use a self-contained breathing apparatus vith a full facepiece and operated a positive pteraure mode or a combination Type C supplied-air respirator vith an auxiliary self-contained breathing apparatus, both with full facepiece and operated in a positive pressure mode. For escape from a contaminated area use a gas mask with organic vapor canister or an escape self-contained breathing apparatus.

PROCEDURES FOR SPILLS AND LEAKS

Get all workers out of spill area. Put on protective clothing and equipment vhen entering spill area Cor clean-up. Spread absorbent material on spill, sweep up and keep contained in fiber carton tightly sealed. For final disposal, contact your regional office of the New York State Department of Environmental Conservation.

?or more information:
Contact the Industrial Hygienist or Safety Officer at your worksite or the New 'lock State Department of Health, Bureau of Toric Substance Assessment, 2 University Place, Albany, New 'lock 12203.

1,2-DICHLOROETHANE

The information in this sheet applies to workplace exposure resulting from processing, manufacturing, storing or handling and is not designed for the population at large. Any generalization beyond occupational exposures should not be made. The best industrial hygiene practice is to maintain concentrations of all chemicals at levels as low as is practical.

Chemical Names: Ethylene dichloride; 1,2-ethylene dichloride; 1,2-dichloroethane; alpha, beta-dichloroethane; symdichloroethane; dichloroethylene; CAS 107-06-2.

Trade Names: Freon 150, EDC.

Uses: As a lead scavenger in gasoline; in anti-knock mixtures; fumigant for grain, upholstery and carpets; as a degreaser, as a solvent for fats, oils, waxes, gums, and resins; in the manufacture of acetyl cellulose; present in paint removers, wetting and penetrating agents, soaps and scouring compounds; in tobacco extract; as plastic cement and others.

PHYSICAL INFORMATION

Appearance: Clear, colorless, oily liquid.

Odor: Sweetish. **Minimum Detectable By Odor:** 6 ppm.

Evaporation: Rapid.

In Water: Slightly soluble, sinks.

HEALTH HAZARD INFORMATION

OSHA Standard: Average 8 hour exposure -- 50 ppm.

NIOSH Recommended Limit: Average 10 hour day/40 hour week -- 1 ppm.

ACGIH Recommended Limit: Average 8 hour exposure -- 10 ppm.

Short Term Exposure:

Inhalation: Levels of 10 to 30 ppm may cause dizziness, nausea, and vomiting. Levels up to 50 ppm may cause weakness, trembling, headaches, abdominal cramps, liver and kidney damage, and fluid build up in lungs. May cause coma and death at high levels.

Skin: Prolonged contact my cause irritation and skin rashes.

Eyes: May cause redness, pain, and blurred vision. Vapor can damage the cornea.

Ingestion: Ingestion of 2 ounces has resulted in nausea, vomiting, faintness, drowsiness, difficulty breathing, pale skin, internal bleeding, kidney damage, and death due to respiratory failure. Other possible symptoms may include abdominal spasms, severe headache, lethargy, lowered blood pressure, diarrhea, shock, physical collapse, and coma.

Long Term Exposure:

May cause eye, nose aad throat irritation, nausea, vomiting, loss of appetite, nerve damage, liver and kidney damage. This substance has been determined to cause cancer in laboratory animals. Whether it doer so in humans is not known.

*Prepared by the Bureau of Toxic Substance Assessment, New York State Department of Health. For an explanation of the terms and abbreviations used, see "Toxic Substances: How Toxic Is Toxic", available from the New York State Department of Health.

EMERGENCY AND FIRST AID INSTRUCTIONS

Inhalation: Move to fresh air. Give oxygen or artificial respiration as necessary. Seek medical attention.

Skin: Remove contaminated clothing, Wash affected areas with soap and water. See medical attention,

Eyes: Wash with plenty of water lifting eyelids occasionally. Seek medical attention,

If conscious, give plenty of water and induce vomiting. Seek medical attention.,

FIRE AND EXPLOSION INFORMATION

General: Highly flammable. Flashbacks' can occur along vapor trail.

Explosive Limits: Upper -- 15.9%, lower -- 6.2%.

Extinguisher: Dry chemical, foam, carbon dioxide. Water can be used to cool fire exposed containers.

REACTIVITY

Materials to Avoid: Reacts violently with strong caustics such as lye or potassi hydroxide and oxidizers such as potassium permanganate: may react with alumin to form compounds sensitive to mechanical shock. Explosions have occurred on contact with dimethylaminopropylamine or with mixtures of liquid ammonia,

Conditions to Avoid: Heat, sources of ignition. May produce highly toxic fumes c phosgene when heated,

PROTECTIVE MEASURES

Storage and Handling: Dry, explosion-proof room, separated from oxidizers.

Engineering Controls: Use in closed system, if possible. Provide adequate ventilation. Use spack-proof tools and electrical equipment. Sinks, showers and eyewash stations should be readily available.

Protective Clothing (Should not be substituted for proper handling and engi eerin controls): Faceshield, Viton gloves and protective clothing.

Protective Equipment: For any detectable levels use self-contained breathing apparatus with a full facepiece operated in a positive pressure mode or a combination Type C supplied-air respirator and an auxiliary self-contained breathing apparatus, both with a full facepiece and operated in a positive pressure mode, For escape from a contaminated area use a gas mask with an organic vapor canister oc an escape self-contained breathing apparatus.

PROCEDURES FOR SPILLS AND LEAKS

Warn other workers of spill. Put on proper protective clothing and equipment. Eliminate all sources of ignition, Ventilate area, absorb on vermiculite or other suitable material. Collect liquid into sealable containers, Small amounts can be allowed to evaporate out of doors or in a laboratory hood. For disposal of large amounts, contact your regional office of the New York State Department of Environmental Conservation,

Pot more inf ocmation:
Contact the Industrial Hygienist or Safety Officer at your worksite or the Ne York State Department of Health, Bureau of Toxic Substance Assessment, 2 University Place, Albany, New Yock 12203.

1,1,2-TRICHLOROETHANE

The information in this sheet applies to workplace exposure resulting from processing, manufacturing, storing or handling and is not designed for the population at large. *Any* generalization beyond occupational exposures should n be made, The best industrial hygiene practice is to maintain concentrations of all chemicals at levels as low as is practical.

Chemical Names: Ethane trichloride; beta-trichloroethane: 1,2,2-trichloroethane; vinyl trichloride; NCI-C04579; CAS 79-00-5.

Trade Names: Beta-T.

Uses: As an intermediate in the production of vinylidine chloride: as a solvent for fats, waxes, and natural resins; and as a component of adhesives.

PHYSICAL INFORMATION

Appearance: Colorless liquid,

Odor: Chlotoform-like, sweet.

Evaporation: Moderate. Vapors are heavier than air and tend to sink.

Behavior In Water: Only slightly soluble; sinks,

HEALTH HAZARD INFORMATION

OSHA Standard: Average 8 hour exposure -- 10 ppm.

NIOSH Recommended Limit: Average 10 hour day/40 hour week -- 10 ppm.

ACGIH Recommended Limit: Average 8 hour exposure -- 10 ppm.

Short Term Exposure:

Inhalation: Inhalation may produce headache, lassitude, dizziness, incoordination, low blood pressure, irregular heart beat, coma and death from respiratory arrest. Exposure to vapor concentrations near 2000 ppm for 5 minutes causes central nervous system depression and anesthetic effects. Symptoms are nasal irritation, drowsiness and equilibrium disturbances. Death may result from 13,600 ppm for 2 hours.

Skin: Hay cause irritation and chemical burns if allowed to remain on the skin for a prolonged period, May be absorbed through the skin to cause or increase the severity of symptoms listed above.

Eyes: May cause irritation,

Ingestion: May cause effects similar to those listed under inhalation. Liver and kidney damage have occurred in animals. Laboratory studies with animals suggests that the probable lethal dose for humans is about 12 ounces.

Long Term Exposure:

Inhalation may cause liver and kidney damage. Has caused cancer in laboratory animals. Whether it does so in humans is unknown.

*Prepared by the Bureau of Toxic Substance Assessment, New York State Department of Health. For an explanation of the terms and abbreviations used, see 'Toxic Substances: How Toxic Is Toxic", available from the New York State Department Health,

EMERGENCY AND FIRST AID INSTRUCTIONS

Inhalation: Hove to fresh air and perform artificial respiration if necessary. Keep warm and at rest. Get medical attention.

Skin: Remove contaminated clotbinq. Wash skin with soap or mild detergent and plenty of water for at least 15 minutes. Seek medical attention if necessary.

Eyes: Wash vith water for 15 minutes. Seek medical attention.

Ingestion: Do not induce vomiting. Seek medical attention immediately.

FIRE AND EXPLOSION INFORMATION

General: Not flammable under normal conditions.

Explosive Limits: Upper -- 15.5%, lower -- 6.01, (High energy ignition source required.)

Extinguisher: Water foq, foam, carbon dioxide, dry chemical.

REACTIVITY

Materials to Avoid: Fire and explosion may result from reaction with strong oxidizers such as peroxides and permanganates: stronq caustics such as potassium bydroxidr and sodium hydroxide and chemically active metals such as aluminum, magnesium powders, and potassium. Liquid will attack some forms of plastic, rubber and coatings.

Conditions to Avoid: When decomposed by hot metals, ultraviolet radiation, acids or acid fumes, highly toxic hydrogen chloride gas and small amounts of phosgene and carbon monoxide fumes are evolved. Open flames, welding arcs or other high temperature sources vhich induce thermal decomposition should be avoided.

PROTECTIVE MEASURES

Storage and Handling: Store in a cool, dry and dark place. Do not store in aluminum containers. Contaminated clothing should be placed in closed containers until it can be discarded or 'cleaned.

