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CONTAMINATION ASSESSMENT/ REMEDIAL ACTIVITIES INVESTIGATION WORK PIAN -- GROUP M NAVAL AIR STATION PENSACOIA PENSACOIA, FLORIDA

Soil North of Building 648 (Site 31)

July, 1990

Prepared for:

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SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
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Contract Number N62467-88-C-0200

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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 Soil North of Building 648 (Site 31) 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 which 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.

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2. SITE DESCRIPTION

Site 31, located adjacent to and north of Building 648, and adjacent to and west of Murray Road is a 100 by 200 foot unpaved area characterized by well-drained sandy soils. As shown on Figure 2-1, Bayou Grande is located approximately 1,300 feet north of the site; however, the nearest surface water body is a small creek 800 feet south of the site (USGS 1970a). Topographically, the site and immediate vicinity is generally flat, with land surface elevations ranging from 25 to 28 feet above mean sea level (MSL)(USGS 1970a). North of the site is a large, tree-covered park area (see Figure 2-2). Immediately west of the site is a covered storage area and Building 693. Approximately 400 feet west of Building 648 and Site 31 is the A.C. Read Golf Course.

The site area is enclosed by an iron and concrete fence. At the time of the E & E initial site reconnaissance, the following were stored within this enclosure: a temporary storage trailer, located near the northwest corner of Building 648; several 55 gallon drums, located near the center of the site; and a monitoring well (GM-1), located approximately 20 feet north of the northeast corner of Building 648 (Geraghty and Miller [G & M] 1984).

Monitoring well GM-1, installed by G & M in 1984, is screened from 23.8 feet to 26.3 feet (see Figure 2-2). Monitoring well GM-2, installed at the same time, is located approximately 700 feet east of Site 31. Well GM-2 is located on Site 27 and is screened from 17.7 to 20.2 feet (G & M 1984). An NAS Pensacola supply well (Well No. 2), is located approximately 1,300 feet southwest of the site. This well is screened from 110 to 160 feet and the well casing is 24 inches in diameter terminating in a 12 inch diameter screen (Wilkins ~~et al~~. 1985). Site 31 is located approximately 500 feet northwest of NAS Pensacola Sites 25 and 27.

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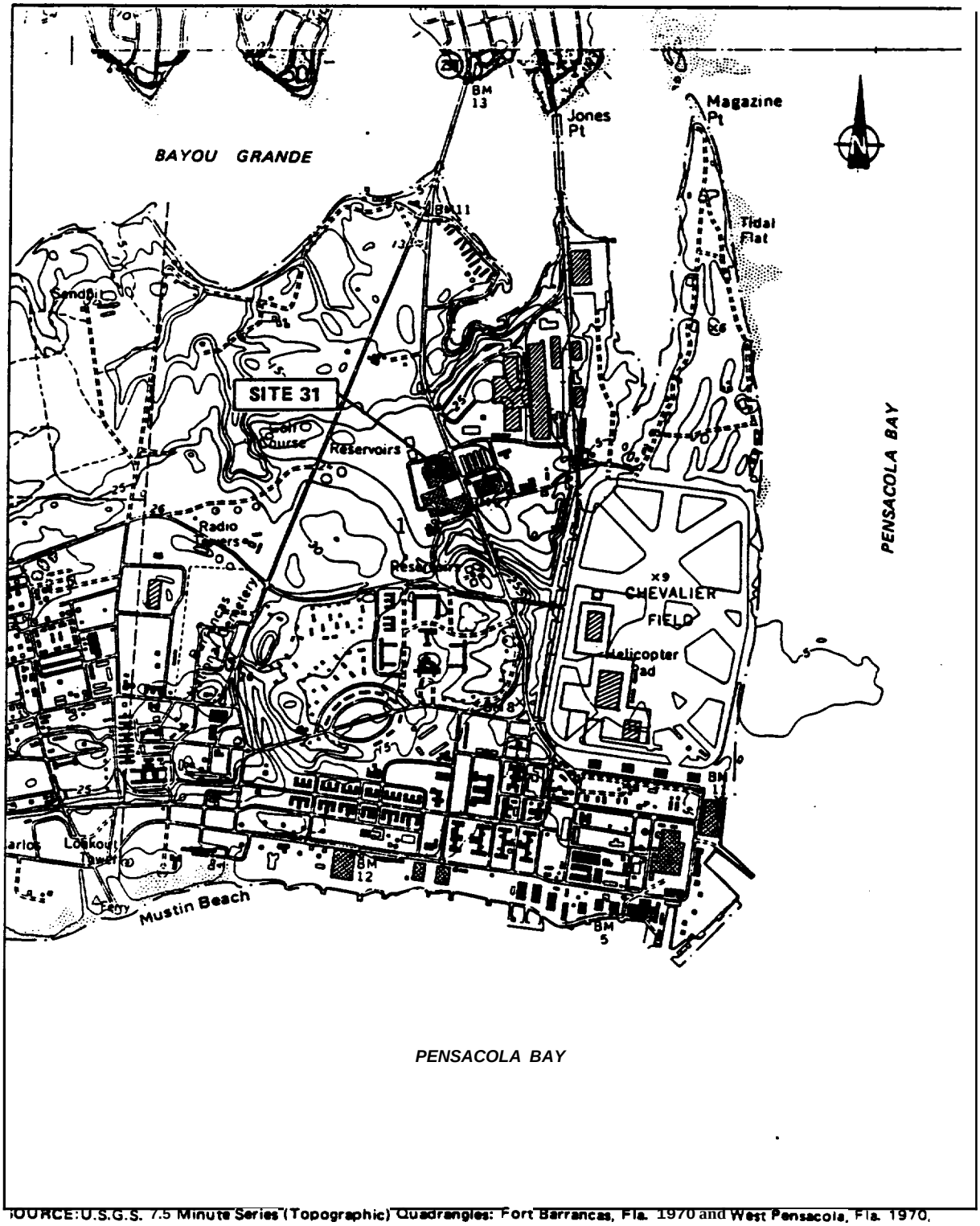

SOURCE: U.S.G.S. 7.5 Minute Series (Topographic) Quadrangles: Fort Barrancas, Fla. 1970 and West Pensacola, Fla. 1970, Photorevised 1987

SCALE

0 ½ 1 MILE

0 .5 1 KILOMETER

Figure 2–1 LOCATION MAP – NAS PENSACOLA SITE 31

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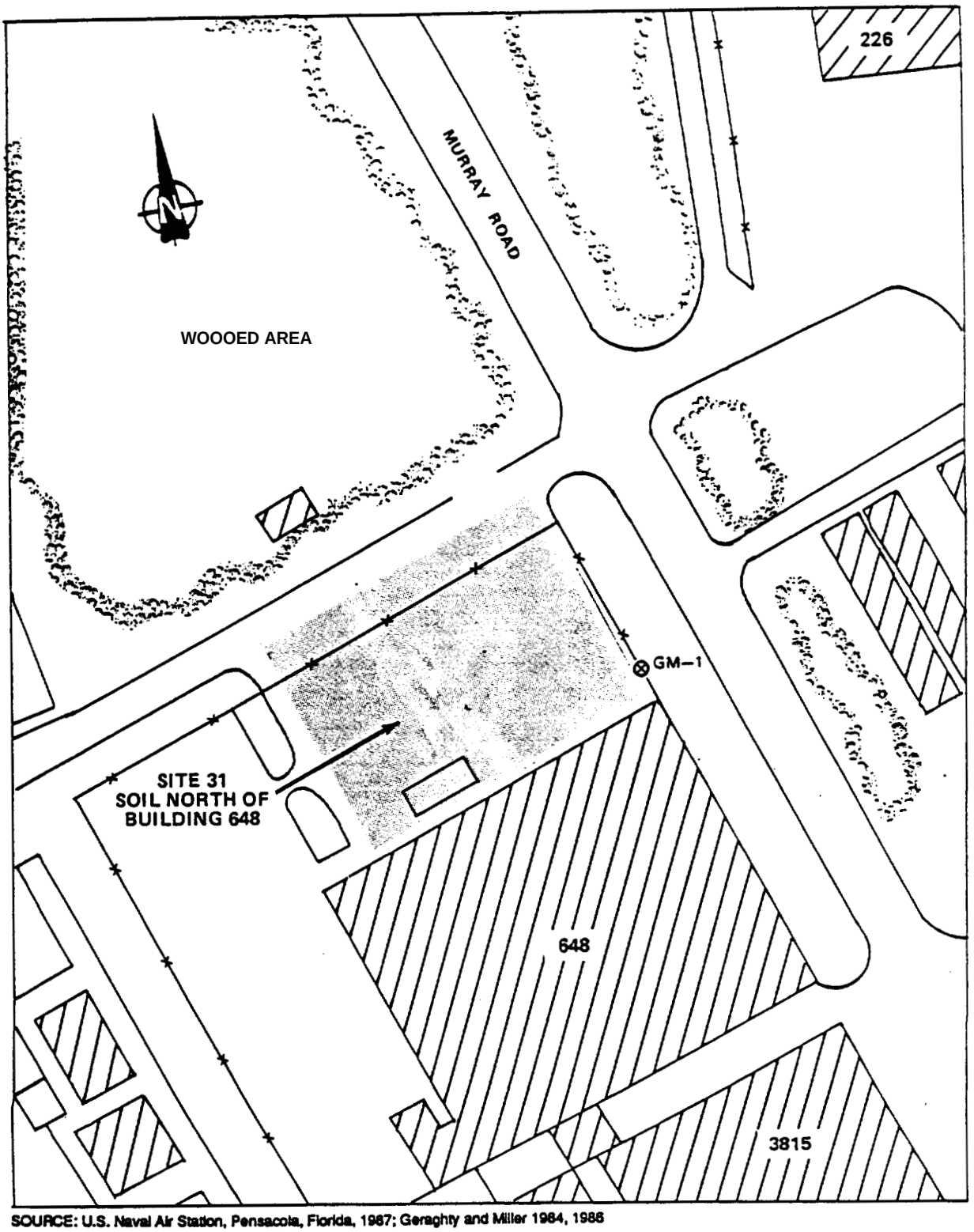

SOURCE: U.S. Naval Air Station, Pensacola, Florida, 1987; Geraghty and Miller 1984, 1986

SCALE

0 50 100 200 300 FEET

KEY:

Building

Existing Monitoring Well

Figure 2–2 SITE MAP • NAS PENSACOLA SITE 31

3. SITE HISTORY

Building 648 has been used for painting operations since 1949 (Naval Energy and Environmental Support Activity [NEESA] 1983). Until 1973, paint waste and spent paint thinner were discarded in the unpaved area north of the building (Site 31). It is estimated that over the 24 year period, 20,000 gallons of waste paint thinners and paint, as well as 8,600 gallons of paint sludges removed from water well paint booths, were poured directly onto the ground adjacent to the building. Paints and thinners that were commoqly used by the Naval Aviation Depot (NADEP) included: cellulose nitrate lacquer; zinc chromate; nitrate dope; acetate dope; "day-glow"; epoxy; enamel; lacquer thinner; toluene; and M-T-6096 (NEESA 1983; G & M 1984).

In June 1983, an Initial Assessment Study (IAS) of 29 potentially contaminated sites was Completed by NEESA at NAS Pensacola. Site 31 was not included in this study; however, at a meeting with the Florida Department of Environmental Regulation (FDER) in November 1983, this site, along with three others, was added to the list of sites included in a Verification Study conducted by G & M (1984).

In July 1984, G & M completed the Verification Study for 18 sites, including Site 31, at NAS Pensacola. During the study, monitoring well GM-1 was installed on-site and monitoring well GM-2 was installed approximately 700 feet to the east, on Site 27. Analysis of the groundwater from well GM-1 revealed low levels of five volatile organic compounds: methylene chloride, 2.1 ug/L; 1,1-dichloroethene, 0.1 ug/L; chloroform, 4.6 ug/L; 1,1,1-trichloroethane, 1.7 ug/L; and tetrachloroethene, 0.4 ug/L. Analysis of groundwater from well GM-2 revealed some of the same contaminants at comparable concentrations:

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chloroform, 3.7 ug/L; 1,1,1-trichloroethane, 2.5 ug/L; and tetrachloroethene, 0.6 ug/L; as well as an elevated concentration of 1,2-dichloroethane, 29 ug/L (see Table 3-1). According to G & H (1984) the direction and rate of shallow groundwater flow suggest that the volatile organic contamination found at Site 27 may have originated at Site 31. G & H recommended the installation of three additional shallow monitoring wells east of the two sites near the drainage ditch, and the installation of a deep well next to GH-2, in order to further define the horizontal and vertical extents of contamination.

During a subsequent Characterization Study (G & M 1986), two of the recommended shallow monitoring vells (GH-55 and GH-58) were installed approximately 1,600 feet east of Site 31 near the drainage ditch, and the recommended deep well (GH-54) was installed near well GM-2 on Site 27. Shallow wells GH-55 and GM-58 are screened from 23.5 to 26 feet and 23 to 25.5 feet, respectively. The deep well, GH-54, is screened from 109.5 to 114.5 feet (G & H 1986). Analysis of the groundwater samples collected from monitoring wells GH-54 and GH-55 did not reveal any volatile organic contamination. Eiowever, a concentration of 8 ug/L, 1,1,1-trichloroethane was detected in the groundwater sample from monitoring well GM-58. Groundwater samples collected from monitoring wells GH-1 and GH-2 during the Characterization Study (G & M 1986) exhibited significantly fewer contaminants at lower concentrations than during the previous sampling effort in 1984. During the 1986 study, groundwater from monitoring well GM-1 did not exhibit any volatile organic contamination, and groundwater from monitoring well GH-2 was found to contain 3 ug/L trichloroethene (G & H 1986)(see Table 3-1). G & H (1986) stated that water level elevations indicated a north-northeasterly groundwater flow, differing from the easterly flow estimated in the Verification Study (G & M 1984). A more accurate determination of groundwater flow is needed for the site.

An additional study was conducted in the site vicinity in 1988, apparently in an attempt to eliminate the site [from] consider[ation] as a hazardous waste site, which would allow NAS Pensacola to proceed with

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TABLE 3-1

SUMMARY OF GROUNDWATER ANALYTICAL RESULTS
FOR SITE 31 (µg/l [ppb])

Compounds Detected (EPA Methods 601 and 602)	Monitoring Well Number											
	GM-1		Gn-2		GH-52		GM-54		GM-55		GM-58	
	VS	CS	VS	CS	VS	CS	VS	CS	VS	CS	VS	CS
Methylene chloride	2.1	--	--	--	NA	--	NA	--	NA	--	NA	--
1,1-dichloroethene	0.1	--	--	--	NA	--	NA	--	NA	--	NA	--
Chloroform	4.6	--	3.7	--	NA	--	NA	--	NA	--	NA	--
1.2-dichloroethane	--	--	29	--	NA	--	NA	--	NA	--	NA	--
1,1,1-trichloroethane	1.7	--	2.5	--	NA	--	NA	--	NA	8	NA	--
Trichloroethene	--	--	5.2	3	NA	--	NA	--	NA	--	NA	210
Tetrachloroethene	0.4	--	0.6	--	NA	--	NA	--	NA	--	NA	--
Trans-1,2-dichloroethene	--	--	--	--	NA	--	NA	--	NA	--	NA	530
Vinyl chloride	--	--	--	--	NA	--	NA	--	NA	--	NA	13

VS = Verification Study, Geraghty and Miller, 1984.
CS = Characterization Study, Geraghty and Miller, 1986.

-- = Not present above detection limits.
NA = Not Applicable - wells were not installed at this date.

the construction of a proposed building. Under the Naval Installation and Restoration Program (NIRP), ERM-Southeast, Inc. (ERM) was retained by the Southern Division Naval Facilities Engineering Command (SOUTHDIV) to complete a site investigation for Site 31 at Building 649. There is some confusion as to the actual location of samples collected during the ERM investigation. Site 31, as designated by this investigation (shown in Figure 2-2), is immediately north of Building 648. However, the ERH report locates the site north of Building 649. According to the Navy, samples taken during the ERM investigation were actually collected in front of Building 648 (Greene 1989). Low levels of semi-volatile organics, PCB-1260, and 4,4-DDE were found in soil samples collected. ERM concluded that the low levels of contaminants present at the site posed no apparent threat to human health or the environment and that the planned construction activity should proceed.

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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 (Wolfe et al. **1988).**

Precipitation rates in the NAS Pensacola vicinity are relatively high with an average annual rainfall of approximately [60] inches. Rainfall amounts are highest in July and August during almost daily thunderstorms (averaging **[7]** inches per month) and lowest during spring and fall (averaging [4] inches per month)([Kennedy **1982]).** High intensity thunderstorms are common, producing as much as 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 geminata (twin live oak), and the stunted shrubs species Yucca aloifolia (yucca), Opuntia, and Cereus. This community type has been ranked by the Florida Natural Areas Inventory (FNAI) as locally restricted and vulnerable to extinction due to developmental activities. This community type can have 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). Flatwoods communities also occupy areas of low depressions and small creeks and drainage courses, but the overstory vegetation is usually replaced by Taxodium ascendens (pond cypress), Cliftonia monophylla (black titi), Cyrilla facemiflora (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).