Engineering Controls: Provide proper ventilation. Sinks, showers and eyewash stations should be easily available.

Protective Clothing (Should not be substituted for proper handling and engineering controls) Splash-proof goggles, impervious clothing, gloves (not leather), and face shield. Wash clothing before reuse; it may not be possible to clean contaminated leather.

Protective Equipment par any detectable levels use a self-contained breathing apparatus vith a full facepiece and operated in a positive pressure mode or a combination Type C supplied-aft respirator vith an auxiliary self-contained breathinq apparatus, both vith a full facepiece and operated in a positive pressure mode. par fire fighting use a self-contained breathing apparatus with a full facepiece operated in a positive pressure mode. For escape use a gas mask providinq protection against orqanic vapors or an escape self-contained breathinq apparatus.

PROCEDURES FOR SPILLS AND LEAKS

Warn other workers of spill. Put on proper protective clothinq and equipment. Ventilate the area. Mop, wipe or soak up immediately in absorbent material such as vermiculite or dry sand and move to safe place out-of-doors. Contain liquid, transfer to closed metal containers. For final disposal, contact your regional office of the New Yock State Department of Environmental Conservation.

tor mote information:
Contact the Industrial Hygienist or Safety Officer at your worksite or the New York State Department of Health, Bureau of Toxic Substance Assessment, 2 University Place, Albany, New York 12203.

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Chemical Fact Sheet* Version 3

CHLOROFORM

The information in this sheet applies to workplace exposure resulting from processing, manufacturing, storing or handling and is not designed for the population at large. Any generalization beyond occupational exposures should not be made. The best industrial hyqiene practice is to maintain concentrations-of all chemicals at levels as low as is practical.

Chemical Names: Trichloromethane, methyl trichloride, trichloroform methane, trichloroform, ; CAS 67-66-3.

Trade Names: Freon 20, R20 and others,

Uses: Refrigerant, extracting agent for penicillin and pharmaceuticals, in the manufacture of plastics and synthetic fibers, solvent, anesthetic.

Appearance: Clear, colorless liquid,

Odor: Ether-like. **Minimum Detectable by Odor:** 200 ppm.

Evaporation: Rapid, fumes generally heavies than air,

Behavior in Water: Only very slightly soluble; sinks.

HEALTH HAZARD INFORMATION

OSHA Standard: 50 PPI-

NIOSH Recommended Limit: 2 ppm.

ACGIH Recommended Limit: Averaqe 8 hour exposure -- 10 pep.

Short Term Exposure:

Inhalation: Symptoms are generally not observed at exposures below 90 ppm for minutes. Effects may include headaches, pounding heart, dizziness, slowed reactions, unconsciousness, coaa and death. Delayed effects of exposure which may not occur for up to 24 hours can include cramps, muscle tremors, jaundice, profuse sweating, liver damage, coma and death.

Skin: Can cause reddening of the skin, followed by blistering and chemical burns on prolonged contact,

Eyes: Vapors may cause stinging sensation, Splashes may cause pain, burning, redness and damage to tissues.

Ingestion: May Cause nausea, vomiting and other symptoms as listed under inhalation, For an adult, death may result from 30 ml (1 liquid ounce).

Long Term Exposure:

The following symptoms have been observed in people *exposed* to levels up to 200 ppm over periods of weeks, months or years: depression, hallucination, sluggishness, loss of appetite, fatigue and liver and kidney damage. Chlorofor is a cancer suspect agent because high levels cause kidney and liver cancer in rats and mice.

*Prepared by the Bureau of Toxic Substance Assessment, New York State Department of Health. For an explanation of the terms and abbreviations used, see "Toxic Substances: How Toxic is Toxic" available from the New York State Department of Health.

EMERGENCY AND FIRST AID INSTRUCTIONS

Inhalation: Move person to fresh air. Give artificial respiration or oxygen as required. Seek medical attention.

Skin: Remove soaked clothing. Wash affected areas with soap and water for at least 5 minutes. Seek medical attention if necessary.

Eyes: Wash eyes with large amounts of water for at least 15 minutes. Seek medical attention.

Ingestion: Seek medical attention immediately.

Note to Physician: Expired air and blood levels may be useful in estimating levels of acute exposure.

FIRE AND EXPLOSION INFORMATION

General: Chloroform is non-flammable and non-explosive.

REACTIVITY

Materials to Avoid: Strong alkalies like lye and potassium hydroxide decompose chloroform to chloride salts and formates.

Conditions to Avoid: Sunlight will decompose chloroform to highly toxic fumes.

PROTECTIVE MEASURES

Storage and Handling: Store in dark bottles or cans in a cool place.

Engineering Controls: Provide adequate ventilation, eyewash stations and showers.

Protective Clothing (Should not be substituted for proper handling and engineering controls): Impervious gloves, splash-proof goggles and apron should be worn if contact is likely.

Protective Equipment: For any detectable levels use a self-contained breathing apparatus with a full facepiece operated in a positive pressure mode or a combination Type C supplied-air respirator with an auxiliary self-contained breathing apparatus, both with a full facepeice and operated in a positive pressure mode. For escape from a contaminated area use a gas mask with an organic vapor canister or an escape self-contained breathing apparatus.

PROCEDURES FOR SPILLS AND LEAKS

Get all workers out of spill area. Use respirator and protective clothing when spreading absorbent material on spill. Shovel into buckets and take to safe place in open air. Allow to evaporate. Wash spill area with soap and water. For final disposal contact your regional office of the New York State Department of Environmental Conservation.

For more information:
Contact the Industrial Hygienist or Safety Officer at your worksite or the New York State Department of Health, Bureau of Toxic Substance Assessment, 2 University Place, Albany, New Pork 12203.

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Chemical Fact Sheet* **Version 2**

METHYLENE CHLORIDE

The information in this sheet applies to workplace exposure resulting from processing, manufacturing, storing or handling and is not designed for the population at large. Any generalization beyond occupational exposures should not be made. The best industrial hygiene practice is to maintain concentrations of all chemicals at levels as low as is practical.

Dichloromethane, Methylene dichloride; CAS 75-09-2.

Trade Names: Solaestine, Aerothene MM, Narkotel, Somethine, R30 and others.

Uses: The liquid is used as a solvent, degreasing and cleaning fluid, aerosol propellant, anesthetic and refrigerant. Also used in paint removers, blowing agents in foams, in the process of decaffeinating coffee and extraction of spices.

PHYSICAL INFORMATION

Appearance: Clear, colorless liquid.

Odor: Sweetish (like chloroform or ether). **Minimum Detectable by Odor:** 214 ppm.

Behavior in Water: Slightly soluble (1.32 g/100 g water), remainder will sink.

Evaporation: Liquid evaporates rapidly.

HEALTH HAZARD INFORMATION

OSHA Standard: Average 8 hour exposure limit — 500 ppm.

NIOSH Recommended Limit: Reduce exposure to the lowest feasible level.

ACGIH Recommended Limit: Average 8 hour exposure -- 100 ppm.
(Proposed for change in 1988: 50 ppm).

Short Term Exposure:

Note: Methylene chloride is changed to urban monoxide in the human body. This is a particularly hazardous condition for those who have a history of heart trouble or those who are also exposed to carbon monoxide. See carbon monoxide fact sheet. These persons should take extra precautions.

Inhalation: Levels of 300-700 ppm for 3-5 hours has caused slight loss of muscle control and coordination. Effects of higher concentrations include stupor, dirtiness, chest pain, arm and leg pains, loss of feeling, loss of appetite, hot flashes and death.

Skin: May be irritating if confined on the skin by gloves or clothing. May be absorbed slowly through the skin to cause symptoms listed under inhalation.

Eyes: May cause pain, irritation and burns.

Ingestion: Accidental ingestion of paint removers containing methylene chloride as the main ingredient have reportedly caused headache, nausea, vomiting, visual disturbance, presence of blood in the urine, and unconsciousness.

Long Term Exposure:

Same symptoms as above. Prolonged exposure can cause changes in blood, hallucinations and decreased response to visual and audirory stimulation. Some long term exposures have also resulted in damage to the liver. Most of the effects will disappear after exposure stops. Methylene chloride caused genetic effects in certain bacteria and caused birth defects in chickens. In laboratory studies, methylene chloride has also been shown to cause tumors in mice and rats. Whether methylene chloride cuses birth defects or tumors in humans is nor known.

*Prepared by the Bureau of Toxic Substance Assessment, New Yock State Department of Health. For an explanation of the terms and abbreviations used, see "Toxic Substances: How Toxic it Toxic" available from the New York State Department of Health.

EMERGENCY AND FIRST AID INSTRUCTIONS

Inhalation: Remove person to fresh air. Give artificial respiration or oxyqcn if breathing has stopped. Seek medical attention immediately.

Skin: Wash with large amounts of soap and water for at least 5 minutes, Seek medical attention if necessary.

Eyes: Wash with water for at least 15 minutes. Seek medical attention.

Ingestion: Do not induce vomiting. Seek medical attention.

Note to Physician: Gastric lavage with 3–58 sodium bicarbonate. Prompt hemodialysis if blood methanol level is above 50 mg/dl or if there is evidence of acidosis. Provide routine supportive measures and 1008 oxygen until the carboxyhemoglobin level is satisfactory (less than 10% in an otherwise healthy patient).

FIRE AND EXPLOSION INFORMATION

General: Considered non-flammable, but will burn in high concentrations such as near spills or in closed spaces. Ignites at 624°C (1224°F).

Explosion Limits: Upper -- 64.68; lower -- 15.58 in oxygen.

REACTIVITY

to Avoid: Avoid heat: decomposes to highly poisonous gases (phosgene).

to Avoid: Avoid contact with alkali metals (example: sodium or potassium); such contact may cause an explosion. Methylene chloride will corrode icon, stainless steel and copper, especially at high temperatures and if the metals are wet. Can is impervious and resistant to methylene chloride. Improper gloves or clothing can prevent evaporation and promote skin contact. Check with manufacturer's specification or your supervisor.

Protective Equipment: For any detectable levels use a self-contained breathing apparatus with a full facepiece operated in a positive pressure mode or a combination Type C supplied-air respirator: with an auxiliary self-contained breathing apparatus, both vith a full facepiece and operated in a positive pre is impervious and resistant to methylene chloride. Improper gloves or clothing can prevent evaporation and promote skin contact. Check with manufacturer's specification or your supervisor.

Protective Equipment: For any detectable levels use a self-contained breathing apparatus with a full facepiece operated in a positive pressure mode or a combination Type C supplied-ai: respirator with an auxiliary self-contained breathing apparatus, both with a full facepiece and operated in a positive pressure mode. For escape use a gas mask with an organic vapor canister or an escape self-contained breathing apparatus, par firefighting use a self-contained breathing apparatus with a full facepiece operated in a positive pressure rode,

PROCEDURES FOR SPILLS AND LEAKS

Got all workers out of the spill area. Remove all sources of combustion, Ventilate the area. If you must enter the area, wear protective clothing and equipment. Since methylene chloride is extremely volatile, most will evaporate. For final disposal contact your regional office of the New Pork State Department of Environmental Conservation.

tor more information:
Contact the Industrial Hygienist or Safety Officer at your worksite or the New York State Department of Health, Bureau of Toxic Substance Assessment, 2 University Place, Albany, N w York 12203.

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 feet w of site 11

Prepared by: Kim Walker

Date Prepared: 4-25-89

Approval by: Mary Miller MM

Date Approved: 5-5-89

Site Safety Officer Review:

Date Reviewed:

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

Proposed Date of Field Activities: August 1989

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

Documentation/Summary:

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

B. SITE/WASTE CHARACTERISTICS

Waste Type(s):

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

Characteristic(s):

Flammable/ Ignitable [ ]	Volatile [ ]	Corrosive [ ]	Acutely Toxic I 1
Explosive [ ]	Reactive [ ]	Carcinogen [ ]	Radioactive* [ ]

Other:

Physical Hazards:

Overhead [X]	Confined* Space [ ]	Below Grade [ ]	Trip/Fal1 [X]
Puncture [ ]	Burn I 1	Cut [ ]	splash [X]
Noise [X]	Other: Vehicular traffic around existing buildings.		

*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 the mid-1940's, garbago from NAS Pensacola was placed in scrap bins and stored in this area (industrial wastes were sent to tho Uorth 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 feed. 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. —a

List Hazards by Task (i.e., drum sampling, drilling, etc.) and number thorn. (Task numbers are cross-retoroncod 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) Decontamination Procedures - Using solvents.

Chemical Hazard Evaluation:

Compound	PEL/TWA	Route of Exposure	Acute Symptoms	Odor Threshold	Odor Description
Isopropyl Alcohol	400 ppm	" "	drowsiness,head.	7.5-200 ppm	rubbing alcohol
Nitric Acid	2 ppm	" "	corrosive	0.3-1 ppm	acrid

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

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D. SITE SAFETY WORK PLAN

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

(Expand if necessary)

Modifications: Modified level D with tyveck, neoprene gloves and boots, safety glasses, APR available when level C upgrade is necessary

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) >5 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) >500 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):

Contarinant of Interest	Type of Sample (area, personal)	Monitoring Equipment	Prequency of Sampling
VOC's	Area	OVA	Continuous
Radiation	Area	Mini-Rad	Continuous
Explosive Gases	Area	O_2/Explosimeter	Continuous

Decontamination Solutions and Procedures for Equipment. Sampling Gear, otc.:
Trisodium phosphate wash. tap water rinse, isopropanol rinse, distilled water rinse, isopropanol rinse, and final distilled water rinse.

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

Decon Solution Monitoring Procedures, if Applicable: Decontamination will be 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 Procedures and Special Considerations: E & E's "Buddy System" will be employed at a11 tires during fieldwork activities. Personnel will exercise caution in the vicinity of nearby roadways. If above background radiation levels are encountered team members will evacuate the sampling area, and contact the corporate health physics group to reassess the site.

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

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

General Spill Control, if applicable: N/A

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

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

Sample Handling Procedures Including Protective Wear:

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

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

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

C0C0301

E. **EMERGENCY INFORMATION**

(Use supplemental shoots, if necessary)

LOCAL RESOURCES

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

Ambulance On Base — 904-451-4138, Off Base -- 921

Hospital Emergency Rood 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 Division, Engineer-In-Charge, 1-803-743-0574

Site Contact. NAS Pensacola Enviromental Coordinator, W. Dewayne Ray -- 904-452-4515

SITE RESOURCES

Site Emergency Evacuation Alarm Method N/A

Water Supply Source On-sit.

Telephone Location, Number To bo determined on-sit.

Cellular Phone, it available N/A

Radio

Other On-site 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 Office Contact .....M.Miller.... 656-2854 (homo)
   877-1978 (office)

4. Office Manager ..... R.Rudy ..... 893-7245 (homo)

1. Twenty-four hour answering sorvico: (501) 370-0263

what to report:

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

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

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

a. 24 hour hotline - (716) 684-8910
b. Corporate Safety Director - Paul Jonmaire - homo # (716) 655-1260
c. Assistant Corp. Safety Officer - Steven Sherman - home t (716) 606-0004

EMERGENCY ROUTES

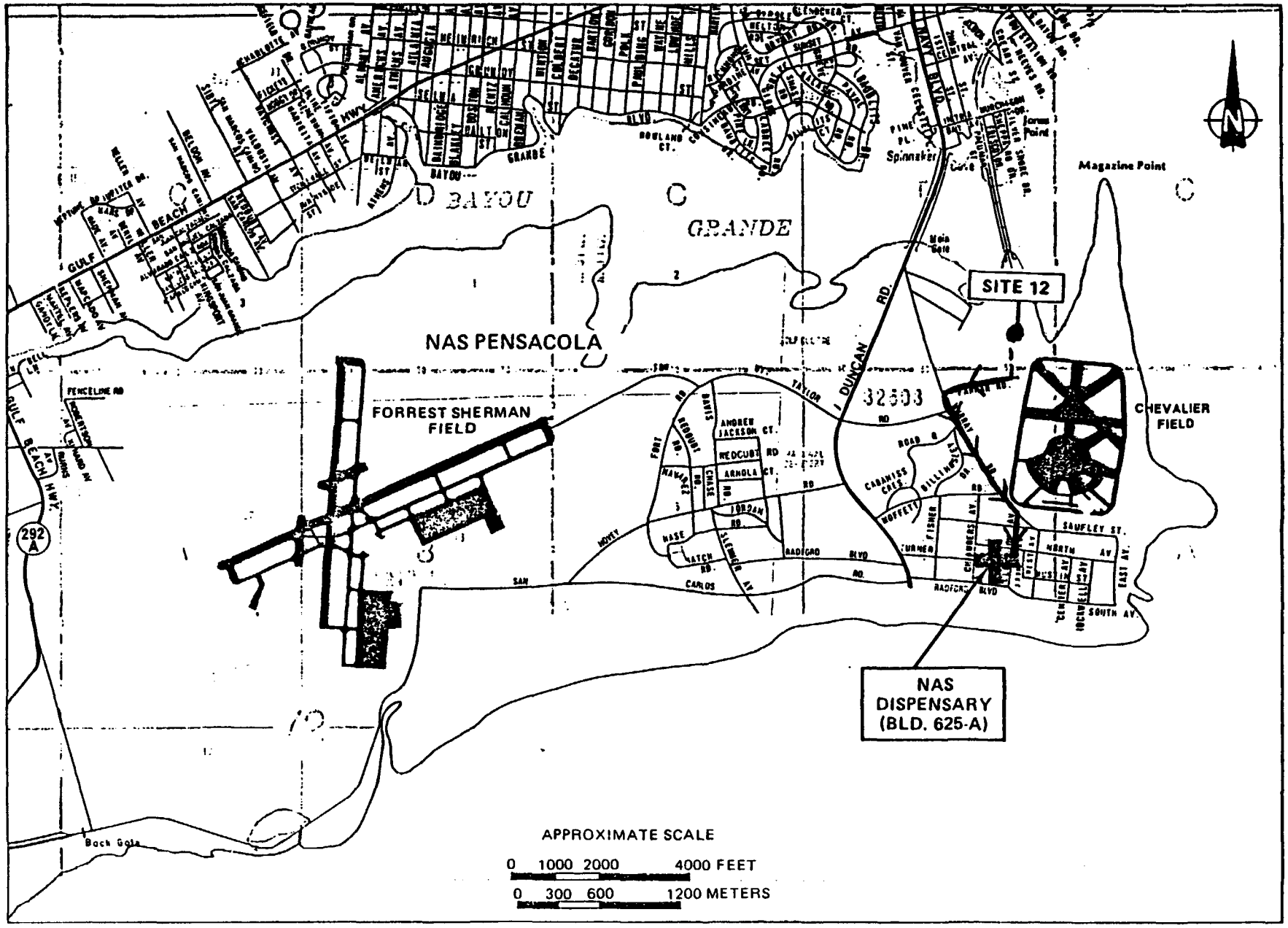
(NOTE: Field Team must Know Route(s) Prior to Start of Work)

Directions to hospital (include map)

NAS Dispensary - Proceed to Murray Road (See attached map). Follow Murray Road South to Ellyson Avonuo. Tu tight onto Ellyson Avonuo and continuo to it's intersection vith Turner Street. Tho NAS Dispensary is located on the northwest corner of tho intersection of Ellyson Avenue and Turner Street, in Building 625-A.