Preshvater Wetland Vegetation. Much of the geological material underlying the NAS Pensacola facility is deep, porous sand often containing relatively impermeable clay lenses. In combination with high 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 the presence of the [illegible] se Gopherus polyphemus, can most likely be found in suitable habitats on the western portions of the facility (see Appendix C). Most 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

Preshvater. 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 (Wolfe ~~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 saltmarch 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 **tzschoides, and** Hemiaulus **p The** zooplankton is primarily dominated by Calonoid copepods and benthic invertebrate larvae. This study is very limited by the fact that samples were collected with undefined methods and only during the early spring. This sampling protocol does not define population fluctuations that are characteristic of low population abundances commonly found in estuaries during the summer months. Examination of the zooplankton data results in the same conclusions. It should be pointed out that any contamination entering Pensacola Bay from either groundwater or surface water sources may be accumulated in the invertebrate larvae that predominate most estuarine water bodies.

Benthos. Marine soft-sediment communities are found adjacent to the northern, eastern, and southern areas of the NAS Pensacola facility in Pensacola Bay. Although no intensive benthic surveys were conducted along the perimeter of the facility, surveys at nearby sites by the Florida Department of Environmental Regulation (FDER) and the Navy have described the benthic communities within Pensacola Bay as a whole. FDER collected benthic samples in most of Pensacola Bay and found that the sediments were dominated by polychaetes (Aricidea spp., Capitella spp., various spionids and Haploscoloplos spp.) and bivalves (Anodontia

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alba and Tellina spp.) during most of the year. FDER samples collected along the wastewater treatment plant outfall show a drastic drop in species abundance and diversity close to the sewage outfall (Navy 1986). This indicates that the benthic community 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. Hovever, the Navy's data reveals that very few deep dvelling organisms reside in the areas around the turning basin, and a lack of deep dvelling benthic organisms may be an indication of a benthic community under stressed conditions (Luckenbach et al. 1988).

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

Fish diversity was highest in the more saline waters near the NAS Pensacola facility during spring and summer. In the less saline waters of East Bay, diversity was lowest in summer and highest during the vinter months. Fish population density vas 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 & 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 commercially 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. Few mammals have been sighted within the area of the NAS Pensacola facility, most of the 13 species of mammals reported for the northeastern Gulf of Hexico stay predominantly in Gulf waters. The atlantic bottlenose dolphin (Tursiops truncatus), hovever, has been sighted regularly off the NAS Pensacola facility. Manatees have been sighted irregularly, with one recent sighting in the area recorded by the FNAI in October 1988. A goosebeaked whale (Ziphius cavirostris) was reported stranded on Santa Rosa Island, and a pilot whale (Globicephala macrorhynchus) was found stranded on a beach near Pensacola (Navy 1986).

Although no surveys of marine mammals have been conducted, it can be assumed that they are are quantatively 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 with the wetland or bog habitats found on NAS Pensacola. A total of 57 occurrences for six plant species were recorded in an inventory conducted by FNAI (1988b) of the NAS Pensacola facility (see Appendix C). Most of these plants were found in the area around Sherman Field and habitats to the west. Any site remediation and, more importantly, any assessment of environmental endangerment, must consider the water level requirements of rare and endangered plant species, the foraging activities of birds in the waters surrounding the NAS Pensacola facility, as well as nesting and feeding animals on the

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facility grounds. Complete biotic surveys may be necessary to determine the presence of threatened or endangered species and potential pathways of contamination to these species.

5.2 Site-Specific Biological Resources

Site 31 is located within the industrialized portion of NAS Pensacola. A wooded area consisting of an altered sand pine scrub community habitat exists north of the site. The understory in this wooded area was removed during the establishment of a park area. Although the site is unpaved, it is not expected that flora or fauna from nearby habitats utilize this site for feeding 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.

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The discharge of surface waters into Pensacola Bay, Bayou Grande, and the coastal wetland areas presents the potential for transport of contaminants into these systems. This could have a significant impact on seagrass and other sensitive plant communities, as well as on shell fishing, recreational fishing, and swimming in these coastal zones. Discharges, either through the surface water or groundwater, into wetland areas found on-site could also have a significant impact on the biotic communities that are dependent on those habitats.

6.2 Site-Specific Surface Water Hydrology

No surface water bodies occur on or in the immediate vicinity of Site 31. The nearest body of surface water, an unnamed creek and marshy area, is located approximately 800 feet south of Site 31. A cove of Bayou Grande is located approximately 1,300 feet north of Site 31 and an unnamed drainage ditch, which flows north to Bayou Grande, is located approximately 1,500 feet east of the site. A small pond associated with the golf course is located approximately 2,000 feet to the west.

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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.

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7.1.2.1 Surficial/Sand-and-Gravel Aquifer

The Surficial Aquifer occurs from land surface to a depth of approximately 300 feet at NAS Pensacola and is [composed] of a sequence of unconsolidated to poorly indurated clastic deposits (Wagner et al. 1984). In this portion of Florida the Surficial Aquifer constitutes an important source of 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 Eolocene 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 (Uilkins 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 is [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 groundvater 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. Horizontal

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groundwater flow velocities in the surficial zone will depend on site-specific hydraulic conductivities and horizontal hydraulic gradients; however, velocities would generally be expected to be high.

Lev 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

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Pensacola are wells located at Corry Field, approximately 3 miles to the north. The thickness of the main producing zone can be highly variable: however, it is estimated to be up to about 100 feet at NAS Pensacola. Insufficient data exist for wells open to the main producing zone at NAS Pensacola to determine direction of groundwater flow vithin this zone; however, 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 toward 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 lower than that in an adjacent well open to the surficial zone (G & M 1986). This indicates that a significant downward hydraulic gradient exists between these two zones. Thus, a considerable potential exists for vertical groundwater flow 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 (Vilkins 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 vhich may yield small quantities of water. In the NAS Pensacola area, the Intermediate System is approximately 1,100 feet thick and is composed of the lower portion of

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the Miocene Coarse Clastics, the Upper Member of the Pensacola Clay, the Escambia Sand Member of the Pensacola Clay, and the Lower Member of the Pensacola Clay; all are of Miocene Age.

7.1.2.3 Floridan Aquifer System

Immediately underlying the Intermediate System and occurring at a depth of approximately 1,500 feet 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 Site 31, the surficial zone of the Sand-and Gravel Aquifer occurs from land surface to a depth of approximately 73 feet. The lithologic description of cuttings collected during the installation of monitoring well GM-54, located near Site 27, indicates that this zone primarily [consists] of tan and brown, fine to medium-grained quartz sand. Only one shallow monitoring well open to the surficial zone exists in the immediate proximity of Site 31 (see Figure 2-2). This well (GM-1) has indicated that the water table in this area occurs approximately 14 feet below land surface. Another shallow well (GM-2) exists approximately 700 feet southeast of GM-1 and is associated with Site 27. Based on water-level data collected from both of these wells (G & M 1984') the direction of groundwater flow is generally to the east toward an unnamed creek, and the horizontal hydraulic gradient is approximately 0.005. No aquifer tests have been conducted on wells open to the surficial zone in the immediate vicinity of Site 31. However, according to the reported results from tests on shallow wells located elsewhre on NAS Pensacola, hydraulic conductivities range from 16 to 57 ft/day and average approximately 30 ft/day. Assuming an effective porosity of 0.20, a groundwater flow velocity for the surficial zone in this area is estimated to be approximately 0.75 ft/day or 274 ft/year (G & M 1986).

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Immediately underlying the surficial zone in the vicinity of Site 31, and extending to a depth of approximately 105 feet, is the low permeability zone of the Sand-and-Gravel Aquifer. Based on the cuttings from the installation of well GH-54, this zone primarily [consists] 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 Site 31; however, based on the lithology, this zone would be expected to function as a confining or semi-confining unit restricting the flow of groundwater between the surficial zone and the underlying main producing zone. The direction of groundwater flow within the low permeability zone is unknown.

The top of the main producing zone occurs at approximately 110 feet below land surface in the site vicinity and consists of fine-grained quartz sand to a depth of at least 120 feet. Monitoring well GH-54 is screened between 109.5 and 114.5 feet and is open to the upper portion of this zone. The water level elevation in well GM-54 is approximately 7 feet lower than that in well GM-2 (located 30 feet southeast of GM-54), indicating a significant downward hydraulic gradient between the surficial zone and the main producing zone in this area (approximately 0.09)(G & M 1984). Thus, depending on the vertical hydraulic gradient of the low permeability zone at this site location, there exists a significant potential for downward groundwater flow from the surficial zone into the main producing zone.

The direction of groundwater flow within the main producing zone at this site is unknown; however, a generally southward flow is expected. An NAS Pensacola supply well (Well No. 2) is located approximately 1,300 feet southwest of Site 31, is screened between 110 and 160 feet below land surface, and thus is open to the main producing zone. This well is utilized by NAS Pensacola for back-up water supply only during periods of peak demand. However, during these periods of pumping, the direction of flow in the main producing zone could be affected over a large area. Insufficient data exists for wells open to the main producing zone to allow a determination of hydraulic gradient 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 Site 31 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 GHSP will be periodically updated, as required, during the course of this program.

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

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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 (SQAP).

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 II) 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 Site 31. Available aerial photographs and maps will be used as guides in locating surface features. Visual inspections will be made regarding surface conditions, stressed vegetation, surface drainage patterns, and areas of staining.

During the reconnaissance survey, the field team will identify areas that 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 air monitoring equipment during walkovers of the site, in accordance with Sections 6.1.1 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

In order to identify potential source areas where volatile organic releases (hot spots) are occurring, a surface emissions survey will be performed across all unpaved areas of Site 31, using an HNu photo-ionization detector or Organic Vapor Analyzer (OVA). Prior to the survey, a sampling grid with 25-foot centers will be laid out, using the method described in Section 14.1.2. In addtion, the sampling team will carefully record the location and dimensions of any areas characterized by visible staining and/or exposed waste materials. Detailed notes of site activities and current weather information will be recorded in the site logbook. 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 site logbook.

[In addition, preliminary air screening will be conducted vith 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 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 migration. 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

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populations of plants and animals. A habitat/biota survey will be conducted for Site 31 as well as an evaluation of the literature sources.

14.1.2 Geophysical Survey

Site 31 and the surrounding, local areas will require an electromagnetic terrain conductivity survey (EM-31) and magnetometer (Mag) survey. The surveys 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 25-foot intervals. A transit survey instrument will be used to establish the baselines, and a Brunton compass and tape measure will be be used to complete the grid system for the study area. The grid spacing will be based on 25-foot centers. The EM-31 and Mag surveys will be conducted by obtaining measurements at each grid point.

The geophysical data will be used in conjunction with other background data obtained to identify anomolous conditions in the site area; water table conditions; the location of potential subsurface contaminant plumes; and the horizontal and vertical orientation of contaminant plumes, if located. Ultimately, the interpretation of this data will be a primary consideration in the development of a rationale for Phase I and Phase II monitoring well placement strategies.

14.1.3 Analytical Screening

14.1.3.1 Laboratory Analyses

Phase I activities for Site 31 will include soil sampling, the installation of shallow temporary monitoring wells, and groundwater sampling. 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

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

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.

Soils -- Soil samples will be collected at 11 locations on Site 31 (see Figure 14-1). At each location soils will be collected and cornposited over 5 foot intervals, from the surface to the water table. Assuming the depth to water is approximately 20 feet below land surface (G & M 1986), it is estimated that 4 soil samples will be collected at each location'for a total of 44 samples. Samples will be collected using a portable drill rig with 4-inch diameter solid stem augers. In those areas where it is impractical to use the portable drill rig, a hand operated bucket auger will be employed. All soil sampling and equipment decontamination activities will be conducted in accordance with Sections 6.6 and 6.10 of the GQAPP.

Groundwater -- Four temporary monitoring wells will be installed on Site 31 during Phase I at the locations shown in Figure 14-1. The exact locations of the temporary monitoring wells will be determined after the completion of the physical and geophysical surveys. Each temporary monitoring well will be constructed of 2-inch stainless steel casing, terminating in 5 feet of 0.01-inch slotted, stainless steel screen. Each well will be installed so that the well screen brackets the water table (i.e., the top of the screen extends slightly'above the water level). Following installation, each well will be developed in accordance with Section 6.7.5 of the GQAPP.

Each of the four temporary monitoring wells and existing well GM-1 will be purged and sampled in accordance with Sections 6.7 and 6.8 of the GQAPP. All temporary stainless steel casings and screens and groundwater sampling equipment will be decontaminated in accordance with Section 6.10 of the GOAPP.

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

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Table 14-1

PHASE I SAMPLING AND ANALYTICAL REQUIREMENTS—GROUP M

SITE 31

Medium	No. of Samples	Duplicates	Tota	Analytical Suite[a,b]
[Soil]	44	2	46	A
Grouadwater[d]	[4]	1	151	A
TOTAL	[48]	3	[51]	

[

Medium	No. of Samples	Dupli-cates	Trip Blanks[e]	Field Blanks	Rinsate Blanks	Preservative Blanks[g]	Total	Analytical Suite[a,c]
Groundwater[e]	1	1	1	1	1	1	6	B

[a]Analytical suitm designations arm as follows:

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

IS = Target Compound List (TCL) volatile organic compounds plus xylene and ketones, TCL base/neutral and acid extractable organic compounds, T U pesticides and PCBs, total recoverable hydrocarbons, T U 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 tho various chemical groups included within analytical suite A are identified in Tables 9-1 through 9-4 of the Generic Quality Assurance Project Plan.

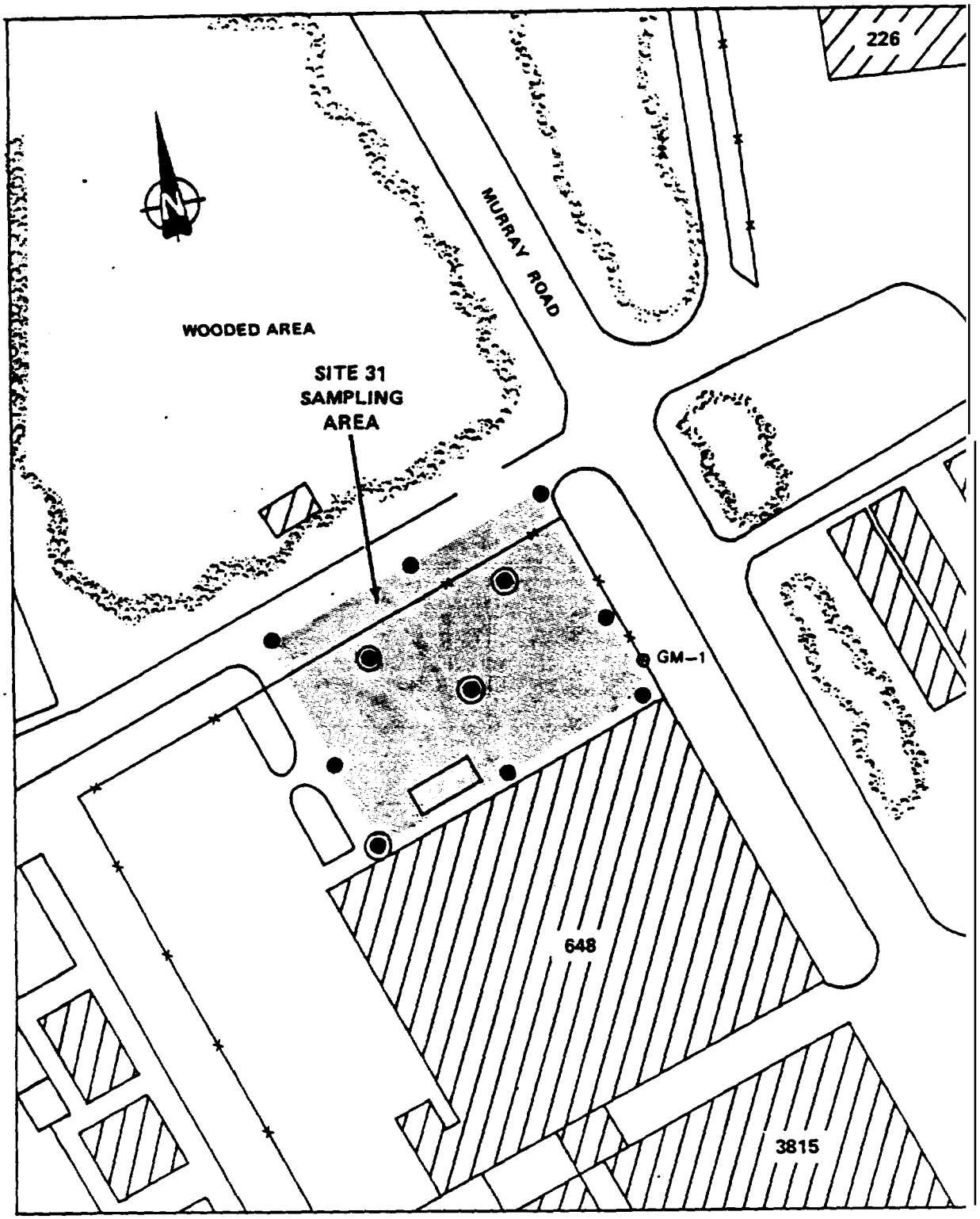
[[c]Specific constituents encompassed by tho various chemical groups included within the above-listed analytical suite B are identified in Tables 9-5 through 9-13 of the GQAPP.

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

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

[f]Trip blanks will be analyzed for TCL volatile organics only.

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



SOURCE: U.S. Naval Air Station, Pensacola, Florida, 1987; Geraghty and Miller 1984, 1986

KEY:

Building

Existing Monitoring Well

Tentative Soil Boring

Tentative Temporary Monitoring Well

SCALE

0 50 100 200 300 FEET

Figure 14–1 TENTATIVE SOIL BORING AND TEMPORARY MONITORING WELL LOCATIONS, SITE 31 – PHASE I

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14.1.4 Hydrologic Assessment

All temporary and existing monitoring wells will be surveyed to obtain top of casing elevations referenced to USGS datum or to a suitable established benchmark located within the vicinity of Site 31. Static water levels will be measured in each well to determine shallow groundwater flow direction and horizontal hydraulic gradient.