Baptist Hospital - Take Duncan Road (Navy Blvd.) north to exit tho base. Navy Blvd. becomes HWY 90 and curves to tho east. Follow Navy Blvd./Hwy. 98 east appro.. 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 follov this road for about 8 blocks and turn loft (north) onto E street. Tho hospital is about 6 blocks north on tho loft.

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


NAS PENSACOLA
FORREST SHERMAN FIELD
CHEVALIER FIELD
SITE 12
NAS DISPENSARY (BLD. 625-A)
BAYOU GRANDE
Magazine Point
Spinnaker
Back Gate
APPROXIMATE SCALE
0 1000 2000 4000 FEET
0 300 600 1200 METERS

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.
* Hake 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.
* Haintain a safe distance from the rig mechanisms during drive sampling and auger removal operations.

ECOLOGY AND ENVIRONMENT, INC.,
STANDARD OPERATING PROCEDURES FOR
EMERGENCIES DUE TO HEAT AND HEAT STRESS MONITORI'IG

Field operations during the summer months can create a variety of hazards to the employee. Heat cramps, heat exhaustion, and heat stroke can be experienced and, if not remedied, can threaten life or health. Therefore, it is important that all employees be able to recognize symptoms of these conditions and be capable of arresting the problem as quickly as possible.

THE EFFECTS OF HEAT

As the result of normal oxidation processes within the body, a predictable amount of heat is generated. If the heat is liberated as it is formed, there is no change in body temperature. If the neat is liberated more rapidly, the body cools to a point at which 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. When such a condition exists, it produces a vicious 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.

Heat produced within the body is brought to the surface largely by the bloodstream and escapes to the cooler surroundings by conduction and radiation. If air movement or a breeze strikes the body, additional heat is lost by convection. However, 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 or sweat from the skin surface. As the air becomes more humid (contains more moisture), vaporization from the skin slows down. Thus, on a day when the temperature is 95 to 100°F, with high humidity and little or no breeze, conditions are ideal for the retention of heat within the body. It is on such a day or, more commonly, a succession of such days (a heat wave) that medical emergencies due to heat are likely to occur. Such emergencies are classified in three categories: heat cramps, heat exhaustion, and heat stroke.

HEAT CRAMPS

Heat cramps usually affect people who work in hot environments and perspire a great deal. Loss of salt from the body causes very painful cramps of the leg and abdominal muscles. Heat cramps also may result from drinking iced water or other drinks either too quickly or in too large a quantity.

Heat Cramp Symptoms. The symptoms of heat cramp are:

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

Heat Cramp Emergency Care. Remove the patient to a cool place. Give him sips of liquids such as "Catorade" or its equivalent. Apply manual pressure to the cramped muscle. Remove the patient to a hospital if there is any indication of a more serious problem.

HEAT EXHAUSTION

Heat exhaustion occurs in individuals working in hot environments, and may be associated with heat cramps. Heat exhaustion is caused by the pooling of blood in the vessels of the rkin. The heat is transported from the interior of the body to the surface by the 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 lower extremities when an individual is in an upright position, may lead to an inadequate return of blood to the heart and eventually to physical collapse.

Heat Exhaustion Symptoms. The symptoms of heat exhaustion are:

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

Heat Exhaustion Emergency Care. Remove the patient to a cool place and remove as much clothing as possible. Administer cool water, "Catorade," or its equivalent. If possible, fan the patient continually to remove heat by convection, but do not allow chilling or overcooling. Treat the patient for shock. and remove him to a medical facility if there is any indication of a more serious problem.

HEAT STROKE

Heat stroke is a profound disturbance of the heat-regulating mechanism, associated with high fever arid 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% mortality rate. Alcoholics are extremely susceptible.

Heat Stroke Symptoms. The symptoms of heat stroke are:

- Sudden onset;
- Dry, hot, and flushed skin;
- Dilated pupils;
- Early loss of consciousness;
- Full and fast pulse;
- Breathing deep at first, later shallow and even almost absent;
- Muscle twitching, growing into convulsions; and
- Body temperature reaching 105 to 106°F or higher.

Heat Stroke Emergency Care. Remember that this is a true emergency. Transportation to a medical facility should not be delayed. Remove the patient to a cool environment if possible, and remove as much clothing as possible. Assure an open airway. Reduce body temperature promptly--preferably by wrapping in a wet sheet or else by dousing the body with water. If cold packs are available, place them under the arms, around the neck, at the ankles, or at any place where blood vessels that lie close to the skin can be cooled. Protect the patient from injury during convulsions. especially from tongue biting.

AVOIDANCE OF HEAT-RELATED EMERGENCIES

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 system. Without these electrolytes, body systems cannot function properly, thereby increasing the represented health hazard. Therefore, when personnel are working in situations where the aniblent temperatures and humidity are high--and especially in situations where protection Levels A B, and C are required--the site safety officer must:

- Assure that all employee's drink plenty of fluids ("Gatorade" or its equivalent);
- Assure that frequent breaks are scheduled so overheating does not occur; and
- Revise work 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].

If protective clothing must be worn, especially Levels A and 8, the suggested guidelines for ambient temperature and maximum wearing time per excursion are:

Ambient Temperature (°F)	Maximum Wcarlng Time per Excursion (Minutes)
Above 90	15
85 to 90	30
80 to 85	60
70 to 80	90
60 to 70	120
50 to 60	180

One method of measuring the effectiveness of employees' rest-recovery regime is by monitoring the heart rate. The "Brouha guideline" is one such method:

- During a three-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 mlnutc.
- Double the count.

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

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Mallinckrodt
Material Safety Data

Emergency Phone Number: 314-982-5000

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

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.

I RECAUTIONARY 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 Io 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 kast 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.

Bailing 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 @ 2VC (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 chemicrl, alcohol foam, or carbon dioxide. Water spray may be used to keep fire exposed containers cool.

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

SECTION 3 Reactivity Datq

Stability:
Stable under ordinary conditions of use and storage. Hut and sunlight can contribute to Instability.

Hazardous Decomposition Products:
Toxic gases and vapors such as carbon monoxide ma7 be released in a fire involving isopropyl alcohol.

Hazardous 'Polymerization:
Will not occur.

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

SECTION 4 Leak/Spill Disposal Information

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

Ensure compliance with local, state and federal regulations.

NFPA Ratings: Health 1 Flammability: 3 Reactivity 0

SECTION 5 Health Hazard Information

A. EXPOSURE / HEALTH EFFECTS

Inhalation:
May cause irritation of the nose and throat. Exposure to high concentrations has a narcotic effect, producing symptoms of drowsiness, headache, staggering, unconsciousness and possibly death.

Ingestion:
May cause drowsiness, unconsciousness, and death. Gastrointestinal pain, cramps, nausea, vomiting, and diarrhea may also result. The single lethal dose for a human adult is about 250 mls (SAX Sixth Edition).

Skin Contact:
Has a defatting action of the skin that can cause irritation. May cause irritation with a stinging effect and burning sensation.

Eye Contact:
Vapors may irritate the eyes. Splashes may cause severe irritation, possible corneal burns and eye damage.

Chronic Exposure:
Prolonged contact with skin may cause mild irritation, drying, cracking, or contact dermatitis may develop.

Aggravation 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

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

Ingestion:
Give water to drink. Induce vomiting if medical help not is immediately available. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Skin Exposure:
Remove any contaminated clothing. Wash skin with soap or mild detergent and water for at least 15 minutes. Get medical attention if irritation develops or persists.

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: 5840 mg/kg. Skin rabbit LD50: 13 gm/kg. Inhalation rat LC50: 16000 ppm/8H. Mutation references cited Aquatic Toxicity rating TLm96: 1000-10 ppm.

SECTION 6 Occupational Control Measures

Airborne Exposure Limits:
-OSHA Permissible Exposure Limit (PEL): 400 ppm (TWA).
-ACGIH Threshold Limit Value (TLV): 400 ppm (TWA); 500 ppm (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 a full facepiece chemical cartridge respirator may be worn, in general, up to the maximum use concentration specified by the respirator supplier. 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

Protect against physical damage. Store in a cool, dry well-ventilated location, away from any area where the fire hazard may be acute. Outside or detached storage is preferred. Separate from oxidizing materials. Containers should be bonded and grounded for transfers to avoid static sparks. Storage and use areas should be NO Smoking areas. Use non-sparking type tools and equipment.

Mallinckrodt
Material Safety Data

Emergency Phone Number: 314-982-5000

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Mallinckrodt, Inc., Science Products Division, P.O. Box XI. Puis. KY 43061.

NITRIC ACID, 70%

PRODUCT IDENTIFICATION:

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

Formula CAS No.: **7697-37-2**

Molecular Weight: ***63.00***

Chemical Formula: HNO_3

Hazardous Ingredients: **Not** Applicable

PRECAUTIONARY MEASURES

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

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

EMERGENCY/FIRST AID

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

DOT Hazard Class: Oxidizer

SECTION 1 Physical Data

Appearance: Clear, colorless to slightly yellow liquid.

Odor: Suffocating acrid.

Solubility: Infinite in **water.**

Boiling Point: **122°C (252°F)**

Melting Point -34°C **(-29°F)**

Specific Gravity: 1.41

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

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

Evaporation Rate: No information found.

ON2 Fire and Explosion Information

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

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

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

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

SECTION 3 Reactivity Data

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

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

Hazardous Polymerization:
Will **not** occur.

Incompatibilities
A dangerously powerful oxidizing **agent,** concentrated nitric **acid** is incompatible with **mat** substances, **especially** strong b—— metallic powders, carbides, hydrogen sulfide, turpentine, a d 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.

NFPA **Ratings:** Health 3 Flammability ***0*** Reactivity ***0*** Other: Oxidizer

0003007

SECTION 5 Health Hazard Information

A. EXPOSURE / HEALTH EFFECTS

Inhalation:
Corrosive! Inhalation of vapors can c a w 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, pin, and severe skin burns. Concentrated solutions cause deep ulcers and stain skin a yellow or yellow-brown color.

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

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

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

B. FIRST AID

Inhalatioo:
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 am. Please refer to the ACGIH document, 'Industrial Ventilation, A Manual of Recommended Practices", m a t 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 am. Protect from physical damage and direct sunlight. Isolate from incompatible substances. Protect from moisture.

Mallinckrodt
Material Safety Data

Emergency Phone **Number: 314-982-5000**

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

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 I f INHALED. INHALATION MAY CAUSE LUNG DAMAGE.

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

EMERGENCY/FIRST AID

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

DOT Hazard Class: ***Corrosive* Material**

SECTION 1 Physical Data

Appearance: Colorless, oily liquid.

Odor: Odorless.

Solubility: Infinite @ 20°C.

Boiling Point: ca. 310°C (590°F)

Melting Point: ca. -14°C (6°F).

Specific Gravity: **1.84**

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

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

Evaporation Rate: **No** information found.

SECTION 2 Fire end 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 m a t 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 a d 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**

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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 a n cause severe b u m of the mouth, throat, and stomach, leading to death. Can cause sore throat, vomiting, diarrhea.

Skin Contact:
Corrosive. Symptom's of redness, pain, and severe burn can occur.

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

Chronic Exposure:
Long-term exposure to mist or vapors may cause damage lo 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 b 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 lo an unconscious person.

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

Eye Exposure
Wash c y u with pknly of water lor at least 15 minutes, lifting lower and upper eyelids occasionally. Get medial attention immediately.

C. TOXICITY DATA (RTECS, 1982)

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

SECTION 6 Occupational Control Measures

Airborne Exposure Limits:
-OSHA Permissible Exposure Limit (PEL):
1 mg/m^3 (TWA).
-ACGIH Threshold Limit Value (TLV):
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 lo the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, lor details.

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

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

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

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 lor other purposes. When diluting, always add the acid to water; never add water lo the acid.

ecology and environment, inc.

SITE SAFETY PLAN

Version 988

A. GENERAL INFORMATION

Project Title: Site 26-Supply Department Outsido Storago

Project No.: UH1102

TDD/Pan Io.:

Project Manager: John Barksdale

Project Dir.: Rick Rudy

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

Prepared by: Kim Walker

Dato Proparod: 4-25-89

Approval by: Mary Miller MM

Dato Approved: 5-5-89

Site Safety Officer Review:

Date Reviewed:

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

Proposed Date of Field Activities: August 1989

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

Documentation/Summary:

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

B. SITE/WASTE CHARACTERISTICS

Waste Typo(.):

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

Characteristic(s):

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

Othor :

Physical Hazards:

Overhead	[X]	Confined* Space	[ ]	Below Grade	[ ]	Trip/Fall	[X]
Puncture	[ ]	Burn	[1	cut	I 1	Splash	[X]
Noise	[X]	Other: Vehicular traffic around existing buildings.					

*Requires completion of additional form and special approval from tho 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 collected at the site for EP toxicity metals did not reveal any evidence of the of heavy metals. However, groundwater collected from a well hydraulically downgradient from the 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: [1

---

e. HAZARD EVALUATION

List Hazards by Task (i.e., drum sampling, drilling, etc.) and number them. (Task numbers are croaa-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) Decontamination Procedures - Using solvents.

Chemical Hazard Evaluation:

Compound	PEL/TWA	Route of Exposure	Acute Symptoms	Odor Threshold	Odor Description
mothylene chloride	500 ppm	inh,ing,con,eye	dizzy,chest pain	214 ppm	sweetish
trichloroethane	10 ppm	inh, ing, con	head,vertigo,naus	20-100 ppm	ether-like
1,2-dichloroethane	50 ppm	inh,ing,con,eye	naus,vomit,head	6 ppm	sweetish
nitric acid	2 ppm	" "	corrosive	0.3-1 ppm	acrid
tetrachloroethane	5 ppm	inh,ing,con,abs	nausea,vomit	5 ppm	ether-like
isopropyl alcohol	400 ppm	Inh,Abs	drowsiness,head	7.5-200 ppm	rubbing alcohol

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

D. SITS SAFETY WORK PLAN

Site Control: Attach map, use back of this page, or sketch of site showing hot zone, contamination reduction, sone, 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 Protaction (Cross-reference task numbers to Section C):

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

(Expand if necessary)

Modifications: Modified level D with tyvack. neoprene gloves and boots, safety glasses, APR available when level C upgrade is necessary

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

- Level D: O_2 <19.5% or >25%, explosive atnosphoro >10% LEL. organic vapors above background levels, particulatas >_____ mg/m^3, othor _____
- Level C: O_2 <19.5% or >25%, explosive atmosphere >25% LEL (California-20%), unknown organic vapor (in breathing zone) >5 ppm, particulates >_____ mg/m^3, othor _____
- Level B: O_2 t19.55 or >25%, explosive atmosphoro >25% LEL (California-20%), unknown organic vapors (in breathing zone) >500 ppm, particulates >_____ mg/m^3, othar _____
- Level A: O_2 <19.5% or >25%, explosive atmosphere >25% LEL (California-20%), unknown organic vapors ,300 ppm, particulates >_____ mg/m^3, othor _____

Air Monitoring (daily calibration unless otherwise noted):

Contaminant of Interest	Type of Sample (area, personal)	Monitoring Equipment	Frequency of Sampling
VOC's	Area	OVA	Continuous
Radiation	Area	Mini-Rad	Continuous
Explosive Gases	Area	O_2/Explosimeter	Continuous

Decontamination Solutions and Procedures for Equipment, Sampling Gear, otc.:
Trisodium phosphate wash, tap wator rinse, isopropanol rinsa, distilled water rinse, isopropanol rinse, and final distilled water rinsa.

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

Decon Solution Monitoring Procedures, if Applicable: Decontamination will be performed in a well-vontilatod 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 be strictly adhered to as outlined in Attachment A.

Site Entry Procedures and Spacial Considerations: E & E's "Buddy System. will be employed at a11 tires during fieldwork activities: Personnel will exercise caution in the vicinity of nearby roadways. If above background radiation levels are encountered tear members will evacuate the sampling area, and contact the corporate health physics group to reassess the rite.

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

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

General Spill Control, if applicable: N/A

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

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

Sample Handling Procedures Including Protective Wear:

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

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

*All entries into exclusion zone require Buddy System use. All E & E field staff participate in medical monitoring program and have coqleted 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 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)

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 1-800-230-5355

Client Contact U.S. Navy Southern Division, Enginoor-In-Chargo, 1-803-743-0574

Site Contact NAS Pensacola Enviromental Coordinator, W. Dewayno Ray -- 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 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 Office Contact .....M.Miller.... 656-2854 (home)
   877-1978 (office)

4. Office Managor. ..... R.Rudy ..... 893-7245 (home)

MEDTOX HOTLINE

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

   mat to report:

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

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

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

   a. 24 hour hotline - (716) 664-6940
   b. Corporate Safety Director - Paul Jonmaire - home # (716) 655-1260
   c. Assistant Corp. Safety Officer - Steven Sherman - home # (716) 688-0084

EMERGENCY ROUTES

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

Directions to hospital (include up)

NAS Dispensary - Proceed to Murray Road (See attached up). Follow Murray Road South to Ellyson Avenue. Tu right onto Ellyson Avenue and continue to it's intersection vith Turner Street. The NAS Dispensary is located on tho northwest corner of tho intersection of Ellyson Avenue and Turner Street, in Building 625-A.

Baptist Hospital - Take Duncan Road (Navy Blvd.) north to exit tho base. Navy Blvd. becomes HWY 98 and curves to the east. Follow Navy Blvd./Hwy. 98 east appro. 3mi to Pace Blvd. Turn loft (north) on Pace Blvd. and proceed appro.. 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. The hospital is about 6 blocks north on tho loft.