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 Site 31 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.

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

[During the Phase II investigation of Site 31, which is covered by RCRA requirements, at least one sample per contaminated medium will also be

Table 14-2

PHASE II SAMPLING AND ANALYTICAL REQUIREMENTS—GROUP M

SITE 31

Medium	lo. of Samples	Dupli-cates	Trip Blanks[a]	Field Blanks	Rinsate Blanks	[Preservative Blanks[b]]	Total*	Analytical Suite[c,d]
Soil	25	3	[1	1	1	1	32] [(10)]	A C
Groundwater	[3]	1	1	[NR]	1	[NR]	[6] [(2)]	A B
TOTAL	[28]	4	[2	1	2	1	38(11)]	

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

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

[c]Analytical suite designations are as follows:

A = 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, gross alpha, total organic carbon, hardness (water only), and alkalinity (water only).

B = total suspended solids. total Kjeldahl nitrogon, amnia nitrogon, orthophosphate phosphorus, dissolved oxygen (in field), 5-day biological oxygen demand (BOD_5), and chemical oxygen demand (COD).

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

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

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

[NR = Not required.]

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analyzed for Appendix IX parameters (40 CFR, Part *264).* These samples will be collected from the area of highest 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

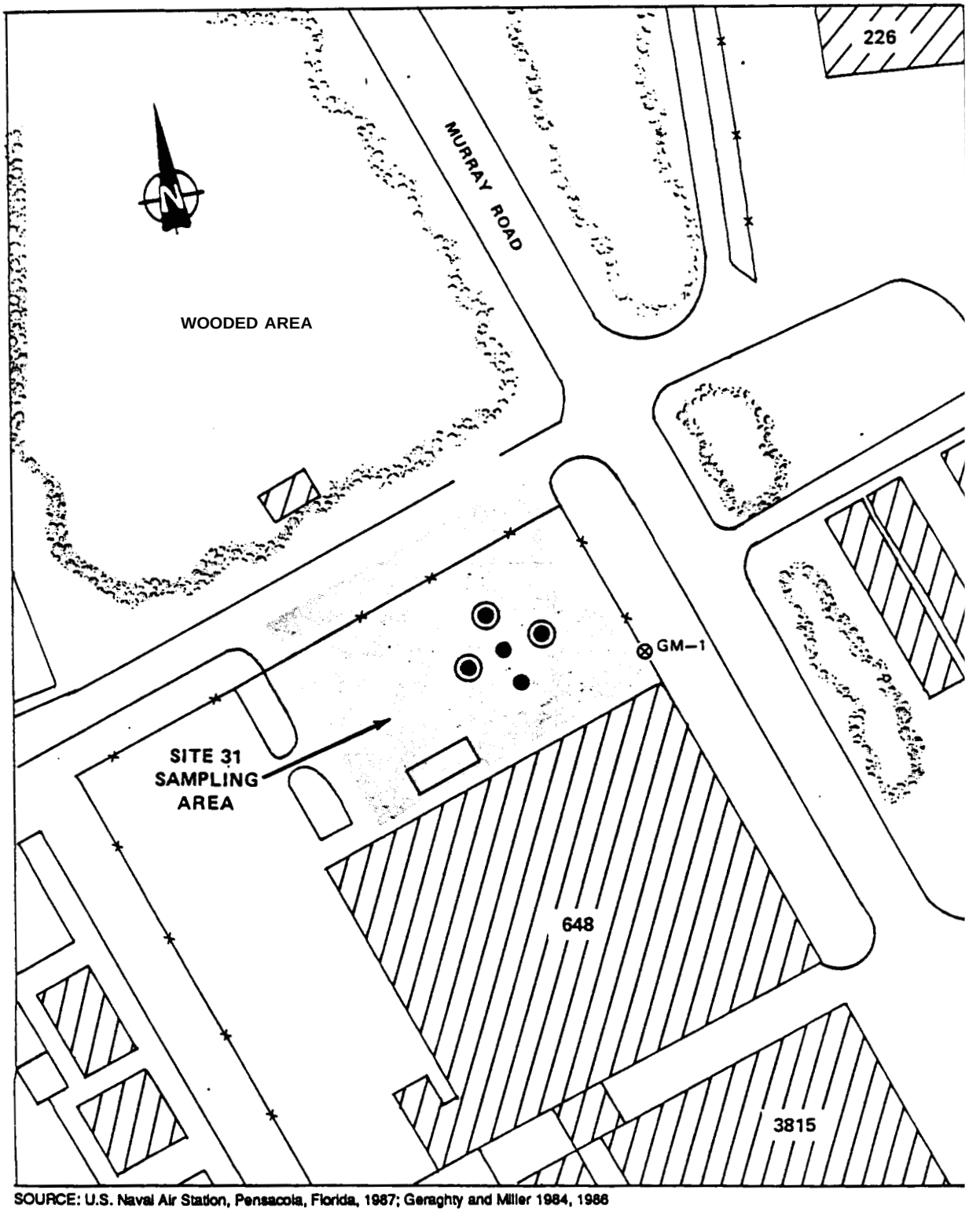
The actual number and location of soil samples as well as their appropriate sampling locations will be determined based on the results of Phase I. Tentative locations for collection of soil samples for Phase II are presented in Figure 14-2. For planning purposes, five soil samples are assumed at each boring location.

Soil samples will be collected in discrete intervals using a hand operated bucket auger or a split-spoon sampler powered by a drill rig. At each location a composite soil sample will be collected from the following depth intervals: 0. to 0.5 feet, ***0.5*** to **2.5** feet, then every **2.5** feet to **a** maximum of 10 feet or the water table, whichever is shallower. Intervals deeper than 10 feet will be sampled only if contamination was found in the deeper zone during Phase I. All sampling, compositing, and lithologic logging will be performed in accordance with Sections 6.6 and 6.7 of the GQAPP. Equipment decontamination will be performed in accordance with Section 6.10 of the GQAPP. A detailed discussion of split-spoon soil sampling procedures is provided in Section 6.7.2.3 of the GQAPP.

[14.2.3] Shallow Monitoring Well Installation and Development

Tentative locations for the Phase II shallow monitoring wells are shown in Figure ***14-2.*** The exact monitoring well locations will depend on

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



SOURCE: U.S. Naval Air Station, Pensacola, Florida, 1987; Geraghty and Miller 1984, 1986

SCALE

0 50 100 200 300 FEET

KEY:

- Building
- Existing Monitoring Well
- Tentative Soil Boring
- Tentative Shallow Monitoring Well

Figure 14—2 TENTATIVE BORING AND SHALLOW MONITORING WELL LOCATIONS SITE 31 - PHASE II

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Phase I results. For planning purposes, three new shallow monitoring wells are tentatively proposed for Site 31. Shallow monitoring wells will be installed using the hollow-stem auger method described in Section 6.7.2.1 of the GQAPP. Each of the shallow monitoring wells will be constructed of two-inch PVC casing, will bracket the water table with 10 feet of 0.01-inch slotted screen, and will be an estimated 15 feet deep. A detailed discussion of standard monitoring well construction practices is provided in Section 6.7.3 of the GQAPP. Upon completion, the wells will be developed using the method described in Section 6.7.5 of the GQAPP. All equipment used in monitoring well installation will be decontaminated as discussed in Section 6.10 of the GQAPP.

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

[14.2.4] Groundwater Sampling

Groundwater samples will be collected from the three newly installed shallow monitoring wells. Each well will be purged and sampled according to the methods provided in 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 following procedures described in Section 14.1.4 of this workplan.

Limited aquifer testing will be conducted on all newly installed and existing monitoring wells. This will consist primarily of performing short-duration specific capacity tests during the development of the newly installed monitoring wells and performing 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,

transnissfvity). The advantages of conducting specific capacity tests n conjunction with well development is that the test itself does not generate additional potentially contaminated water which requires disposal. Slug testing does not generate 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] Air Sampling

Formal air sampling will be performed only as required based on the results of the Phase I surface emissions survey [and particulate air sampling, and the **Phase I shallov soil sampling.]** If formal air sampling is necessary, sampling will be conducted in accordance vith procedures outlined in Section 6.1 of the GQAPP.

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 Site 31, Phase III activities will be geared toward further delineating the horizontal and vertical extents of contamination.

14.3.1 Soil Sampling

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

14.3.2 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.

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

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14.3.3 Intermediate and ,Deep Honitoring 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.

14.3.4 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.

14.3.5 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. Horizontal and vertical gradients will be determined. Aquifer testing will be performed, as required, to determine aquifer physical characteristics. [On sites where contamination is found in the surficial zone during Phases I and/or 11, the low permeability zone will be further characterized during Phase III and any subsequent phases. It is intended that soil sample results, lithologic logs, isopach maps, permeability testing, aquifer testing, etc. will be utilized as required to determine the lateral extent and/or continuity of the low permeability zone, as well as the degree to which hydraulic connection exists between the surficial zone and underlying main producing zone at the site.]

14.3.6 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 II.

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

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:

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

14.5 Topographic Survey and Base Map

Following the completion of Phases III and IV, a topographic survey of the Site 31 area will be conducted and a base map will be developed. Base map coverage, contour intervals, scale, and requirements for horizontal and vertical control will be established and approved by the Navy. The topographic base map will be developed for the requirements of remedial planning and will include the locations of surface features such as roads, structures, monitoring vells, municipal supply 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.

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.

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

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14.7 Decontamination and Waste Management Procedures

14.7.1 Decontamination Procedures

All equipment decontamination procedures for Site 31 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 31 will be discharged onto the ground surface away from the well or will be contained, labeled, and moved to a storage area on NAS Pensacola, as directed by the Navy.

Any excess soil auger cuttings generated by soil boring or monitoring well installation activities will be disposed of on Site 31 or will be contained, 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 other disposable materials, will be contained, labeled, and moved to a storage area on NAS Pensacola.

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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 treatability tests, will provide the basic data required for the evaluation of physical, chemical, and biological remedial technologies. Some of the treatability tests that may be examined are incineration tests, solubility tests, soil leaching tests, and coagulation-flocculation jar tests.

[Bold items enclosed in brackets denote changes 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 associated with all of the above. The complexity of the site will determine the level of effort required to conduct the baseline risk assessment. The conclusions of the baseline risk assessment will determine the level of effort required in the risk assessment to be conducted in the FS.

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

18.1 Contaminant Identification

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

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

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 pathvays 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, ground water, 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.

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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;

- Records of any environmental and/or health complaints regarding the sites; and

- Log of any actions taken by a health unit regarding health issues, complaints, and concerns.)

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

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

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

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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 6 E will select a single remedial action alternative for the remediation of the site. The alternatives assembled during the preceding task will be compared using technical, environmental, and economic criteria. E 6 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,

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

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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 degradation of

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

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

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21. DOCUMENT REVISION

Periodic updating of all administrative documents (GQAPP, 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, 11, 111, and IV, respectively. Given that the scopes of work for Phase' II and beyond are dependent on the results of the preceding phases, the project schedules for Phases 11, 111, and IV are tentative. In addition, the length of time 'between phases is subject to the schedule in the Federal Facilities Agreement Site Management Plan (FFASMP). The schedule in the PFASMP will be updated yearly.]

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

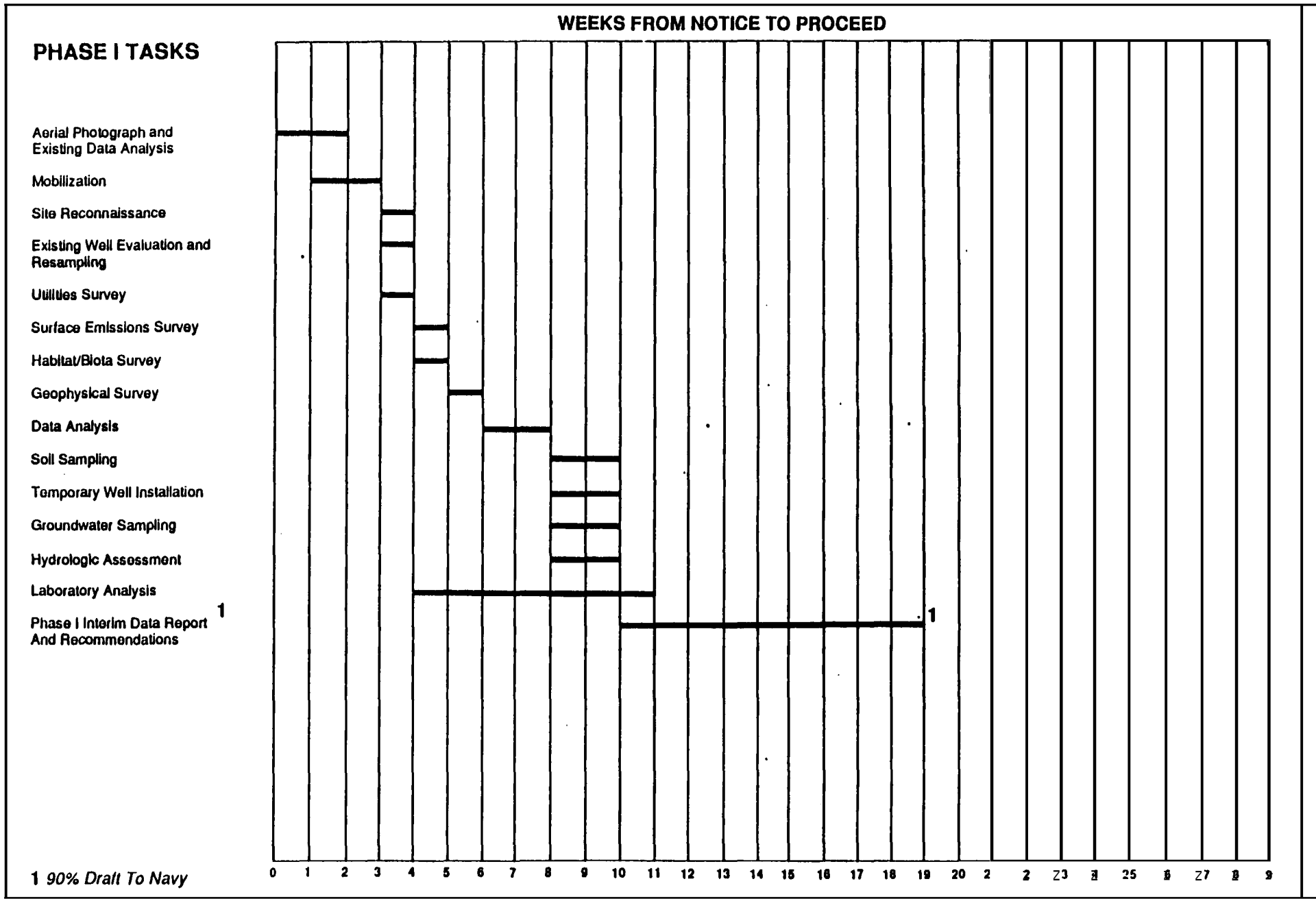

Figure 23-1 PHASE I PROJECT SCHEDULE -- GROUP M (SITE 31)

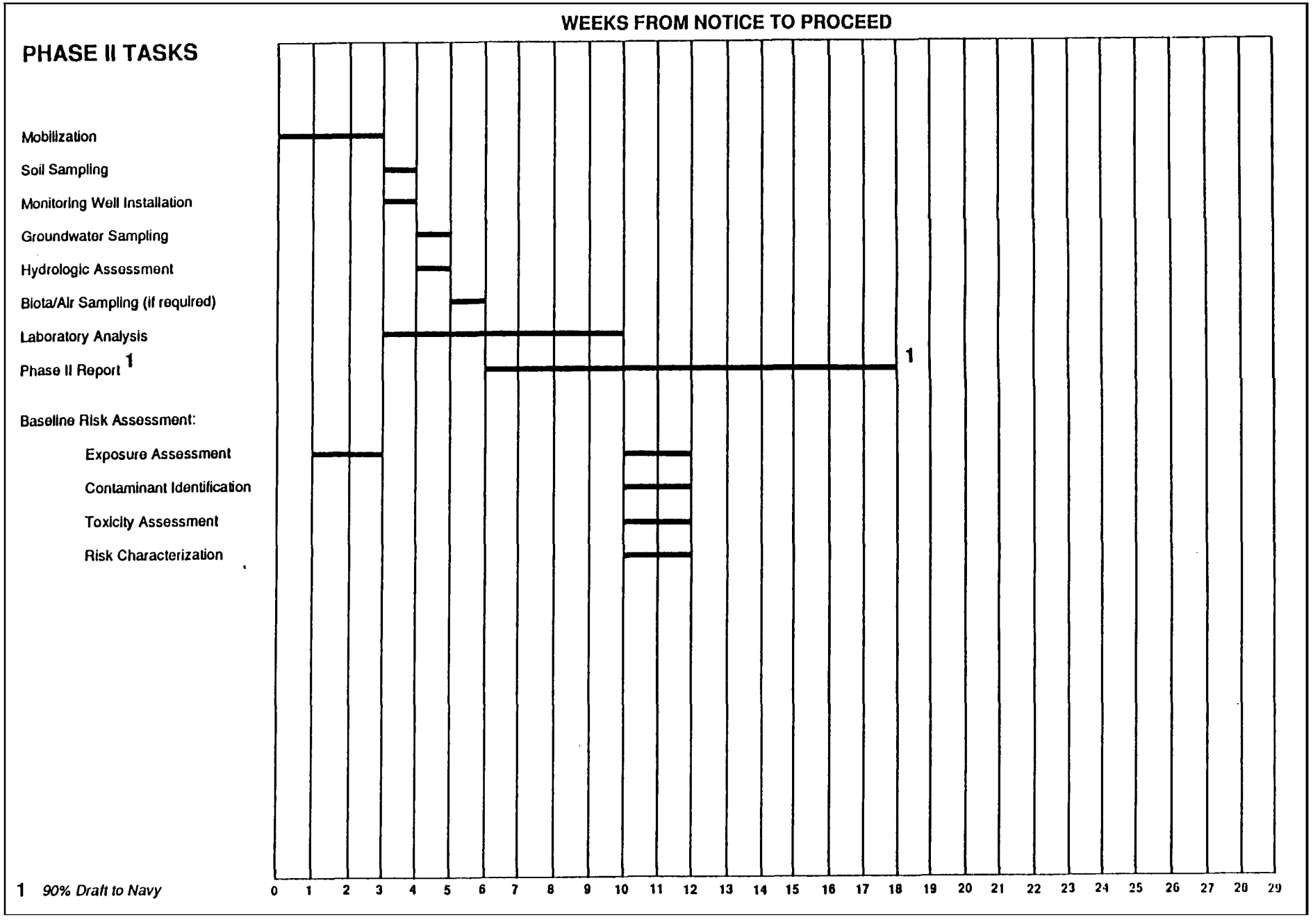

Figure 23-2 PHASE II PROJECT SCHEDULE -- GROUP M (SITE 31)