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

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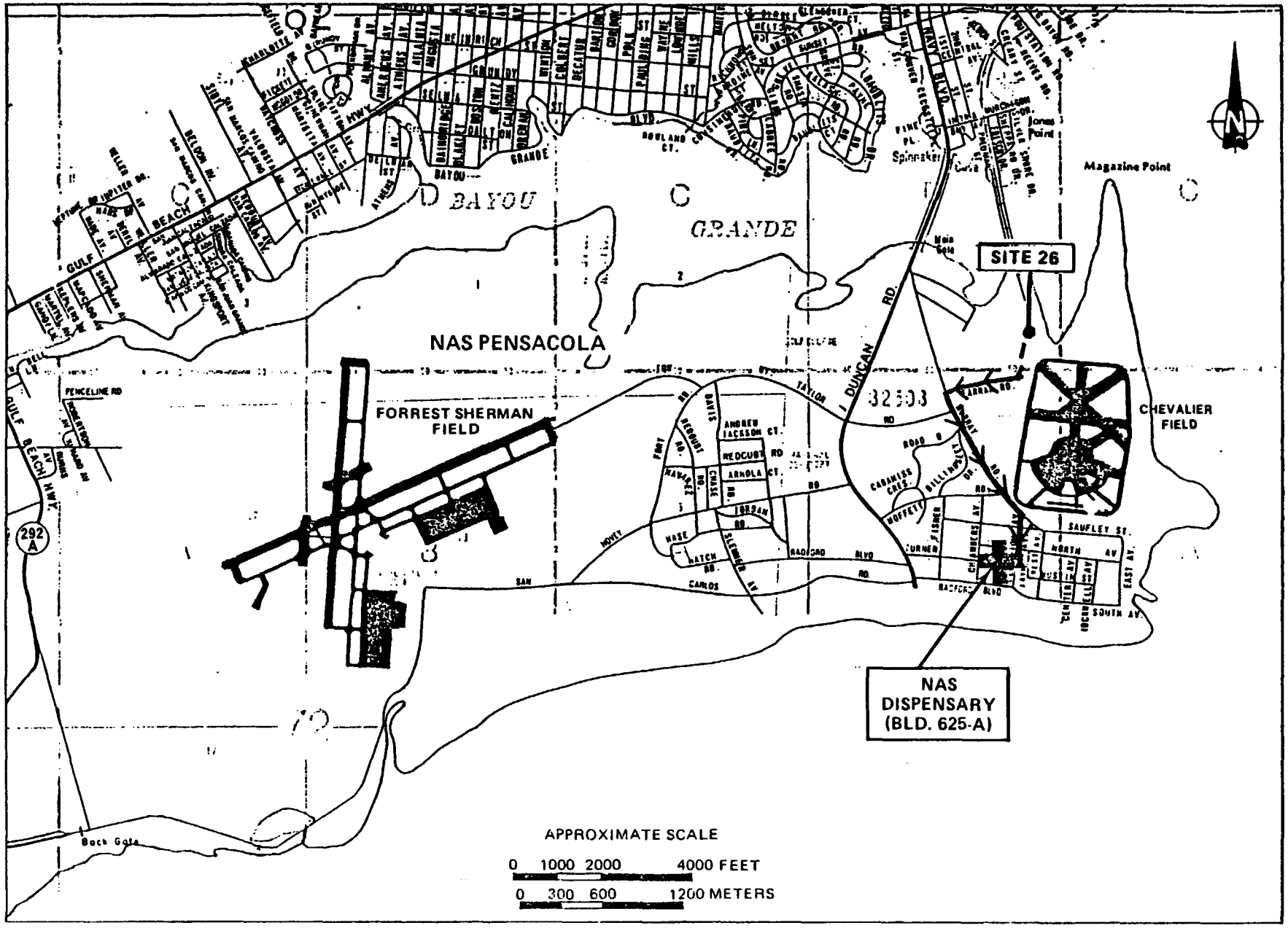
SITE 26
NAS PENSACOLA
FORREST SHERMAN FIELD
CHEVALIER FIELD
NAS DISPENSARY (BLD. 625-A)
BAYOU GRANDE
Magazine Point
Jones Point
Spinnaker
Main Gate
Back Gate
GULF BEACH HWY.
PENSACOLA BEACH
PENCLINE RD
DUNCAN RD
TAYLOR
SAN CARLOS
MOVEY
FORT REDOUBT
HAWKEZ RD
DAVIS
CHASE RD
ANDREW JACKSON CT.
REDOUBT RD
ARNOLA CT.
JORDAN RD
HASE
HATCH RD.
SLEMMER AV
RAILROAD BLVD
CADAMESS CRES.
MOFFETT
BELLINGER DR.
TURNER
FISHER
CHAMBERS AV
BAYFORD BLVD
SAUFLEY ST
NORTH AV
SOUTH AV
EAST AV
CENTER AV
LOCUST AV
ROAD B
32503
APPROXIMATE SCALE
0 1000 2000 4000 FEET
0 300 600 1200 METERS

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.
* Hake sure the site, platforms and walkways are free of obstructions.
* Hake 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.

ECOLOGY AND ENVIRONMENT, INC.,
STANDARD OPERATING PROCEDURES FOR EMERGENCIES DUE TO HEAT AND HEAT STRESS MONITORING

Field operations during the summer months can create a variety of hazards to the employee. Heat cramps, heat exhaustion. and heat stroke can be experienced and, if not remedied, can threaten life or health. Therefore, it is Important that all employees be able to recognize symptoms of these conditions and be capable of arresting the problem as quickly as possible.

THE EFFECTS OF HEAT

As the result of normal oxidation processes within the body, a predictable amount of heat is generated. If the heat is liberated as it is formed, there is no change in body temperature. If the heat is liberated more rapidly, the body cools to a point at which 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. When such a condition exists, it produces a vicious 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.

Heat produced within the body is brought to the surface largely by the bloodstream and escapes to the cooler surroundings by conduction and radiation. If air movement or a breeze strikes the body, additional heat is lost by convection. However, 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 or sweat from the skin surface. As the air becomes more humid (contains more moisture), vaporization from the skin slows down. Thus, on a day when the temperature is 95 to 100°F, with high humidity arid little or no breeze, conditions are ideal for the retention of heat within the body. It is on such a day or, more commonly, a succession of such days [a heat wave) that medical emergencies due to heat are likely to occur. Such emergencies are classified in three categories: heat cramps, heat exhaustion, and heat stroke.

HEAT CRAMPS

Heat cramps usually affect people who work in hot environments and perspire a great deal. Loss of salt from the body causes very painful cramps of the leg and abdominal muscles. Heat cramps also may result from drinking iced water or other drinks either too quickly or in too large a quantity.

<u>Heat Cramp Symptoms</u>. The symptoms of heat cramp are:

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

Heat Cramp Emergency Care. Remove the patient to a cool place. Give him sips of liquids such as "Gatorade" or its equivalent. Apply manual pressure to the cramped. muscle. Remove the patient to a hospital if there is wry indication of ,a more serious problem.

HEAT EXHAUSTION

Heat exhaustion occurs in individuals working in hot environments, and may be associated with heat cramps. Heat exhaustion is caused by the pooling of blood in the vessels of the skin. The heat is transported from the interior of me body to the surface by the blood. The blood vessels in the skin become dilated and a large amount of blood is pooled in the skin. This condition, plus me blood pooled in the loner extremities when an individual is in an upright position, may lead to an inadequate return of blood to the heart and eventually to physical collapse.

Heat Exhaustion Symptoms. The symptoms of heat exhaustion are:

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

Heat Exhaustion Emergency Care. Remove me patient to a cool place and remove as much clothing as possible. Administer cool water, "Gatorade," or its equivalent. If possible, fan the patient continually to remove heat by convection, but do not allow chilling or overcooling. Treat the patient for shock, and remove him to a medical facility if there is any indication of a more serious problem.

HEAT STROKE

Heat stroke is a profound disturbance of the heat-regulating mechanism, associated with' high fever and collapse. Sometimes this condition results in convulsions, unconsciousness, and even death. Direct

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APPENDIX B

SITE-SPECIFIC QUALITY ASSURANCE PROJECT PLAN

[Bold items enclosed in brackets denote changes from original text]

Section 1.0 -- Title Page

Work Plan Group: B
Site No.: 11
Site Name: North Chevalier Disposal Area

Prepared by: Mary L. Hiller
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 C. Barksdale
J. Barksdale

E & E QA/QC Director or
Assistant QA/QC Director: Russell Short
T. Yeates/R. Short

E & E ASC Director: R. Clifton
A. Clifton

E & E QAIQC Project Officer: Andrew Schuessler
A. Schuessler

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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 Beadspace 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 Uater	___	Air	___	Duplicates	3
Sediment	___	Biota:		Trip Blanks	2
Soil	15	Flora	___	Field Blanks	2
Groundwater	4	Fauna	___	Rinsate Blanks	2

CATEGORIES OF ANALYSES

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

Additional analytical categories are identified below:

___ Gross Alpha
X Total Organic Carbon
X Eardness (water only)
X Alkalinity
X Total Suspended Solids (water only)
X Total Kjeldahl Nitrogen
X Ammonia Nitrogen
X Orthophosphate Phosphorus
X pH
X Percent Moisture
X Grain Size
X BTU Content
X Ash Content
X Total Halogens
X Sulfur
X Ignitability
X Cation Exchange Capacity

X Dissolved Oxygen (in field)
X 5-day Biological Oxygen Demand
X Chemical Oxygen Demand

Section 4.0 -- Project Organization and Responsibility

The overall organizational structure for this site is discussed in Section 4.0 of the GOAPP. 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/H	N/M	N/M	N/M
Polynuclear Aromatic Eydrocarbons	S/W	--	N/M	N/M	N/M	N/M
Pesticides	S/W	--	N/H	N/M	N/M	N/M
Polychlorinated Biphenyls	S/W	--	N/M	N/M	N/M	N/M
Total Recoverable Hydrocarbons	S/W	EPA 418.1				
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/H	N/M
Copper	S/W	--	N/M	N/M	N/M	N/H
Lead	S/W	--	N/M	N/M	N/M	N/H
Nickel	S/W	--	N/M	N/M	N/M	N/H
Silver	S/W	--	N/M	N/H	N/M	N/M
Zinc	S/W	--	N/M	N/H	N/M	N/M
Laboratory Analyses						
Volatile Halogenated Bydrocarbons	S/W	EPA 8010/601	N/M	N/M	N/H	N/M
Volatile Aromatic Eydrocarbons	S/W	EPA 8020/602	N/M	N/M	N/H	N/M
TCL BNAs	S/W	€PA 8270/625	N/M	N/M	N/H	N/M
TCL Pesticides & PCBs	S/W	EPA 8080/608	N/M	N/M	N/H	N/H
Total Recoverable Bydrocarbons	S/W	EPA 418.1	N/M	N/M	N/M	N/M
TCL Metals:						
Aluminum	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Antimony	S/W	EPA 6010/200.7	N/M	N/H	N/M	N/M
Arsenic	S/W	EPA 7060/206:2	N/M	N/M	N/M	N/M
Barium	S/W	EPA 6010/200.7	N/H	N/M	N/M	N/H
Beryllium	S/W	EPA 6010/200.7	N/M	N/M	N/H	N/M
Boron	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Cadmium	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Calcium	S/W	EPA 6010/200.7	N/H	N/M	N/M	N/M
Chromium	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/H
Cobalt	S/W	EPA 6010/200.7	N/M	N/M	N/H	N/M
Copper	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Iron	S/W	BPA 6010/200.7	N/M	N/M	N/M	N/H
Lead	S/W	EPA 74211239.2	N/M	N/M	N/H	N/M
Magnesium	S/W	EPA 6010/200.7	N/M	N/H	N/M	N/M
Manganese	S/W	EPA 6010/200.7	N/M	N/M	N/H	N/M
Mercury	S/W	EPA 7471/245.1	N/M	N/M	N/H	N/M