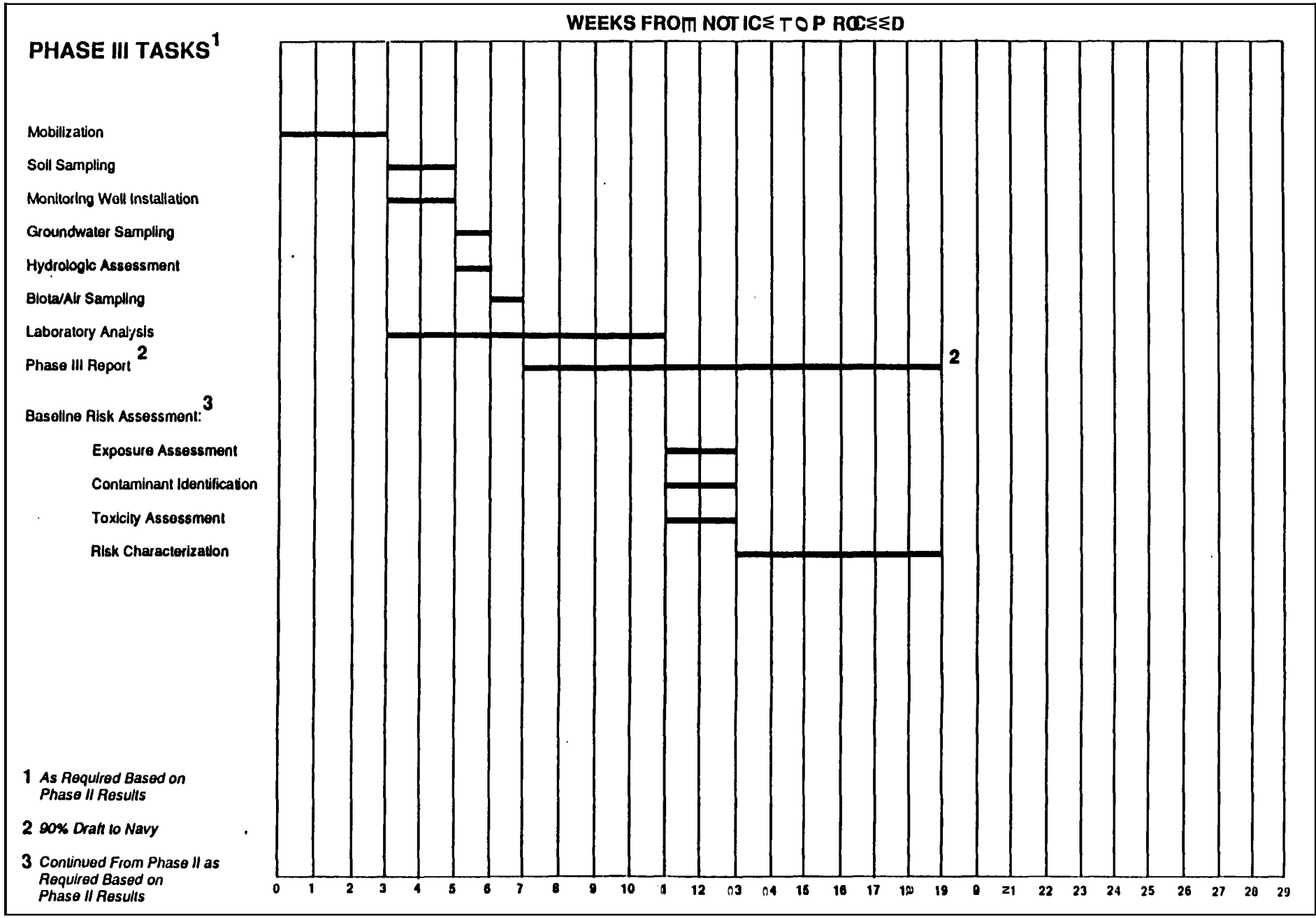

Figure 23-3 PHASE III PROJECT SCHEDULE -- GROUP M (SITE 31)

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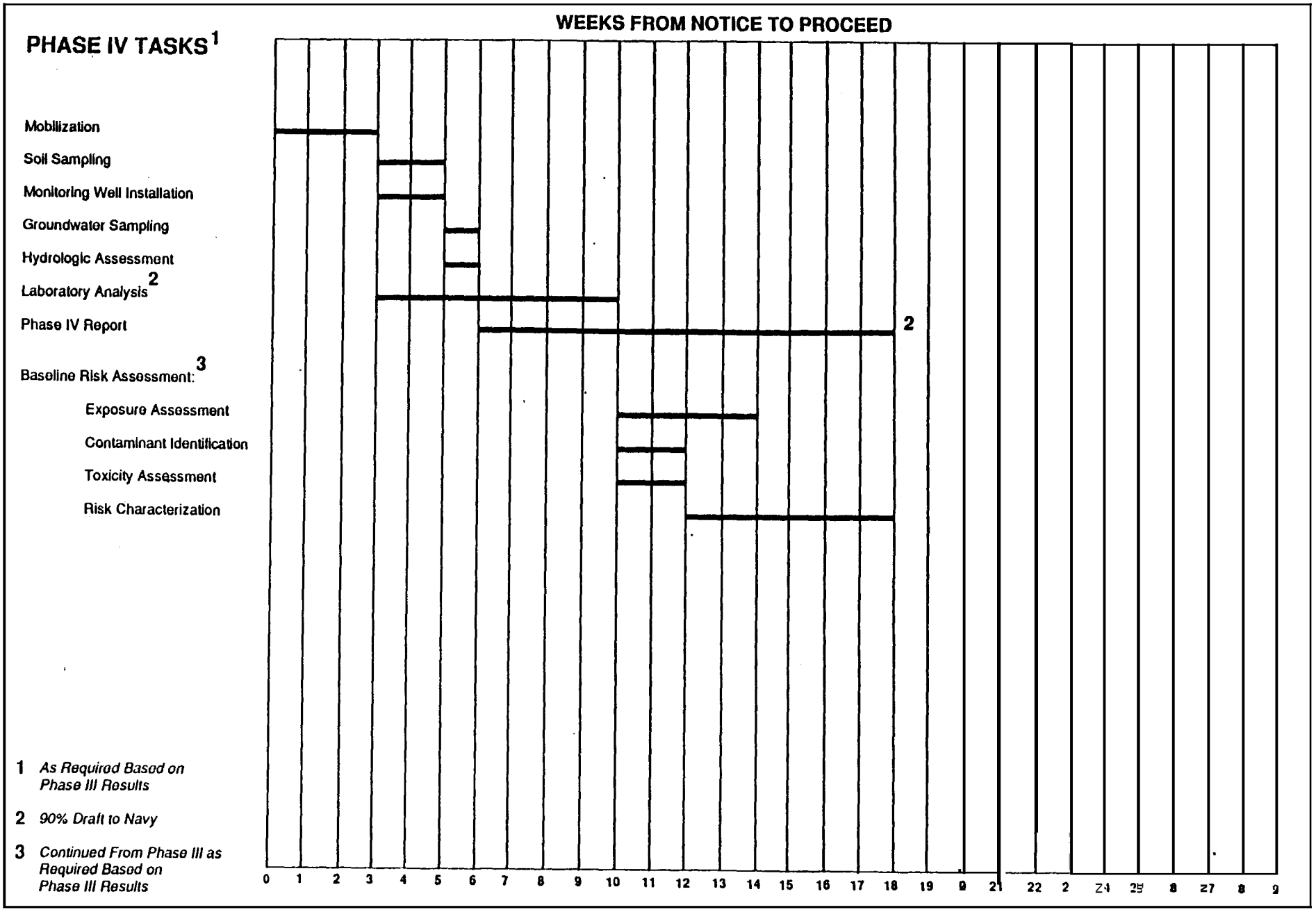

Figure 23-4 PHASE IV PROJECT SCHEDULE -- GROUP M (SITE 31)

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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 966

A. GENERAL INFORMATION

Project Title: Site 31-Soil North of Building 648 Project No.: UH1204

TDD/Pan NO.:

Project Manager: John Barksdale Project Dir.: Rick Rudy

Location(s): Soil North of Building 648 - Area adjacent to and north of Building 648, off of Murray Road

Prepared by: Kim Walker Date Prepared: 4-26-89

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 groundwater sampling.

Proposed Date of Field Activities: August 1989

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

Documentation/Summary:

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

B. SITE/WASTE CHARACTERISTICS

Waste Type(s):

Liquid [X]	Solid [ ]	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 [ ]	Trip/Fall [X]
Puncture [ ]	Burn [ ]	Cut [ ]	Splash [X]
Noise [X]	Other: Working within fenced area containing drums and small sheds. Vehicular traffic in tho site area.		

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

Site History/Description and Unusual Features (see Sampling Plan for detailed description): A 100 by 200 foot area adjacent to north of Building 648, enclosed by a chain link fence, is the site of dumping paints and paint thinners and solvents over a 24 year period, from 1949 to 1973. Several wells located near tho site have had elevated levels of solvents found within the groundwater.

Locations of Chemicals/Wastes: Liquid and sludge wastes were dumped directly on tho ground adjacent to Building 648.

Estimated Volume of Chemicals/Wastes: Approximately 20,000 gallons of waste paints and thinners as well as 8,600 gallons of paint sludges were dumped on tho ground over a 24 year period.

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

C. HAZARD EVALUATION

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

Physical Hazard Evaluation:

1) Physical Surveys - walking around tho site;

2) Temporary Monitoring Well Installation - using portable drill rig;

3) Soil Sampling - Using portable drill rig:

4) Decontamination Procedures - Using solvents.

Compound	PEL/TWA	Route of Exposure	Acute Symptoms	Odor Threshold	Odor Description
Lead	0.05 mg/m3	Inh,Ing, Dorm	Volit, Diarr.	N/A	N/A
tetrachloroethane	5 ppm	Inh,Abs,Derm	Skin Irritant	--	Chloroform. Chloroform
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	dizsy, headache	200 ppm	ether-like
1,1,1-trichloroethane	350 ppm	Inh, Ing, Con	naus, dizzy,vomit	20-100 ppm	chloroform-like
1,2-dichloroethane	50 ppm	Inh,Ing	naus, dizzy,vomit	6 ppm	sweetiah
vinyl chloride	1 ppm	Inh, Abs	drowsy, cough	260 ppm	sweet pungent

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

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D. SITE SAFETY WORK PLAN

Site Control: Attach rap. use back of this page, or sketch of site showing hot rono, contamination reduction, zono, etc.

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

. Work Area's Designated? [yes] Zone(s) of Contamination Identified? [no]

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

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

Task 2				X
Task 3				X
Task 4				X

(Expand if necessary)

Modifications: Modified level D with' tyvock, 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:

- o Level D: O_2 <19.5% or >25%, oxplosive atmosphoro >10% LEL, organic vapors above background levels, particulatos >_____ mg/m^3, othor _____
- o Level C: O_2 <19.5% or >25%, explosive atmosphoro >25% LEL (California-20%), unknown organic vapor (in breathing zone) >5 ppm, particulatos >_____ mg/m^3, othor _____
- o Lovol B: O_2 <19.5% or >25%, explosive atmosphoro >25% LEL (California-20%), unknown organic vapors (in breathing zone) >500 ppm, particulatos >_____ mg/m^3, othor _____
- o Lovol A: O_2 <19.5% or >25%, explosive atmosphere >25% LEL (California-20%), unknown organic vapors >500 ppm, particulatos >_____ 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	Aroa	OVA	Continuous
Radiation	Aroa	Mini-Rad	Continuous
Explosive Gases	Aroa	O_2/Explosimeter	Continuous

Docontamination solutions and Procedures for Equipment, Sampling Gear, etc.:
Trisodium phosphate wash, tap water rinso, isopropanol rinso, distilled water rinse, isopropanol rinse, and final distilled water rinso.

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

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

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

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

Site Entry Procoduros and Special Considerations: E L E's "Buddy System" will bo employed at a11 times during fieldwork activities. Personnel will exercise caution in tho vicinity of Chevalier Field and of along nearby roadways. If above background radiation levels are encountered team members will evacuate tho sampling area, and contact tho corporate health physics group to reassess tho site.

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

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

General Spill Control, if applicable: N/A

Invertigation-Derived Material Disposal (i.e., expendables, decon vasto, cuttings):

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

Sample Handling Procoduros Including Protective Wear:

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

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

*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 211.2 (1980).

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E. EMERGENCY INFORMATION

(Use supplemental shoots, if necessary)

LOCAL RESOURCES

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

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

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

Poison Control Center

Police (include local, county sheriff, state) 911

Fire Department 911

Airport

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

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

rod. 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 Enrgoncy Evacuation Alarm Method N/A

Water Supply Source On-sit.

Telephone Location, Number To bo determined on-site

Cellular Phone, if available N/A

Radio

Other On-sit. warehouse number to bo determined

EMERGENCY CONTACTS

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

2. Ecology and Environnont, 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 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 you. 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 made:

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

ROUTES

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

Directions to hospital (include map)

NAS Dispensary - Follow Murray Road South to Ellyson Avenue. Turn right onto Ellyson Avenue and continue to it's intersection with Turner Street. The NAS Dispensary is located on tho northwest corner of tho intersection of Ellyson Avenue and Turner Stroot, 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 Blvd. Turn loft (north) on Pace Blvd. and proceed approx. 1mi to Cervantes St. (Hwy. 90). Turn right on Cervantes/Hwy. 90 and follow this road for about 8 blocks and turn loft (north) onto E street. The hospital is about 6 blocks north on tho loft.

Emergency Egress Routes to Got Off-Sit0 Emergency egress routes will bo located if emergency exit routes become blocked by construction, etc.

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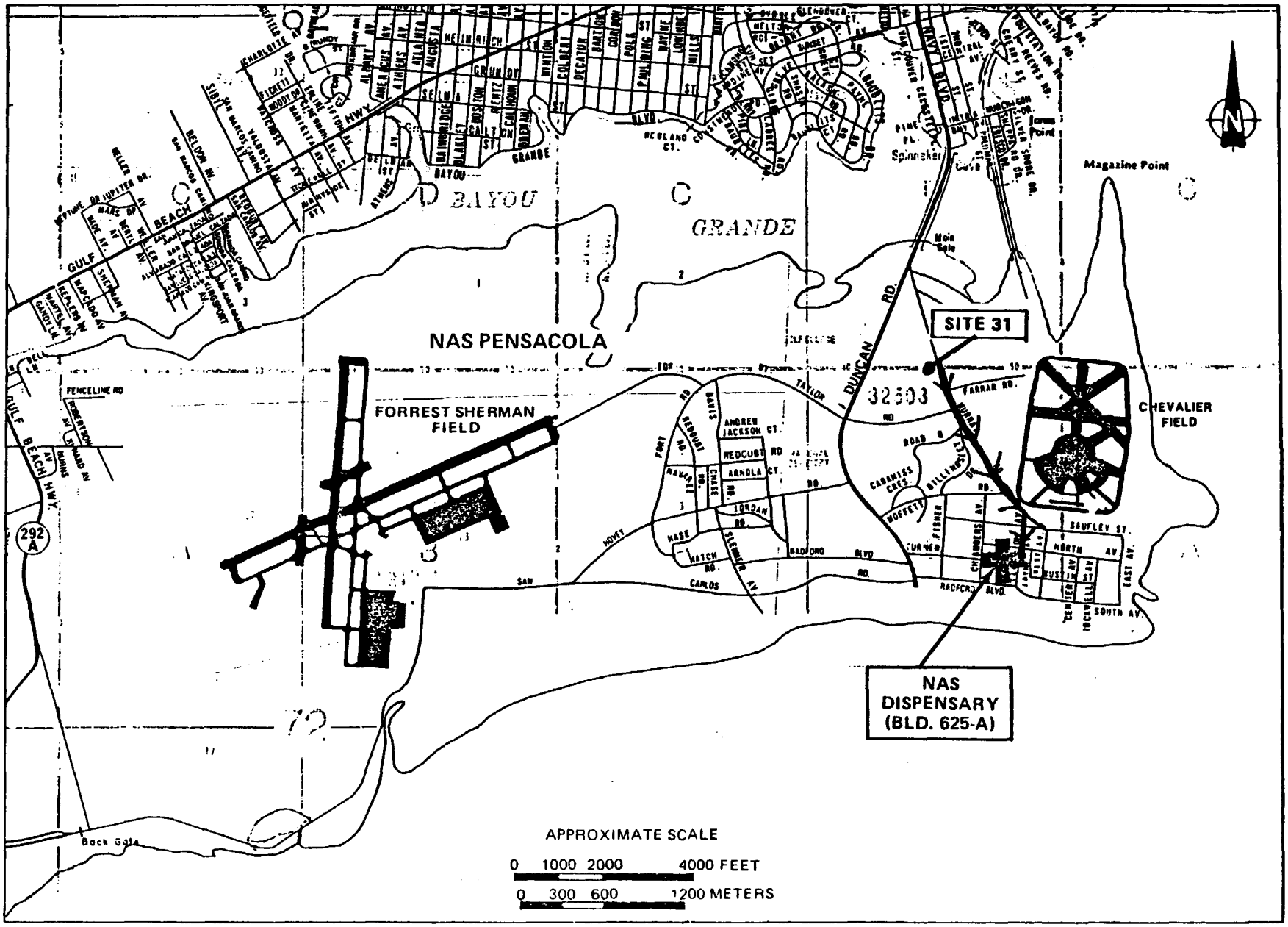
NAS PENSACOLA
FORREST SHERMAN FIELD
SITE 31
CHEVALIER FIELD
NAS DISPENSARY (BLD. 625-A)
Magazine Point
Spinnaker
Main Gate
Back Gate
BAYOU GRANDE
GULF BEACH HWY.
DUNCAN RD.
FARRAR RD.
32503
APPROXIMATE SCALE
0 1000 2000 4000 FEET
0 300 600 1200 METERS

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.
* Make sure proper housekeeping is practiced around and on the rig at all times. Tools should be stored in a manner that permits convenient access and provides for adequate safety.
* Store gasoline in approved containers that have a spark arrestor and keep them clear of the drilling work area.
* Check rig equipment prior to starting work. Repair or replace faulty and worn items.
* Handle augers with care. Use proper lifting techniques .when picking up samplers and augers. Use a tool hoist if possible and stay clear of rotating augers. Keep cables and ropes secured when not in use.
* Level and stabilize the drill rig prior to raising the mast.
* Watch for slippery ground when working in the area of the rig.
* All unattended boreholes must be properly covered.
* Do not drill during an electrical storm.
* Maintain a safe distance from the rig mechanisms during drive sampling and auger removal operations.

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 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 "Gatorade" 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 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 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, "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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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 ambient 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 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 protcctlve clothing must be worn, especially Levels A and 6, 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 aS	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 is at 110 beats/minute or less and the deceleration between the first, second, and third minutes 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.

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ISOPROPYL ALCOHOL

PRODUCT IDENTIFICATION;

Synonyms: ?-propanol; KC-propyl alcohol; isopropanol

Formula CAS No.: 67-63-0

Molecular Weight: 60.10

Chemical Formula: $(CH_3)_2$ CHOH

Hazardous Ingredients: Not applicable.

PRECAUTIONARY MEASURES

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

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

EMERGENCY/FIRST AID

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

DOT Hazard Class: Flammable Liquid

SECTION 1 Physical Data

Appearance: Clear, colorless liquid.

Odor: Rubbing alcohol.

Solubility: Infinite in water.

Boiling Point: 82°C (180°F).

Melting Point: -89°C (-128°F).

Specific gravity: 0.79

Vapor Density (Air = 1): 2.1

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

Evaporation Rate: (n-BUAC = 1) 2.83

SECTION 2 Fire and Explosion Information

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

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

Fire Extinguishing Media:
Water spray, dry chemical, alcohol form, 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 r 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 rad 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 lo high concentrations has a narcotic effect, producing symptoms of drowsiness, headache, staggering, unconsciousness and possibly death. .

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

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

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

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

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:
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 lor at least 15 minutes. Get medical attention if irritation develop or persists.

Eye Exposure:
Wash eyes with plenty of water lor 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 Umit (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 kerp 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 tho ACGIH document, 'Industrial Ventilation, A Manual of Recommended Practices', most recent edition, lor details.

Personal Respirators: (NIOSH Approved)
If the TLV is exceeded a full facepiece chemical cartridge respirator may be worn, in general, up to tho maximum use concentration specified by the respintor 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 lull 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 a d 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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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

DASGER! STRONG OXIDIZER CONTACT WITH OTHER MATERIAL MAY CAUSE FIRE. CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATALIF 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 lust 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. IC 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 Pbvsical Data

Appearance: Clear, colorless to slightly yellow liquid.

Odor: Suffocating acrid.

Solubility Infinite in water.

Boiling Point: 122°C (252°F)

Melting Point: -34°C (-29°F)

Specific Gravity: 1.41

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

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

Evaporation Rate: No information found.

SECTION 2 Fire and Explosion Information

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

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

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

Special Information:
Increases the flammability of combustible, organic and readily oxidizable materials. In the event of a fire, war 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 odder 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 b—— 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 ruitabk 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 d i i 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! G n cause redness, pain, and severe skin burns. Concentrated solutions cause deep ulcers and stain skin a yellow or yellow-brown color.

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

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

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

B. FIRST AID

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

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

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

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

C. TOXICITY DATA (RTECS, 1982)

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

SECTION 6 Occupational Control Measures

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

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

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

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

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

SECTION 7 Storage and Special Information

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

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SULFURIC ACID 96%

PRODUCT IDENTIFICATION:

Synonyms: Oil of Vitriol

Formula CAS No.: 7664-93-9

Molecular Weight: 98.07

Chemical Formula: H_2SO_4

Hazardous Ingredients: Not applicable.

PRECAUTIONARY MEASURES

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

Do not get in eyes, on skin, or on clothing.
Do not breathe mist.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly alter 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 lor 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 nod Emlosloo Information

Fire:
Not combustible, but substance is a strong oxidizer a d its heat of reaction with reducing agents or combustibles may cause ignition. Reacts with mart 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:
D g chemical, form 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 lo form poisonous hydrogen cyanide and hydrogen sulfide respectively.

Hazardous Polymerization:
Will not occur.

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

SECTION 4 Leak/Spill Disposal Information

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

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

Ensure compliance with local, state and federal regulations.

NFPA Ratings: Health 3 Flammability: 0 Reactivity: 2 Other: Water reactive

SECTION 5 Health Hazard Information

A. EXPOSURE / HEALTH EFFECTS

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

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

Skin Contact:
Corrosive. Symptoms of redness, pain, and severe burns 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.

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:
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.

Chemical Fact Sheet* Version 3

1,1,2,2-TETRACHLOROETHANE

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 to practical.

Chemical Names: Acetylene tetrachloride, dichloro-2,2-dichlorotthane, tetrachloroethane, sym-tetrachloroethane; CAS 79-34-5.

Trade Names: Acetosal, Bonoform, Cellon, Westron, TCE and others.

Uses: Primary use is as an intermediate in the production of trichloroethylene, also used as solvent for fats, oils, resins, paints, varnish, weed killers. insecticides and many others.

PHYSICAL INFORMATION

Appearance: Clear, colorless or pale yellow liquid.

Odor: Sweetish, like chloroform. Minimum Detectable by Odor: 5 ppm.

Behavior in Water: Only slightly soluble, sinks.

HEALTH HAZARD INFORMATION

OSHA Standard: Average 8 hour exposure - 5 ppm.

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

ACGIH Recommended Limit: Average 8 hour exposure - 1 ppm.

Short Term Exposure:

Inhalation: Exposure of 116 ppm for 20 minutes has caused dizziness and vomiting. At 260 ppm for 10 minutes, irritation of nose and throat were felt in addition. At 335 ppm for 10 minutes, rapid fatigue was also experienced. These symptoms generally disappear when exposure stops. Large accidental exposures have resulted in death.

Skin: Absorption through skin is possible. Significant skin absorption may occur to produce toxic effects. Earliest and most common symptom is tremors of hands, followed by skin irritation, numbness and effects listed above. Death has occurred from a combination of inhalation and skin absorption.

Eyes: Irritation and tearing.

Ingestion: Abdominal pain, nausea, and vomiting followed by similar symptoms as inhalation. As little as 3 ml (1/10 liq. oz.) may cause unconsciousness.

Long Term Exposure:

Symptoms may include nervousness, loss of appetite, constipation, tremors. fatigue, dizziness, nausea, vomiting and headache. May result in long lasting liver damage. These symptoms have been reported after prolonged exposure to 75 ppm.

Tetrachloroethane at high levels has caused liver cancer in mice. Whether it causes cancer 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 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. Wad affected area with soap and water for at least 5 minutes. Seek medical attention.

Eyes: Wash eyes with lots of water. Seek medical attention.

Ingestion: Seek medial attention immediately.

Note to Physician: Expired air or blood analysis may be helpful in determining severity of exposure. Give special attention to neurological and liver function screening tests. Alcoholism may be a predisposing factor.

FIRE AND EXPLOSION INFORMATION

General: Not flammable except under conditions listed below.

REACTIVITY

Materials to Avoid: Reacts violently with sodium, potassium, nitrates and 2,4-dinitrophenyl disulfide; flammable gas given off when heated with strong alkalies such as potassium hydroxide.

Conditions to Avoid: Breakdown in the presence of heat, light or moisture may yield chemically active and toxic gases such as hydrogen chloride, phosgene, carbon dioxide and carbon monoxide.

PROTECTIVE MEASURES

Storage and Handling: Keep container closed; store in a cool, dry, dark area with adequa ventilation.

Engineering Controls: Provide adequate ventialtion. Have eyewash stations available.

Protective Clothing (Should not be substituted for proper handling and engineering controls) Rubber or neoprene protective clothing, gloves and goggles.

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

Miscellaneous: Do not wear contact lenses when handling this material.

PROCEDURES FOR SPILLS AND LEAKS

Get all workers out of the spill area. Put on respirator and other protective clothing. Spread sand or other absorbent material over liquid to absorb it. Shovel into buckets. take to a safe place in tbe open air. For final disposal contact your regional office of the New York Stat8 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 York 12203.

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'hemical Fact Sheet* Version 2

VINYL CHLORIDE

The information in this sheet applies to workplace exposure resulting from processing, manufacturing, stoting 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, chloroathene, 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; may be liquified by refrigeration or pressurization.

Odor: Faint, sweat, ether-like. **Minimum Detectable by 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: Avetaqe 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, sneezing, irritability and loss of appetite and weight.

Skin: Contact with liquid may 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 finger tips. Skin may become thickened and stiff with coarse, whitish patches. Bones and joints of arms and legs may suffer damaqe. Liver and spleen damaqe may occur. Not all symptoms disappear after exposure stops.

Vinyl chloride has caused liver cancer in occupationally exposed individuals.

*Prepared by the Burrau 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 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 tlw of gas, Use water to keep fire exposed containers cool.

REACTIVITY

Conditions to Avoid: Higb temperatures may cause breakdown to phosgene and hydrochloric acid. Avoid sources of ignition.

Materials to Avoid: Long 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 f r a sources of ignition.

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

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

Protective Equipment: For any derectable levels use a self-contained breathing apparatus with a full facepiece operated in a positive pressure mode or & 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 providrng protection against vinyl chloride or an escape self-contained breathing apparatus.

PROCEDURES FOR SPILLS AND LEAKS

Get all workers out of the spill area. Put on respirator and other protective clothing. 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 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.

3100600

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-bichloroethane; 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.

Behavior 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 may 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:

nay cause eye, nose and 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 does 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.

Ingestion: 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

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 phosgene when heated.

PROTECTIVE MEASURES

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

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

r g and engineerin 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 or 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 oc 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.

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.

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 not be made. The best industrial hygiene practice is to maintain concentrations of all chemicals at levels as low as is practical.

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

Trade Names: Beta-T.

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

PHYSICAL INFORMATION

Appearance: Colorless liquid.

Odor: Chloroform-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: Avtraqe 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 deptession and anesthetic effects. Symptoms are nasal irritation, drowsiness and equilibrium disturbances. Death may result from 13,600 ppm for 2 hours.

Skin: May cause irritation and chemical burns if allowed to remain on the skin for a prolonged period. May be absorbed thcouqh the skin to cause oc 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 laboratocy 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 of Health.

EMERGENCY AND FIRST AID INSTRUCTIONS

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

Skin: Remove contaminated clothing. wash skin witb soap or mild detergent and plenty of water for at least 15 minutes. Seek medial attention if necessary.

Eyes: wash with water for 15 minutes. Seek medical attention.

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

FIRE AND EXPLOSION INFORMATION

General: Hot flammable under normal conditions.

Explosive Limits: upper -- 15.5%, lower — 6.0%. (High energy ignition source required.)

Extinguisher: Water fog. foam. carbon dioxide. dry chemical.

REACTIVITY

Materials to Avoid: Fire and explosion may result fr a reaction vith strong oxidizers such as peroxides and permanganates, strong caustics such as potassium hydroxide 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 which 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 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: For any detectable levels use a self-contained breathing apparatus with a full facepiece and operated in a positive pressure mode or a combination Type C supplied-air respirator vitb an auxiliary self-contained breathing apparatus, both with a full facepiece and operated in a positive pressure mode. For fire fighting use a Self-contained breathing apparatus vith a full facepiece operated in a positive pressure mode. For escape we a gas mask providing protection against organic vapors or an escape self-contained breathing apparatus.

PROCEDURES FOR SPILLS AND LEAKS

Warn other workers of spill. Put on proper protective clothing and equipment. Ventilate the area. Hop, 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 York State Department of Environmental Conservation.

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

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CHLOROFORM

The information in this sheet applies to workplace exposure resultinq from processing, manufacturing, storinq or handlinq 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: 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 heavier than air.

Behavior in Water: Only very slightly soluble; sinks.

HEALTH HAZARD INFORMATION

OSHA Standard: 50 ppm.

NIOSH Recommended Limit: 2 ppm.

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

Short Term Exposure:

Inhalation: Symptoms are generally not observed at exposures below 90 ppm for 7 minutes. Effects may include headaches, pounding heart, dizziness, slowed reactions, Unconsciousness, coma 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 stinginq sensation. Splashes may cause pain, burning, redness and darnaqe to tissues.

Ingestion: Hay 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 aqent 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 fu

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 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 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 worksfte or the New Pork State Department of Health, Bureau of Toxic Substance Assessment, 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 allays; 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-lead level greater than or equal to .050 mg lead per 100 ml. blood, he oc 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 con result in exposure and symptoms in other family members. Standards only protect for inhalation exposure. Extra precautions should be taken if skin exposure also occucs.

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, achinq 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 irritiation,

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, lonq term exposures to lower levels can result in a build up of lead in the body and more severe symptoms. These My include anemia, pale skin, a blue line at the gum marqin, decreased hand-grip strength, abdominal pain, severe constipation, nausea, vomitinq, and paralysis of the wrist joint. Prolonged exposure may also result in kidney damage. If the nervous system is affected, usually due to very hiqh exposures, the resulting effects include severe headache, convulsions, coma. delirium and death. In non-fatal cases, recovery is slow and not always complete. Alcohol inqestion and physical exertion may bring on symptoms. Continuous exposure can result in decreased fertility. Elevated lead exposure of either parent before pregnancy can increase the chances of miscarriage or birth defects. Exposure of the mother during pregnancy can 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 respiration as needed. Get medical attention immediately.

Skin: Wash area uith *plenty* of soap and rater. Remove any contaminated clothing.

Eyes: Rinse eyes with 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, urd erythrocyte protoporphyrin fluorescent microscopy may all be useful in monitoring or assessing lead exposure. Chelating agents sub 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 burning 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.

Conditions to Avoid: Excessive heat.

PROTECTIVE MEASURES

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

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

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/m^3 use a supplied-air respirator, a self-contained breathing apparatus or an air-purifying respirator vith biqh-efficiency particulate filter. 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 with high efficiency particulate filters. For levels up to 2.5 mg/m^3 use *any* of the above with a full facepiece. For levels up to 50 mg/m^3 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 respirator with a full facepiece operated in a positive pressure mode. For levels greater than 100 mg/m^3 or in areas of unknown concentrations use a self-contained breathing 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 r full facepiece and operated in a positive pressure mode. For escape from a contaminated area use a respirator witb high-efficiency particulate filters or rn escape self-contained bteatbinq apparatus.

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

PROCEDURES FOR SPILLS AND LEAKS

Get 3 1 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.

For more information:
Contact the Industrial Ayqienist 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.