Analyte	Media	Method No.	A	P	C	DL
Nickel	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Selenium	S/W	EPA 7740/270.2	N/M	N/M	N/M	N/M
Silver	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Sodium	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Thallium	S/W	EPA 7841/279.2	N/M	N/M	N/M	N/M
Vanadium	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Zinc	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Cyanide	S/W	EPA 9010/335.2	N/M	N/M	N/M	N/M
TOC	S/W	EPA 9060/415.1	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 507	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 Halogens	S	ASTM D-808-81	N/M	N/M	N/M	N/M
		EPA 325.3	N/M	N/M	N/M	N/M
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	N/M	N/M	N/M	N/M
<u>Field Parameters</u>						
pH	W	Field	N/M	N/M	N/M	N/M
Specific Conductance	W	Field	N/M	N/M	N/M	N/M
Temperature	W	Field	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

*
With the exception of Total Recoverable 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 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 GOAPP. Hodifications 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 GOAPP. 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 GOAPP. Hodifications 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 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

APPENDIX C

THREATENED AND ENDANGERED FLORA AND FAUNA ASSOCIATED WITH NAS PENSACOLA

[Bold itens enclosed in brackets denote changes from original text]

0000233

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 FGFWFC(or FDA)	Status USFWS	Habitat
FISHES					
Acipenser oxyrhynchur	Atlantic sturgeon	M	SSC	UR 2	Gulf coast, estuarine
Ammocrypta asprella	Crystal darter	U	T	UR 2	Frorh water
Etheostoma histrio	Harelquin darter	U	SSC		Frorh water
Fundulus jenkinsi	Salt marsh topminnow	P	SSC		Salt, fresh, brackish waters
Lepisosteus spatula	Alligator gar	U	SSC		Brackish, fresh, salt wator
Moxostoma carinatum	River redhorse	U	SSC		Fresh water
AMPHIBIANS AND REPTILES					
Alligator mississippiensis	American Alligator	R	SSC	T(S/A)	Swamps, marshes, pondr
Caretta caretta caretta	Loggerhead turtlo	M ?	T	T	Marine, coastal
Chelonia mydas mydas	Green turtle	M ?	E	E	Marine, coastal
Dermochelys coriacea	Leatherback turtlo	n	E	E	narino, coastal
Drymarchon corais couperi	Eastern indigo snake	P	T	T	Open areas near water
Eretmochelys imbricata	Hawksbill turtlo	M ?	E	6	Marine, coastal
Gopherus polyphemus	Gopher tortoise	P	SSC	UR 1	Sandy coastal plains
Graptemys pulchra	Alabama map turtlo	U	SSC		Swamps, streams, marshes, pondr
Lepidochelys kempi	Atlantic ridley	M ?	E	E	Marine, coastal
Rana areolata aesopus	Florida gopher frog	P	SSC	UR 2	Sand hill communities
Macroclemys temmincki	Alligator snapping turtle	SR	SSC	UR 2	Swamps, marshes, pondr
MAMMALS					
~~Mustela~~ ~~Viron~~ lutensis	Florida mink	U		UR 2	Terrestrial habitats
Peromyscus polionotur trissyllepsis	Perdido K o beach mouse	N/A	T	E	Beach dunes
Trichechus manatus latirostris	West Indian manatee	M	E	E	Atlantic and Gulf coasts
Ursus americanus floridanus	Florida black bear	[illegible]	T	UR 2	Titi swamps

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 10 — Title Page

Vork Plan Group: B
Site No. : 12
Site Name: Scrap Bins

Prepared by: Mary L. Miller
Ecology and Environment, Inc.
1203 Governor's Square Boulevard, Suite 401
Tallahassee, Florida 32301

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

Signature Approvals:

E & E Project Manager: J. Barksdale

E & E QA/QC Director or Assistant QA/QC Director: T. Yeates/R. Short

E & E ASC Director: A. Clifton

E & E QA/QC Project Officer: A. Schuessler

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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 presente 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 ___ EM-34
- ___ Magnetometry
- ___ Very Low Frequency
- ___ Ground Penetrating Radar
- ___ Seismic Refraction
- ___ Seismic Reflection

Analytical Screening (check all that apply):

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

PLANNED NUMBER OF SAMPLES		CATEGORIES OF ANALYSES
Surface Water	___	X Volatile Organic Compounds
Sediment	___	X Polynuclear Aromatic Hydrocarbons
Soil	30	X Phenols
Groundvater	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	___	Air	___	Duplicates	3
Sediment	___	Biota:		Trip Blanks	2
Soil	15	Flora	___	Field Blanks	2
Groundwater	3	Fauna	___	Rinsate Blanks	2

CATEGORIES OF ANALYSES

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

Additional analytical categories are identified below:

- ___ Gross Alpha
- 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 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 vhich are not included in the GQAPP are included in Appendix A of this document.

Section 5.0 — QA/QC Objectives for Measurement Data

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

Analyte	Media	Method No.	A	P	C	DL
*						
Laboratory Screening Analyses						
Volatile Organic Compounds	S/W	--	N/M	N/M	N/M	N/M
Polynuclear Aromatic Eydrocarbons	S/W	--	N/M	N/M	N/M	N/M
Pesticides	S/W	--	N/M	N/M	N/M	N/M
Polychlorinated Biphenyls	S/W	--	N/M	N/M	N/M	N/M
Total Recoverable Hydrocarbons	S/W	EPA 418.1				
Phenols	S/W	--	N/M	N/M	N/M	N/M
Arsenic	S/W	--	N/M	N/M	N/M	N/M
Cadmium	S/W	--	N/M	N/M	N/M	N/M
Chromium	S/W	--	N/M	N/M	N/M	N/M
Copper	S/W	--	N/M	N/M	N/M	N/M
Lead	S/W	--	N/M	N/M	N/M	N/M
Nickel	S/W	--	N/M	N/M	N/M	N/M
Silver	S/W	--	N/M	N/M	N/M	N/M
Zinc	S/W	--	N/M	N/M	N/M	N/M
Laboratory Analyses						
Volatile Halogenated Hydrocarbons	S/W	EPA 8010/601	N/M	N/M	N/M	N/M
Volatile Aromatic Hydrocarbons	S/W	EPA 8020/602	N/M	N/M	N/M	N/M
TCL BNAs	S/W	EPA 8270/625	N/M	N/M	N/M	N/M
TCL Pesticides & PCBs	S/W	EPA 8080/608	N/M	N/M	N/M	N/M
Total Recoverable Hydrocarbons	S/W	EPA 418.1	N/M	N/M	N/M	N/M
TCL Metals:						
Aluminum	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Antimony	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Arsenic	S/W	EPA 7060/206.2	N/M	N/M	N/M	N/M
Barium	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Beryllium	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Boron	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Cadmium	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Calcium	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Chromium	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Cobalt	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Copper	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Iron	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Lead	S/W	EPA 7421/239.2	N/M	N/M	N/M	N/M
Magnesium	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Manganese	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Mercury	S/W	EPA 7471/245.1	N/M	N/M	N/M	N/M

Analyte	Hedia	Method No.	A	P	C	DL
Nickel	S/W	EPA 6010/200.7	N/H	N/M	N/M	N/M
Selenium	S/W	EPA 7740/270.2	N/M	N/M	N/M	N/M
Silver	S/W	EPA 60101200.7	N/M	N/M	N/M	N/H
Sodium	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/H
Thallium	S/W	EPA 7841/279.2	N/M	N/M	N/M	N/H
Vanadium	S/W	EPA 6010/200.7	N/M	N/H	N/M	N/H
Zinc	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Cyanide	S/W	EPA 9010/335.2	N/M	N/M	N/H	N/M
TOC	S/W	EPA 9060/415.1	N/H	N/M	N/M	N/H
Hardness	V	EPA 130.2	N/H	N/M	N/M	N/M
Alkalinity	W	EPA 310.1	N/M	N/H	N/H	N/M
Total Suspended Solids	V	EPA 160.2	N/H	N/M	N/H	N/H
Total Kjeldahl Nitrogen	S/W	EPA 351.3	N/H	N/M	N/M	N/M
Nitrogen-Ammonia	S/W	EPA 350.2	N/M	N/M	N/M	N/H
Orthophosphate Phosphorus	S/W	EPA 365.2	N/H	N/M	N/M	N/M
5-day Biological Oxygen Demand	W	SH 507	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/H	N/M	N/H	N/M
Percent Moisture	S	ASTM D-2216-80	N/H	N/M	N/M	N/
Grain Size	S	ASTH D-422-63	N/M	N/M	N/M	N/M
BTU Content	S	ASTH D-2015-77	N/M	N/M	N/M	N/H
Ash Content	S	ASTH D-482	N/M	N/M	N/H	N/M
Total Halogens	S	ASTH D-808-81	N/M	N/H	N/M	N/M
		EPA 325.3	N/H	N/M	N/M	N/M
Sulfur	S	ASTH D-129-64	N/M	N/M	N/M	N/M
Ignitability	S/W	EPA 1010	N/H	N/M	N/M	N/M
Cation Exchange Capacity	S	EPA 9081	N/H	N/M	N/M	N/M
Field Parameters						
pH	W	field	N/H	N/H	N/M	N/M
Specific Conductance	W	Field	N/H	N/M	N/M	N/M
Temperature	W	Field	N/M	N/M	N/H	N/M
Dissolved Oxygen	W	EPA 360.1	N/H	N/M	N/H	N/M

Notes: S = Soil and/or sediment
W = Groundvater and/or surface vater
N/M = No Modifications from GQAPP

*
With the exception of Total Recoverable Bydrocarbons and Gross Alpha, the laboratory screening analyses do not have EPA method numbers.