APPENDIX B

SITE-SPECIFIC QUALITY ASSURANCE PROJECT PLAN

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

Section 10 -- Title Page

Work Plan Group: M
Site No.: 31
Site Name: Soil North of Building 648

Prepared by: Mary L. Hiller
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Prepared for: Department of the Navy
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Contract Number N62467-88-C-0200

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E 6 E ASC Director: A. Clifton

E 6 E QA/QC Project Officer: A. Schuessler

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Section 3.0 -- Project Summary

Work Plan Group: M

Site No.: 31

Site Name: Soil North of Building 648

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 ___ EH-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	44	X Phenols
Groundwater	5	___ Organophosphorus Pesticides
Duplicates	3	___ Chlorinated Herbicides
Trip Blanks	___	___ Carbamates
Field Blanks	___	X Pesticides/Polychlorinated Biphenyls
Rinsate Blanks	___	X Total Recoverable Hydrocarbons
Other	___	X Metals
		___ Gross Alpha

Section 3.0 -- Project Summary (Continued)

Phase II -- Characterization

PLANNED NUMBER OF SAMPLES

Surface Water	___	Air	___	Duplicates	4
Sediment	___	Biota:		Trip Blanks	2
Soil	25	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 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 Nitrdgen
- 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 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/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
ıb 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 Purgeables + xylene	S/W	EPA 8240/624	N/M	N/M	N/M	N/M
TCL BNAs	S/W	EPA 8270/625	N/M	N/M	N/M	N/M
TCL Pesticides & PCBs	S/W	EPA 8080/608	N/M	N/M	N/M	N/M
Total Recoverable 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 74211239.2	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	Media	Method No.	A	P	C	DL
Nickel	S/W	EPA 6010/200.7	N/H	N/M	N/H	N/M
Selenium	S/W	EPA 7740/270.2	N/H	N/H	N/M	N/M
Silver	S/W	EPA 6010/200.7	N/H	N/H	N/M	N/H
Sodium	S/W	EPA 6010/200.7	N/M	N/H	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/H	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/H	N/H	N/H	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/H	N/M
Total Kjeldahl Nitrogen	S/W	EPA 351.3	N/H	N/H	N/H	N/M
Nitrogen-Ammonia	S/W	EPA 350.2	N/H	N/M	N/H	N/M
Orthophosphate Phosphorus	S/W	EPA 365.2	N/M	N/M	N/H	N/M
5-day Biological Oxygen Demand	W	SM 507	N/H	N/M	N/H	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/H
Percent Moisture	S	ASTH D-2216-80	N/M	N/M	N/M	N/M
Grain Size	S	ASTH D-422-63	N/M	N/M	N/M	N/M
BTU Content	S	ASTH D-2015-77	N/M	N/M	N/M	N/M
Ash Content	S	ASTH D-482	N/M	N/M	N/M	N/H
Total Ealogens	S	ASTH 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/H	N/H
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/H
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 Eydrocarbons 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 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 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 vhose 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 items enclosed in brackets denote changes from original text]

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 oxyrhynchus	Atlantic sturgeon	M	SSC	UR 2	Gulf coast, estuarine
Ammocrypta asprella	Crystal darter	U	T	UR 2	Fresh water
Etheostoma histrio	Harelquin darter	U	SSC		Fresh water
Fundulus jenkinsi	Salt marsh topainnow	P	SSC		Salt, fresh, brackish waters
Lepisosteus spatula	Alligator gar	U	SSC		Brackish, fresh, salt water
Moxostoma carinatum	River redhorse	U	SSC		Fresh water
AMPHIBIANS AND REPTILES					
Alligator mississippiensis	American Alligator	R	SSC	T(S/A)	Swamps, marshes, ponds
Caretta caretta caretta	Loggorhead turtle	M ?	T	T	Marine, coastal
Chelonia mydas mydas	Green turtle	M ?	E	E	Marine, coastal
Dermochelys coriacoa	Leatherback turtle	M	E	E	Marine, coastal
Drymarchon corais couperi	Eastern indigo snake	P	T	T	Open areas near water
Eretmochelys imbricata	Hawksbill turtle	M ?	E	E	Marine, coastal
Gopherus polyphemus	Gopher tortoise	P	SSC	UR 1	Sandy coastal plains
Graptemys pulchra	Alabama map turtle	U	SSC		Swamps, streams, marshes, ponds
Lepidochelys kempi	Atlantic ridley	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, ponds
MAMMALS					
Mustela vison lutensis	Florida mink	U		UR 2	Terrestrial habitats
Peromyscus polionotus trissyllepsis	Perdido Key beach mouse	N/A	T	E	Beach dunes
Trichechus manatus latirostris	West Indian manatee	M	E	E	Atlantic and Gulf coasts
Ursus americanus floridanus	Florida black bear	N/A	T	UR 2	Titi swamps

Appendix C (Cont).

Scientific Name	Common Name	Base Status	status FGFWFC(or FDA)	USFWS	Habitat
BIRDS					
Charadrius nelodus	Piping Plover	P	T	T	Open dry, sandy beaches
Charadrius alexandrinus	Snowy plover	P	T	UR 2	Open dry, sandy beache
Dendroida dominica .stoddardi	Stoddard's yellow-throated warbler	P-u		UR 2	Wooded habitats
Dendroica kirtlandii	Kirtland's warbler	U	E	E	Wooded habitats
Haenatopus palliatus	American oystercatcher	U	SSC		Coastal habitats
Egretta rufescens	Reddish egret	P-u	SSC	UR 2	Freshwater/coastal wet ands
Egretta caerulea	Little blue heron	P-u	SSC		Freshwater/coastal wetlands
Egretta thula	Snowy egret	P-u	SSC		Freshwater/coastal wetlands
Grus canadensis pratensis	Florida sandhill crane	U	T		Freshwater wetlands
Falco peregrinus tundrius	Arctic peregrine falcon	M	E	T	Winters on coasts
Falco sparverius paulus	Southeastern kestrel	R	T	UR 2	open pine forests, clearings
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 antillarun	Least tern	U	T		Coastal habitats
Mycteria americana	Wood stork	u	E	E	Freshwater/coastal wetlands
Rostrhamus sociabilis	Snail kite	U	E	E	Freshwater/coastal wetlands
INVERTEBRATES					
Copris gopheri	Scarab beetle	P		UR 2	Associated w/Gopher Tortoise

Appendix C (Cont.)

Scientific Name	Common Name	Base * Status	Status FGFWFC(or FDA)	Status USFWS	Habitat
PLANTS					
Chrysopsis gossypina cruiseana	Cruise's goldon-artor	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	Whit.-top pitchorplant	R	E		Open acid bogr
Sarracenia rubra	Sweet pitchorplant	U	E	UR 2	Acid bogs/slash pine voodr
Stewartia malacodnedron	Silky camellia	U	E		Slopes of voodod ravines

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

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Appendix C (Cont.)

Base •	=	Status of species on the NAS Pensacola facility.
R	=	Resident.
M	=	Migrant.
SR	=	Suspected resident.
P	=	Possible resident due to available habitat; survey required.
U	=	Unknown, survey required.
N/A	=	Not expected to occur on the NAS Pensacola facility.

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

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

18.1 Contaminant Identification

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

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

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, ground water, 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.

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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]

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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.

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,

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

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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. Thus, 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, this 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, 11, 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 Pacilities Agreement Site Management Plan (PPASHP). The schedule in the PFASHP will be updated yearly.

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

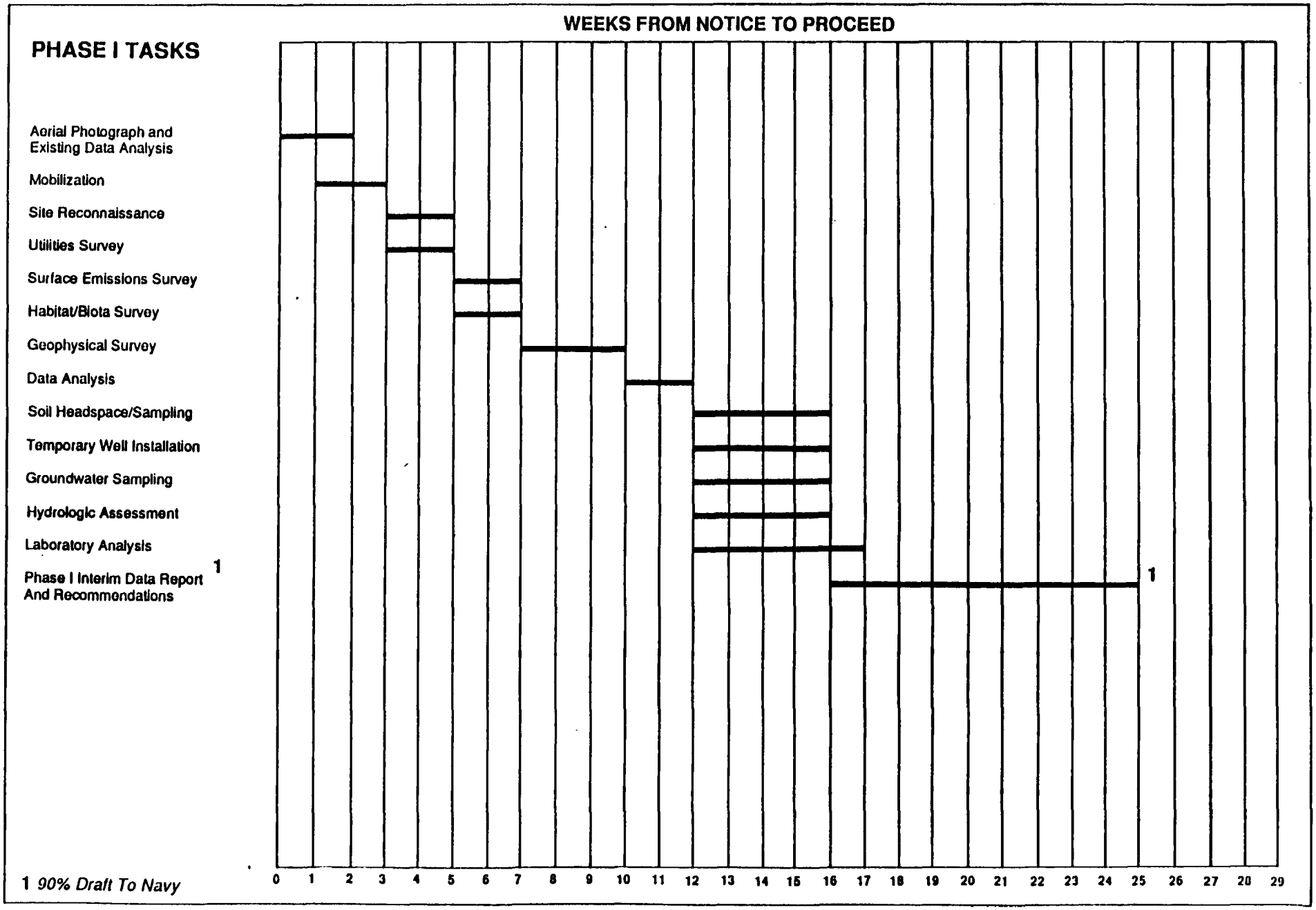

Figure 23-1 PHASE I PROJECT SCHEDULE – GROUP K

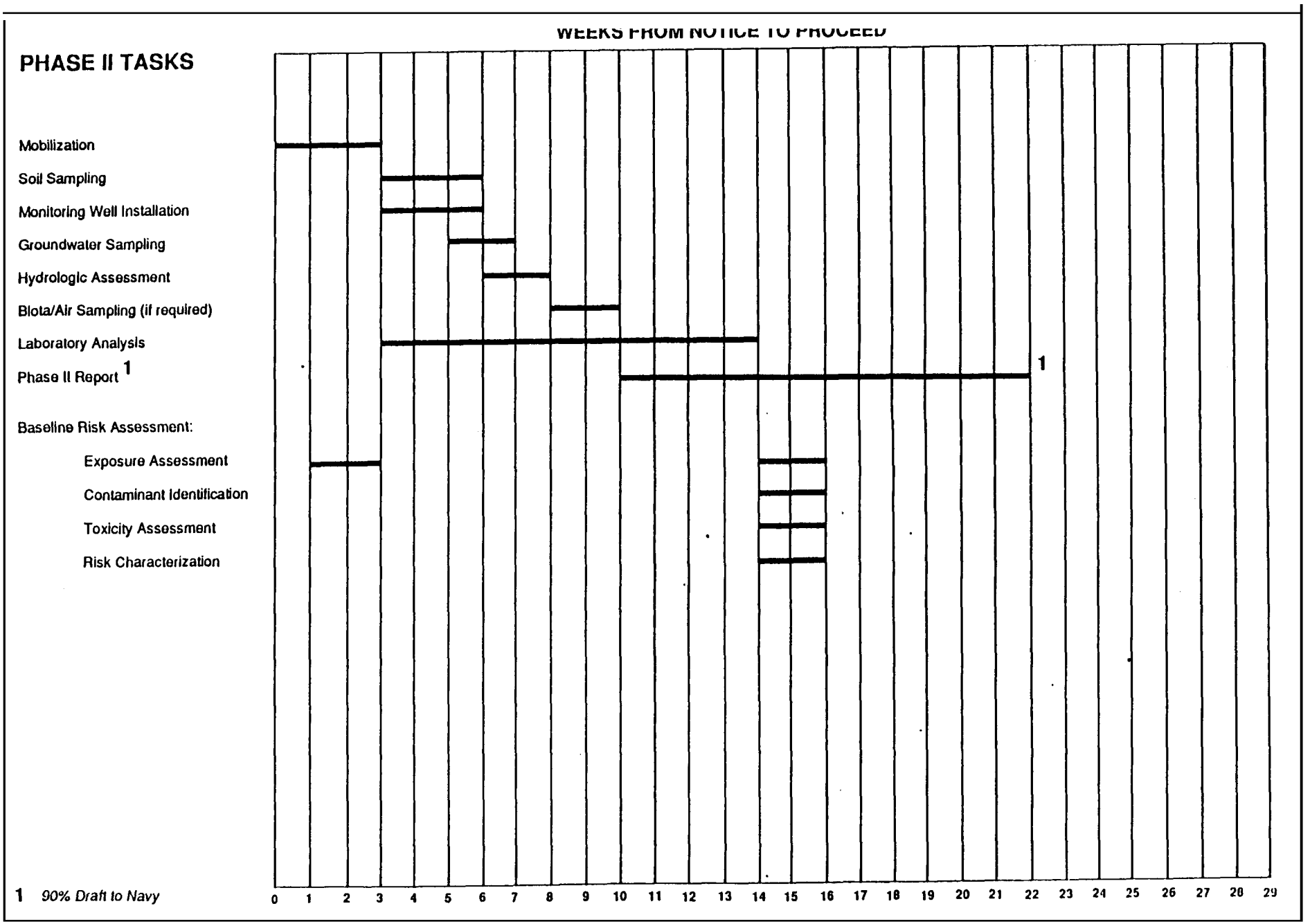

Figure 23-2 PHASE II PROJECT SCHEDULE – GROUP K

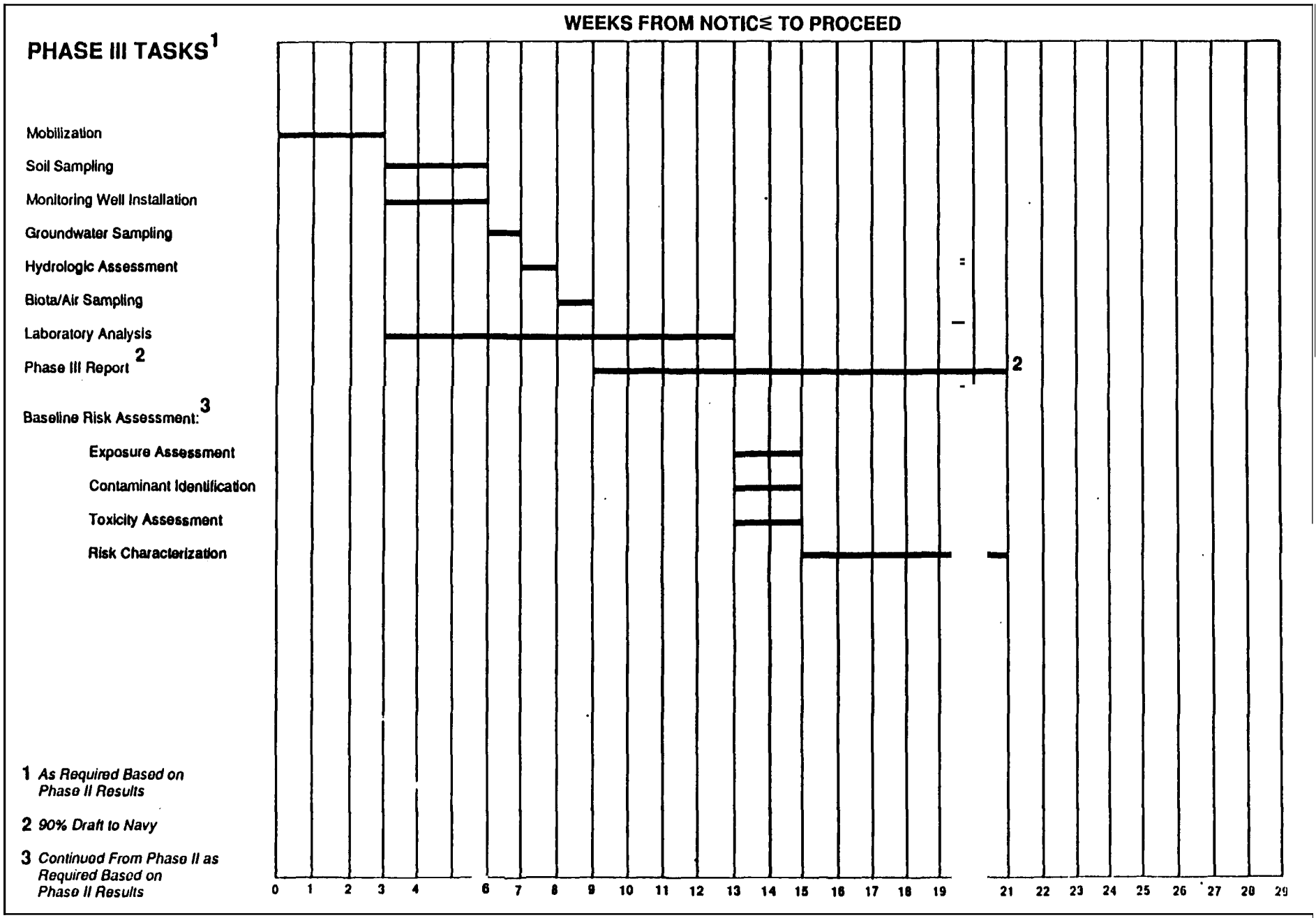

Figure 23ω HASE III PROJECT SCHEDULE – GROUP K

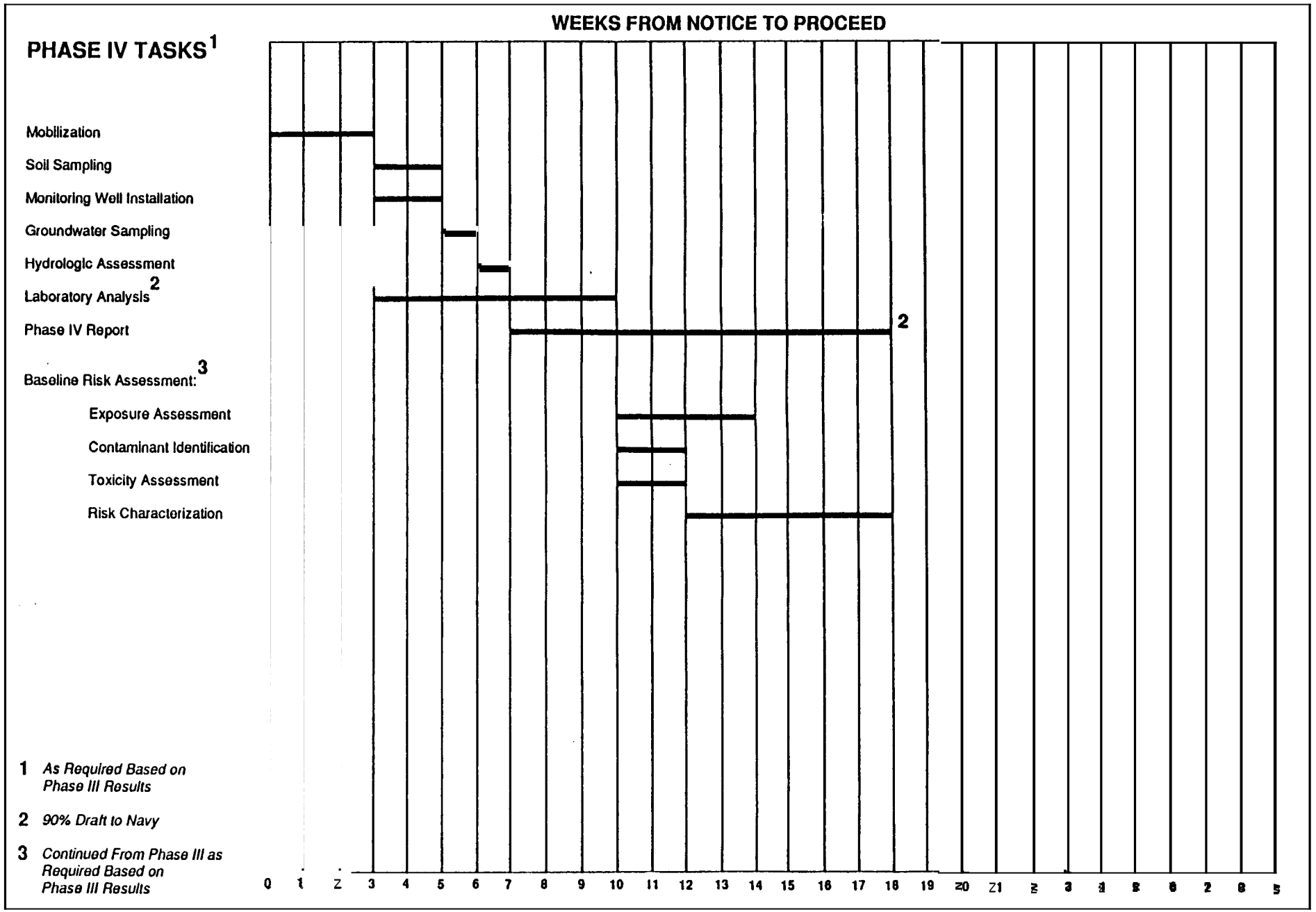

Figure 23-4 PHASE IV PROJECT SCHEDULE -- GROUP K

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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 7 - Firefighting School Area

Project No.: UH1303

TDD/Pan No.:

Project Manager: John Barksdale

Project Dir.: Rick Rudy

Location(s): Firefighting School Area - At Building 1713, near tho intersection of Redoubt and Taylor Roads

Prepared by: Hal Davis

Dato Proparod: 4-25-69

Approval by: Mary Miller MM

Dato Approvod: 5-5-89

Site Safety Officor Roviow:

Dato Reviewed:

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

Proposed Dato 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 [ ]
	LOW [X]	Unknown [ ]

B. SITE/WASTE CHARACTERISTICS

Waste Type(s):

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

Characteristic(s):

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

Other:

Physical Hazards:

Overhead [X]	Confined* Space [ ]	Below Grade [ ]	Trip/Fall [X]
Puncture [ ]	Burn [1	Cut [ ]	Splash [X]
Noise [X]	Other: Vehicular traffic in the site area.		

Requires coaplotion of additional form and special approval from the Corporato Health/Safety group. Contact RSC or HQ.

Site History/Description and Unusual Features (see Sampling Plan for detailed description): The firefighting School in Building 1713 has boon in operation since 1940. Training exercises were performed on fires started with gasoline, and possibly other flammable liquids, in an open tank of water. This tank was reportedly on tho west side of tho building. A NEESA report on tho site in 1983 concluded that thoro was no apparent evidence of hazardous waste disposal at tho site. Thoro have boon no samples collected at Site 7.

Locations of Chemicals/Wastes: unknown

Estimated Volume of Chemicals/Wastes: unknown

Site Currently in Operation . Yes: I 1 . no: I X 1

E. 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 - Aircraft, Automobile hazards;

2) Temporary Monitoring Well Installation - Aircraft, 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
Gasoline	300 ppm	Inhale, Dermal	dizziness, CNS dep	0.005 ppm	aromatic
Isopropyl Alcohol	400 ppm	" "	drowsiness,head.	7.5-200 ppm	rubbing alcohol
Nitric Acid		" "	corrosive	0.3-1 ppm	acrid

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 zono, 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 a11 field personnel):

Anticipated Lovol 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:

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

Air Monitoring

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

(Expand if necessary)

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 be strictly adhered to as outlined in Attachment A.

Site Entry Procedures and Special Considerations: E & E's "Buddy System" will be employed at a11 times during fieldwork activities. If above background radiation levels are encountered tear members will evacuate thm sampling area, and contact the corporate health physics group to reassess tho site.

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

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

General Spill Control, if applicable: N/A

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

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

Sample Randliog Procedures Including Protective Wear:

During a11 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 pmr 29 CFR 1910.120.- Respiratory protection program meets requirements of 29 CFR 1910.134, and M S I Z88.2 (1980).

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E. EMERGENCY INFORMATION

(Use supplemental shoots, if necessary)

LOCAL RESOURCES

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

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

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

Poison control Center

Police (include local, county sheriff, state) 911

Fire Department 911

Airport

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

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

Fed. Express 1-800-238-9395

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

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

SITE RESOURCES

Site Emergency Evacuation Alarm Method N/A

Water supply Source On-site

Telephone Location, Number To bo dotorminod on-sit.

Cellular Phone, if 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 Environnont, Inc., Safety Director
   Paul Jonmaire ..... (716) 684-8060 (office)
   (716) 655-1260 (home)

3. Regional Office Cbntact ..... M.Miller.... 656-2854 (hone)
   877-1978 (office)

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

MEDTOX HOTLINE

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

   What to report:

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

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

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

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

EMERGENCY ROUTES

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

Directions to hospital (include map)

Dispensary - From the site turn right onto Taylor Road (Fort Road) and continue for approximately 1.5 mi. until Taylor Road (Fort Road) intersects Murray Road. Turn right (south) on Murray Road and follow it to Ellyson Avenue. Turn right onto Ellyson Avenue and continue to its intersection with Turner Street. The NAS Dispensary is located on the northwest corner of the intersection of Ellyson and Turner Street, in Bldg. 625-A.

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

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

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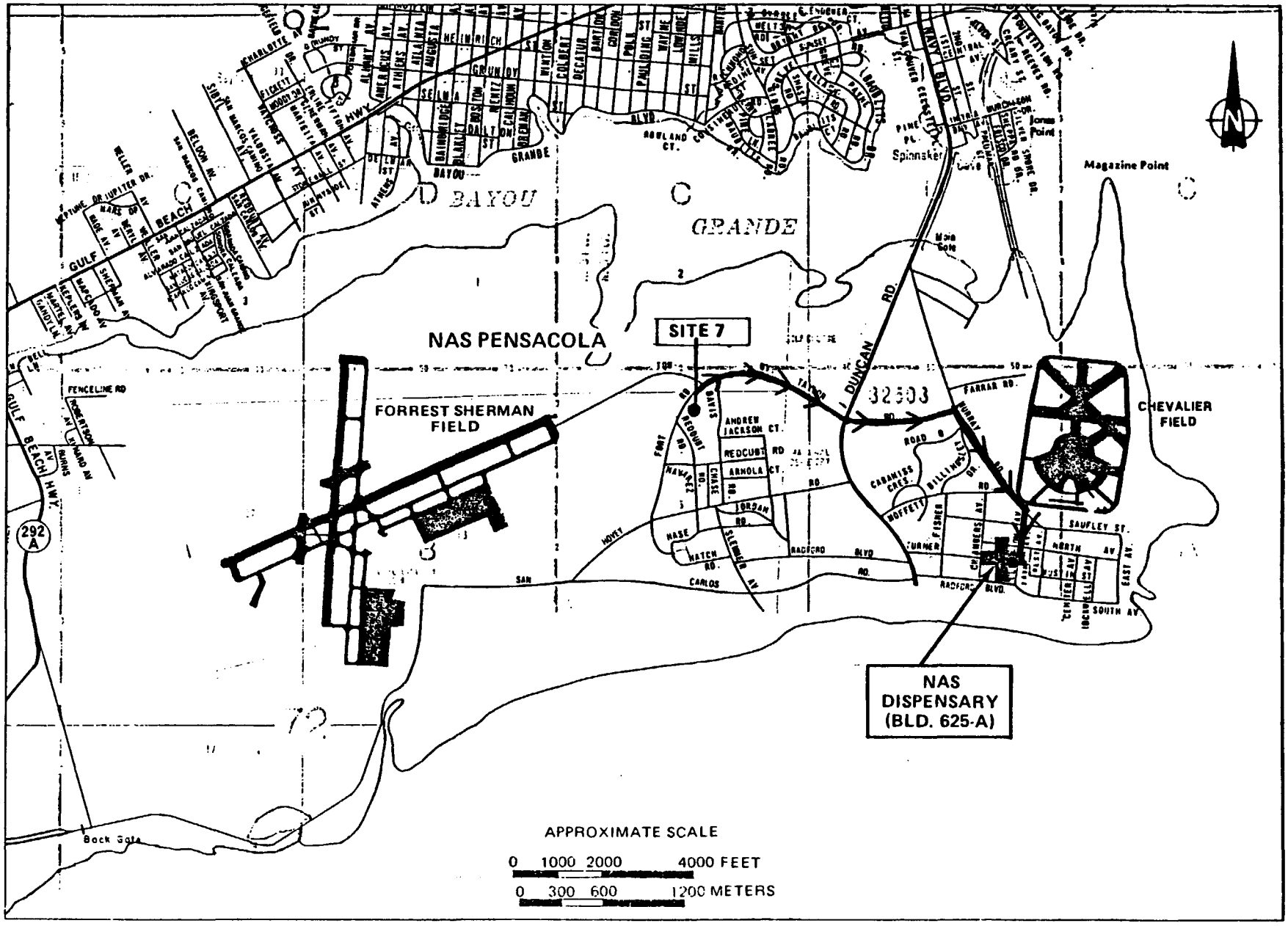
NAS PENSACOLA
SITE 7
FORREST SHERMAN FIELD
CHEVALIER FIELD
NAS DISPENSARY (BLD. 625-A)
GRANDE
BAYOU
Magazine Point
Spinnaker
Cove
Pine Pt.
Jones Point
Main Gate
Back Gate
GULF BEACH HWY.
292 A
DUNCAN RD.
FARRAR RD.
ROAD 9
32503
REDOUBT RD.
ANDREW JACKSON CT.
ARNOLA CT.
JORDAN RD.
HASE
HATCH RD.
SAN CARLOS
HOVEY
RADFORD BLVD.
SAUFLEY ST.
NORTH AV
SOUTH AV
EAST AV
CHAMBERS AV
TURNER
MOFFETT
CARNISS CRES.
BILLINGSLEY DR.
FENCELINE RD
ROBERTSON AV
BURNS
N
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 attenti n to ob tacles 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.
* 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 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 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 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 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, "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

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 ambient 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 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 B, 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 is at 110 beats/minute or less and the deceleration between the first, second, and third minutes is at kast 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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HAZARD. EVALUATION OF CHEMICALS

Chemical Name Gasoline Date 10-9-86

DOT Name/U.N. No. Flammable liquid UN1203 Job No. FP5000

CAS Number 8006-61-9

References Consulted (circle):

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

Toxic and Hazardous Safety Manual ACGIH Other: Sax

Chemical Ropertin: (Synonyms: Petrol, Motor spirits

Chemical Formula Mixture of hydrocarbons Molecular Weight

Physical State liquid Solubility (H_2O) insoluble Boiling Point 39-204°C

Flash Point -50°F Vapor Pressure/Density /3-4g/l Freezing Point N/A

Specific Gravity greater than 1 Odor/Odor Threshold Flammable Limits 1.3-6%

Incompatabilities Strong oxidizers

Biological Properties:

TLV-TWA 300 ppm PEL Odor Characteristic aromatic

IDLH Human Aquatic Rat/Mouse

Route of Exposure Inhalation, Dermal

Carcinogen X Teratogen Mutagen

Handling Recommendations: (Personal protective measures)

Protective goggles, glwes, masks in heavy exposures to vapors.

Monitoring Recommendations:

Combustible gas O_2 meter-lined filter to prevent leaded gasoline from contaminating the elements, and HNU for air monitoring.

Disposal/Waste Treatment:

Health Hazards and first Aid:

Inhalation - remove to fresh air, administer O_2 if needed

Ingestion - use stomach wash followed by saline catharsis.

Symptoms: Acute: dizziness, unconsciouness, hyperemia, CNS depression

Chronic: Dermatitis, Pulmonary edema.

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Material Safety Data

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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.

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 c a w call a physician.

SEE SECTION 5.

DOT Hazard Class: Flammable Liquid

SECTION 1 Physical Data

Appearance: Clear, colorless liquid.

Odor: Rubbing alcohol.

Solubility: Infinite in water.

Boiling Point: 82°C (180°F).

Melting Point: -89°C (-128°F).

Specific gravity: 0.79

Vapor Density (Air = 1): 2.1

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

Evaporation Rate: (n-BUAC = 1) 2.83

SECTION 2 Fire and Explosion Information

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

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

Stability:
Stable under ordinary conditions of use and stongc. Hut and sunlight can contribute to instability.

Hazardous Decomposition Products:
Toxic gases and vapors such as carbon monoxide may be released in a lire 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 an8 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 an8 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

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SECTION 5 Health Hazard Information

A. EXPOSURE / HEALTH EFFECTS

Inhalation:
May cause irritation of the now 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 S i h 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 seven irritation, possible corneal burns and eye damage.

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

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

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

topestion:
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. Got 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 b preferred. Separate from oxidizing materials. Containers should be bonded and grounded for transfers to avoid static sparks. Storage a d use areas should be No Smoking areas. Use non-sparking type tools and equipment.

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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.

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 c a w call a physician.

SEE SECTION 5.

DOT Hazard Class: Flammable Liquid

SECTION 1 Physical Data

Appearance: Clear, colorless liquid.

Odor: Rubbing alcohol.

Solubility: Infinite in water.

Boiling Point: 82°C (180°F).

Melting Point: -89°C (-128°F).

Specific gravity: 0.79

Vapor Density (Air = 1): 2.1

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

Evaporation Rate: (n-BUAC = 1) 2.83

SECTION 2 Fire and Explosion Information

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

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

Stability:
Stable under ordinary conditions of use and stongc. Hut and sunlight can contribute to instability.

Hazardous Decomposition Products:
Toxic gases and vapors such as carbon monoxide may be released in a lire 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 an8 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 an8 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:
Corrosive! Inhalation of nponcan cause breathing difficulties and lead to pneumonia and pulmonary edema, which may be fatal. Other symptoms may include coughing, choking, and irritation of the nose, throat, and respiratory tract.

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

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

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

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

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

B. FIRST AID

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give 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 lust 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

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

C. TOXICITY DATA (RTECS, 1982)

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

SECTION 6 Occupational Control Measures

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

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, 'Industrial Ventilation, A Manual of Recommended Practices", 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 area. Protect from physical damage and direct sunlight. Isolate from incompatible substances. Protect from moisture.