Section 6.0 -- Pieldvork 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 GOAPP. 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 Haintenance

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 GQAPP. 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

Work Plan Group: B
Site No.: 26
Site Name: Supply Department Outside Storage

Prepared by: Mary L. Miller
Ecology and Environment, Inc.
1203 Governor's Square Boulevard, Suite 401
Tallahassee, Florida 32301

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

Signature Approvals:

E & E Project Manager: J. Barksdale

E & E QA/QC Director or, Assistant QA/QC Director: T. Yeates/R. Short

E & E ASC Director: A. Clifton

E & E QA/QC Project Officer: A. Schuessler

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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	2
Sediment	___	Biota:		Trip Blanks	2
Soil	10	Flora	___	Field Blanks	2
Groundvater	3	Fauna	___	Rinsate Blanks	2

CATEGORIES OF ANALYSES

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

Additional analytical categories are identified belov:

- ___ Gross Alpha
- X Total Organic Carbon
- X Eardness (water only)
- X Alkalinity
- X Total Suspended Solids (vater 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 Hoisture
- X Grain Size
- X BTU Content
- X Ash Content
- X Total 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/M	N/M	N/M
Polychlorinated Biphenyls	S/W	--	N/M	N/M	N/M	N/M
Total Recoverable Hydrocarbons	S/W	EPA 418.1				
Phenols	S/W	--	N/H	N/M	N/M	N/M
Arsenic	S/W	--	N/M	N/M	N/M	N/M
Cadmium	S/W	--	N/M	N/M	N/M	N/M
Chromium	S/W	--	N/M	N/M	N/M	N/M
Copper	S/W	--	N/M	N/M	N/M	N/M
Lead	S/W	--	N/M	N/M	N/M	N/M
Nickel	S/W	--	N/M	N/M	N/M	N/M
Silver	S/W	--	N/M	N/M	N/M	N/M
Zinc	S/W	--	N/M	N/M	N/M	N/M
Laboratory Analyses						
Volatile Halogenated Hydrocarbons	S/W	EPA 8010/601	N/M	N/M	N/M	N/H
Volatile Aromatic Hydrocarbons	S/W	EPA 8020/602	N/M	N/M	N/H	N/H
TCL Purgeables + xylene	S/W	EPA 8240/624	N/M	N/M	N/H	N/M
TCL BNAs	S/W	EPA 8270/625	N/M	N/M	N/M	N/M
TCL Pesticides & PCBs	S/W	BPA 8080/608	N/M	N/M	N/H	N/M
Total Recoverable Eydrocarbons	S/W	EPA 418.1	N/M	N/M	N/M	N/H
TCL Metals:						
Aluminum	S/W	BPA 6010/200.7	N/M	N/M	N/H	N/H
Antimony	S/W	BPA 6010/200.7	N/M	N/M	N/M	N/M
Arsenic	S/W	BPA 7060/206.2	N/M	N/M	N/M	N/H
Barium	S/W	BPA 6010/200.7	N/M	N/M	N/M	N/H
Beryllium	S/W	BPA 6010/200.7	N/M	N/M	N/M	N/H
Boron	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/H
Cadmium	S/W	EPA 6010/200.7	N/M	N/H	N/M	N/H
Calcium	S/W	EPA 6010/200.7	N/H	N/H	N/H	N/M
Chromium	S/W	EPA 6010/200.7	N/H	N/M	N/H	N/H
Cobalt	S/W	EPA 6010/200.7	N/M	N/H	N/M	N/H
Copper	S/W	EPA 6010/200.7	N/M	N/H	N/M	N/M
Iron	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Lead	S/W	EPA 7421/239.2	N/H	N/H	N/M	N/H
Hagnesium	S/W	EPA 6010/200.7	N/M	N/M	N/H	N/M
Hanganese	S/W	EPA 6010/200.7	N/M	N/M	N/H	N/M
Mercury	S/W	EPA 7471/245.1	N/H	N/H	N/M	N/M

Analyte	Media	Method No.	A	P	C	DL
Nickel	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Selenium	S/W	EPA 7740/270.2	N/M	N/M	N/M	N/M
Silver	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Sodium	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Thallium	S/W	EPA 7841/279.2	N/M	N/M	N/M	N/M
Vanadium	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Zinc	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Cyanide	S/W	EPA 9010/335.2	N/M	N/M	N/M	N/M
TOC	S/W	EPA 9060/415.1	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 507	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 Halogens	S	ASTM D-808-81	N/M	N/M	N/M	N/M
		EPA 325.3	N/M	N/M	N/M	N/M
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	N/M	N/M	N/M	N/M
Field Parameters						
pH	W	Field	N/M	N/M	N/M	N/M
Specific Conductance	W	Field	N/M	N/M	N/M	N/M
Temperature	W	Field	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

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

Section 6.0 — Pieldvork and Sampling Procedures

Fieldwork and sampling procedures are presented in Section 6.0 of the GQAPP. Hodifications 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 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 Hodifications

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. Hodifications 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 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 Modifications

Section 16.0 -- Quality Assurance Reports to Management

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

No Modifications

Appendix C (Cont).

Scientific Name	Common Name	Base status	status FGFWFC(or FDA)	USFWS	Habitat
BIRDS					
Charadriur melodus	Piping Plover	P	T	T	Open dry, sandy beaches
Charadrius alexandrinus	Snowy plover	P	T	UR 2	open dry, sandy beaches
Dendroida dominica stoddardi	Stoddard's yellow-throated warbler	P-u		UR 2	Wooded habitats
Dendroica kirtlandii	Kirtland's warbler	U	E	E	Wooded habitats
Haematopus palliatus	American oystercatcher	U	SSC		Coastal habitats
Egretta rufescrns	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 wetlands
Crus canadensis pratensis	Florida sandhill crane	U	T		Freshwater wetlands
Falco peregrinus tundrius	Arctic peregrine Lalcon	M	E	T	Winters on coasts
Falco sparverius paulus	Southeastern 'kestrel	R	T	UR 2	Open pine forests, clearings
Haematopus palliatus	American oystercatcher	P-u	SSC		Open coastal beaches
Haliaeetus leucocephalus	Bald eagle	P-U	T	E	Pine forests/coastal habitat
Pandion haliaetus	osprey	R	SSC		Near water
Pelecanus occidentalis	Brown pelican	R	SSC	AC	Mangrove trees, coasts
Picoides borealis	Red-cockaded woodpecker	P-u	T	E	Cavity nests/old pine stands
Vermivora bachmanii	Bachmann's warbler	U	E	E	Wooded habitats
Campephilus principalis	Ivory-billed woodpecker	U	E	E	Wooded habitats
Sterna antillarum	Least tern	U	T		Coastal habitats
flycteria americana	Wood stork	U	E	E	Freshwater/coastal wetlands
Rostrharus sociabilis	Snail kite	U	E	E	Freshwater/coastal wetlands
INVERTEBRATES					
Copris gopheri	Scarab beetle	P		UR 2	Associated w/Gopher Tortoise

Scientific Name	Common Name	Base * Status	Status FGFWFC(or FDA)	USFWS	Habitat
PLANTS					
Chrysopsis gossypina cruiseana	Cruise's golden-aster	P	e	UR 1	Coastal dunes
Drosera intermedia	Spoon-leaved sundew	R	T		Aquatic habitats
Epigaea repens	Trailing arbutus	U	E		Dry, acid, randy roil
Kalmia latifolia	Mountain laurel	U	T		Rich, moist, shady woods
Lilaeopsis carolinensis	Carolina lilaeopsis	R		UR 2	
Lilium iridollae	Panhandle lily	U	E	UR 2	Black, mucky soils
Pinguicula planifolia	Chapman's buttorwort	U	RE	UR 2	
Polygonella macrophylla	Large-leaved jointweed	R	T	UR 1	Sand pino-oak scrub
Rhododendron austrinum	Orange azalea	U	E	UR 5	Moist, woody habitats
Sarracenia leucophylla	White-top pitchorplant	R	E		Open acid bogs
Sarracenia rubra	Sweet pitchorplant	U	E	UR 2	Acid bogs/slash pine woodr
Stewartia malacodnedron	Silky camellia	U	E		Slopes of wooded ravines

E = Endangered
T = Threatened
UR 1 = Under review, for Federal listing with substantial evidence in existence indicating at least some degree of biological vulnerability and/or threat.
UR 2 = Under review, insufficient biological data available.
UR 5 = Candidate species, but taxa has proven to bo more widespread than was previously believed and/or thoro species that are not rubjoct to any identifiable throat.
FDA = Florida Department of Agriculture.
FGFWFC = Florida Game and Freshwater Fish Commirrion.
USFWS = U.S. Fish and Wildlife Service.

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Base * = Status of species on tho HAS 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.