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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.

.UTI S

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

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

MER AID

In all cases call **a** physician. In case **of** contact, immediately flush **skin or eyes** with plenty **of** water lor at least **15** minuter.
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% (77°F)***

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

Evaporation Rate: **No** information found.

SECTION 2 Fire sod 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. Reacts with **mort** metals releasing flammable, potentially explosive hydrogen **gas.**

Explosion:
Not combustible, but substance **is a** strong **oxidizer** and its **h u t** 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 protectbe 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,** a d **with** cyanides a d sulfides **to form poisonous hydrogen** cyanide a d **hydrogen** sulfide **respectively.**

Hazardous Polymerization:
Wi. not **occur.**

Incompatibilities:
Water, bases, organic material, halogens, metal acetylides, **oxides and hydrides,** strong oxidizing a d 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 a d 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 **a d** 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.

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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SITE SAFETY PLAN

Version 988

A. GENERAL INFORMATION

Project Title: Site IO-Pier Pipolino Leak Area

Project lo.: UH1303

TDD/Pan lo.:

Project Manager: John Barksdale

Project Dir.: Rick RUdy

Location(s): Pier Pipeline Leak Area - Southeast Corner of NAS on the Pensacola Bay Shoreline

Prepared by: Hal Davis

Dato Prepared: 4-25-89

Approval by: Mary Miller MM

Dato Approved: 5-5-89

Site Safety Officer Review:

Dato Reviewed:

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

Proposed Dato 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 [ ]	Moderato [ ]
	LOW [X]	Unknown [ ]

B. SITE/WASTE CHARACTERISTICS

waste Type(s):

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

Characteristic(s):

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

Other:

Physical Hazards:

Overhead [X]	Confined* Space [ ]	Below Grade [ ]	Trip/Fall [X]
Puncture [ ]	Burn [ ]	Cut [ ]	Splash [X]
Noise [X]	Other: A 1,300,000 gallon fuel storage tank is on the site and construction is in progress on tho site. Vehicular traffic in tho site area.		

*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): In 1981, a leak was discovered in tho fuel pipeline loading to tho Berthing Pier. Tho pipelines had not boon in active use for several years. Tho leak vas repaired and tho oil soaked soil removed. Four monitoring wells were installed and no free product was reported. Tho location of tho monitoring wells is unknown. Station personnel reported that they commonly observed oil slicks near tho Berthing Pier after tho cleanup.

Locations of Chemicals/Wastes: If contamination is present it is probably located in surface and subsurface soils.

Estimated Volume of Chemicals/Wastes: unknown

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

C. HAZARD EVALUATION

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

Physical Hazard Evaluation:

1) Physical Surveys - Aircraft, Automobile hazards;

2) Temporary Monitoring Well Installation - Aircraft, 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
Fuel Oil	none specified	Inhale, Dermal	vomit, diarrhea	0.082 ppm	mild petroleum
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 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

Modifications: Modified level D with tyvock, 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 ,252 LEL (California-20%), unknown organic vapors >500 ppm, particulates >____ mg/m , 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

(Expand if necessary)

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 Docon 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: Docontamination 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 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. If above background radiation levels are encountered team members will evacuate tho 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 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-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 all handling of samples. a11 field team members will wear surgical gloves. Goggles will be worn during sample preservation with acids.

Tear Member*	Responsibility
Team members to bo determined	Team Loader
	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 train ng per 29 CFR 1910.120. Respiratory protection program meets requirements of 29 CFR 1910.134, and MSI 288.2 1980).

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E. EMERGENCY INFORMATION

(Use supplemental sheets, if necessary)

LOCAL RESOURCES

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

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

Hospital Emergency Rooa NAS Dispensary - 904-452-2733, Baptist Hospital 904-134-4811 (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, Enginmer-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-site

Telephone Location, Number To be determined on-site

Cellular Phone, if available N/A

Radio

Other On-site warehouse number to be determined

EMERGENCY CONTACTS

1. Dr. Raymond Harbison (Univ. of Florida) ..... (501) 221-0465 or (904) 462-3271, 3281
   Alachua, Florida (501) 370-8263 (24 hours)
2. Ecology and Environamnt, Lnc., Safety Director
   Paul Jonmaire ..... (716) 684-0060 (office)
   (716) 655-1260 (home)
3. Regional Office Contact .....M.Miller.... 656-2854 (home)
   877-1978 (office)
4. Office Manager ..... :.....R.Rudy..... 093-7245 (home)

MEDTOX HOTLINE

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

   What to report:

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

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

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

   a. 24 hour hotline - (716) 604-8940
   b. Corporate Safety Director - Paul Jonmaire - homo # (716) 655-1260
   c. Assistant Corp. Safety Officer - Steven Sherman - homo # (716) 688-0014

EMERGENCY ROUTES

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

Directions to hospital (include map)

NAS Dispensary - Take East Avenue north to North Avonuo and turn loft (west). Follow North Avonuo to its intersection with Ellyson Avenue and turn loft (south) on Ellyson Avonuo. Follow Ellyson Avenue to it's intersection with Turner Street. Tho NAS Dispensary is located on tho northwest corner of tho intersection of Ellyson Avonuo 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 Blvd. Turn loft (north) on Pace Blvd. and proceed approx. 1mi to Cervantes St. (Hwy. 90). Turn right on Cervantes/Hwy. 90 and follow this road for about 8 blocks and turn loft (north) onto E street. Tho hospital is about 6 blocks north on tho loft.

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

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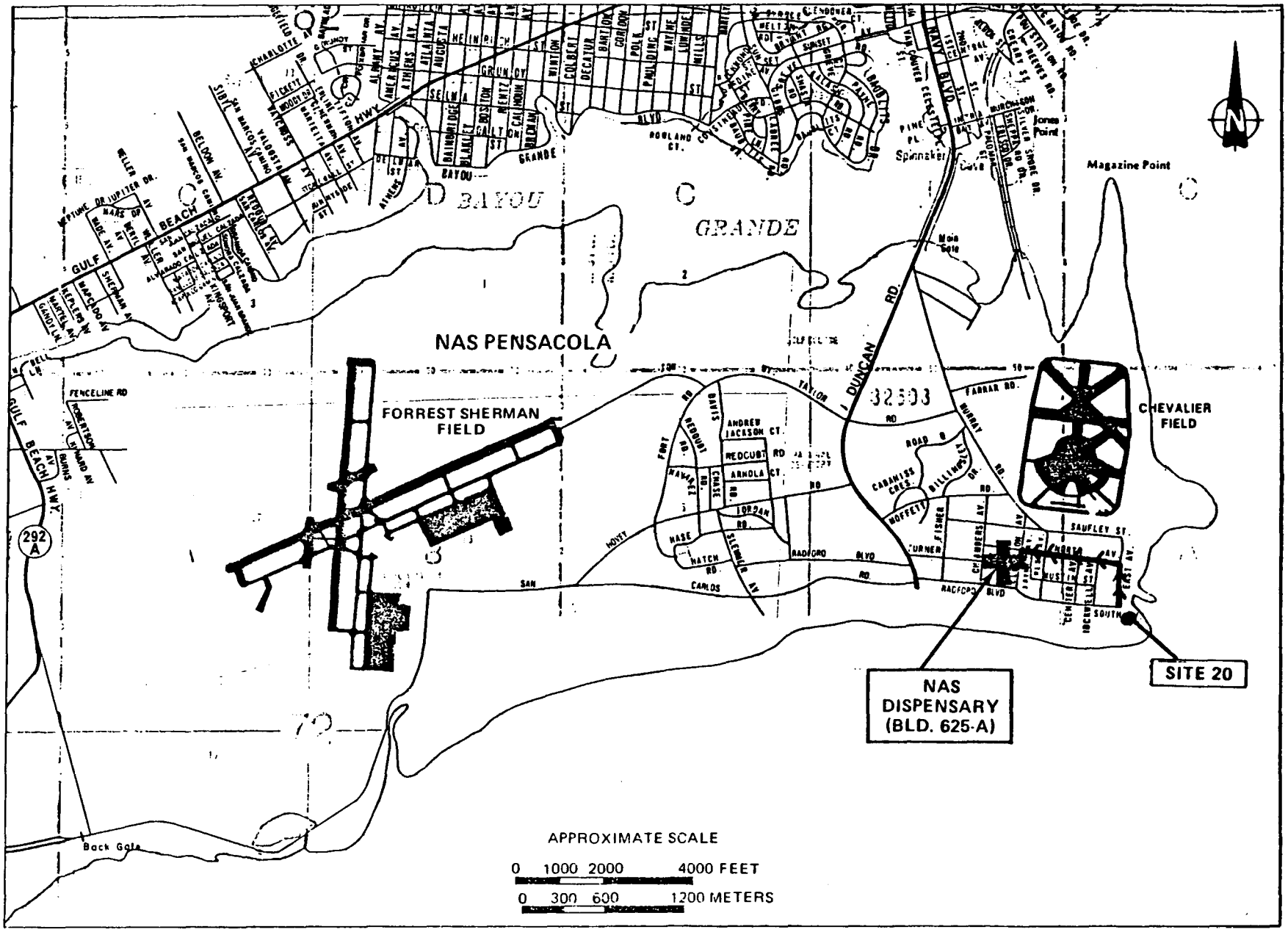
NAS PENSACOLA
FORREST SHERMAN FIELD
CHEVALIER FIELD
NAS DISPENSARY (BLD. 625-A)
SITE 20
Magazine Point
Jones Point
Spinnaker
Main Gate
Back Gate
BAYOU GRANDE
GULF BEACH HWY.
DUNCAN RD.
TAYLOR RD.
FARRAR RD.
MURRAY RD.
SAUFLEY ST.
RADFORD BLVD
SAN CARLOS
HOLT
FENCELINE RD
NAVY BLVD
32503
APPROXIMATE SCALE
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.
* Make sure proper housekeeping is practiced around and on the rig at all times. Tools should be stored in a manner that permits convenient access and provides for adequate safety.
* Store gasoline in approved containers that have a spark arrestor and keep them clear of the drilling work area.
* Check rig equipment prior to starting work. Repair or replace faulty and worn items.
* Handle augers with care. Use proper lifting techniques when picking up samplers and augers. Use a tool hoist if possible and stay clear of rotating augers. Keep cables and ropes secured when not in use.
* Level and stabilize the drill rig prior to raising the mast.
* Watch for slippery ground when working in the area of the rig.
* All unattended boreholes must be properly covered.
* Do not drill during an electrical storm.
* Maintain a safe distance from the rig mechanisms during drive sampling and auger removal operations.

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 arid 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.

<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 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 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 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, "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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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. Tranrportation 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 ambient 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 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 B, the suggested guidelines for ambient temperature arid maxlmum wearing time per excursion are:

Amblent Temperature (°F)	Maxlmum Wearing Time per Excursion (Mlnutes)
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 mlnuta. and tho last 30 seconds of the thlrd 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 thlrd minutes is at least 10 beats/minute, the work-recovery regime is acceptable. If the employee's rate Is above that specifled, a longer rest period is required, accompanied by an Increased intake of fluids.

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HAZARD EVALUATION OF CHEMICALS

Chemical Name Fuel Oil No. 2 Date

DOT Name/U.N. No. Fuel Oil UN1993 Job No.

CAS Number N.S.

References Consulted (circle):

NIOSH/OSHA Pocket Guide Varschwran . Harck Index Hazardline Chris (Vol. II)

Toxic and Hazardous Safety Manual ACGIH Other: OHS 10100

Chemical Properties: (Synonyms: Diesel Oil, NA1993, ASTM D396)

Chemical Formula varies Molecular Weight varies

Physical State liquid Solubility (H_2O) insoluble Boiling Point 340-675°F

flwh Point 100-136°F Vapor Pressure/Density NA freezing Point N.S.

Specific Gravity 0.879 Odor/Odor Threshold 0.082ppm Flammable Limits UEL-7.5%

Incompatabilities Strong oxidizers, heat LEL-0.6%

Biological Properties:

TLV-TWA None specified PEL N.S. Mor Characteristic mild Petroleum odor

IDLH N.S. Human N.S. Aquatic N.S. Rat/Mouse N.S.

Route of Exposure Dermal absorption, inhalation

Carcinogen possible Teratogen N.S. Mutagen N.S.

Handling Recommendations: (Personal protective measures)

Impervious clothing. neoprene gloves and boots.APR with GMCH Cartridges at high concentrations

Monitoring Recommendations:

OVA or HNu with 10.2 eV Drobe for organic detection. MSA 260 €or potentially explosive environments

Disposal/Waste Treatment:

Do not burn thermal decomposition products are toxic.
Contaminated materials to be disposed of as a hazardous waste.

Health Hazards and First Aid:

Skin and mucous membrane irritant. CNS depressant.
Wash skin upon contact, do not induce vomiting if ingested.

Symptoms: Acute: Vomiting, diarrhea, pulmonary edema, pneumonia, coma respiratory paralysis, asphyxia

Chronic: Skin, mucous membrane, respiratory irritant, CNS depressant

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(12/83,DLD)

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 43061.

ISOPROPYL **ALCOHOL**

PRODUCT **IDENTIFICATION**

Synonyms: I-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.
Amid breathing **vapor.**
Wash thoroughly after handling.
Avoid contact **with** eyes, **skin** and clothing.

EMERGENCY/FIRST AID

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

DOT Hazard Class: Flammable Liquid

SECTION 1 Physical **Data**

Appearance: Clear, colorless liquid.

Odor: Rubbing alcohol.

Solubility Infinite in water.

Boiling Point: **82°C (180°F).**

Melting Point: -89°C (-128°F).

Specific **gravity:** 0.79

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

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

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

SECTION 2 Fire and Explosion Information

Fire:
Flammable Liquid
Flashpoint: **12°C (53°F).** (closed cup).
Autoignition temperature: 399°C (750°F).
Flammable limits **in** air, % by volume:
lel: 2.9 uel: 12.0.

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

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

Special Information:
In the event of a fire, wear full protective clothing and 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 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 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 imtation 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:
H ua defatting action of the skin that can cause imtation. May cause irritation with a stinging effect and burning sensation.

Eye Contact:
Vapors may irritate the eyes. Splashes may cause severe irritation, possible corneal bums a d eye damage.

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

Aggrevation of Pre-existing Conditions:
Persons with preexisting 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 m t e r 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 respintor 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, a my from any area where the fire hazard may be acute. Outside or detached storage is preferred. Separate from oxidizing materials. Containers should be bonded a d grounded for transfers to avoid static sparks. Storage and use a r e a s should be No Smoking a r e a s. Use non-sparking type tools a d equipment.

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 43061.

ISOPROPYL **ALCOHOL**

PRODUCT **IDENTIFICATION**

Synonyms: I-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.
Amid breathing vapor.
Wash thoroughly after handling.
Avoid contact with eyes, skin and clothing.

EMERGENCY/FIRST AID

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

SEE SECTION 5.

DOT Hazard Class: Flammable Liquid

SECTION 1 Physical Data

Appearance: Clear, colorless liquid.

Odor: Rubbing alcohol.

Solubility Infinite in water.

Boiling Point: **82°C (180°F).**

Melting Point: -89°C (-128°F).

Specific **gravity:** 0.79

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

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

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

SECTION 2 Fire and Explosion Information

Fire:
Flammable Liquid
Flashpoint: **12°C (53°F).** (closed cup).
Autoignition temperature: 399°C (750°F).
Flammable limits in air, % by volume:
lel: 2.9 uel: 12.0.

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

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

Special Information:
In the event of a fire, wear full protective clothing and 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 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 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

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SECTIO N S 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 pin a d 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.**

Eyr Contact:
Corrosive! Vapors are irritating and may cause damage to the **eyes.** Splashes may cause severe b u m and permanent eye **damage.**

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

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

B. FIRST AID

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

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

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

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

C. TOXICITY DATA (RTECS, 1982)

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

SECTION 6 Occupational Control Measures

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

Ventilatloo 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", 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 canisters **that** contain oxidizable materials, such as activated charcoal.

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

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

SECTION 7 Storage and Special Information

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

Mallinckrodt
Material Safety Data

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

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Mallinckrodt, tux.. **Science Products** Division. P.O. **Box M, Paris,** KY 40061.

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 IE SWALLOWED. HARMFUL IC 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 aod Emlosloo loformstloq

Fire:
Not combustible, but substance is a strong **odduer** and its heat *of* reaction with reducing **agents or** combustible may cause ignition. **Reacts** with **mort 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 chemicrl, form 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 oxide of sulfur. Will **react** with **water** or steam to produce toxic and **corrosive** fumes. Reacts with carbonates to generate carbon dioxide **gas,** a d **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 a d **many** other reactive substances.

SECTION 4 Leak/Spill Disposal Information

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

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

Ensure compliance with local, state **and federal regulations.**

NFPA Ratings: Health: 3 Flammability: *0* Reactivity: **2** Other: **Water** reactive

SECTION 5 Health Hazard Information

A. EXPOSURE / HEALTH EFFECTS

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

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

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

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

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

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

B. FIRST AID

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. 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 pknty 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 Umit (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 lo 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 h into the general work area. Please relet 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 full facepiece 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 is less. Alternatively, a supplied air full facepiece respirator or airlined hood may be wom.

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

Eye Protection:
Use chemical safety goggles and/or a full face shield when 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 wid resistant floors and good drainage. Protect from physical damage. Keep out of direct sunlight and amy from heat, water, and incompatible materials. Do not wash out container and use it for other purposes. When diluting, always add the wid to water, never add water to the acid.

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