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

## Firefighting School (Site 7)
## Pier Pipe Leak Area (Site 20)
## Sludge at Fuel Tanks Area (Site 21)

April 1992

Prepared for:

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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 Firefighting School Area (Site 7), Pier Pipe Leak Area (Site 20), and the Sludge at Fuel Tanks Area (Site 21) 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 6 E during preliminary site inspections conducted in January 1989.

E 6 E has developed a phased approach for performing the NAS Pensacola site investigations. Phase I (Field Screening) is directed toward identifying the principal area(s) and primary contaminants of concern at a site, thereby providing a mechanism for focusing the sampling and analytical efforts during subsequent phases of the investigation. Phase II (Characterization) is directed toward the formal confirmation and quantification of the full spectrum of site contaminants (if any), thereby allowing determination whether further investigation is warranted. Thus, the necessity of implementing phases III and IV (Extent Delineation) will be dependent on the results of phases I and 11. Phases III and IV, if required, will be directed not only toward fully identifying the horizontal and vertical extents of contamination, but also toward providing the quantitative data base necessary to support the screening and evaluation of potential remedial alternatives. The main objectives/advantages of this phased approach are as follows:



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

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

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

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

# 2. SITE DESCRIPTION

## 2.1 Site 7 - Pirefighting School Area

The Firefighting School Area (Site 7) includes Building 1713 and its vicinity near the intersection of Redoubt and Taylor roads, approximately 400 feet southeast of Fort Redoubt (see figures 2-1 and 2-2). The area north and south of Building 1713 is primarily wooded and the area southeast contains several mobile homes. The immediate vicinity is primarily unpaved. A 1983 Initial Assessment Study (IAS) conducted by the Naval Energy and Environmental Support Activity (NEESA) states that the remains of a raised open tank, which was formerly used in the training exercises, exist on the west side of the building. The tank was formerly filled with water topped with gasoline, which was ignited to provide a sustained fire for the training exercises. There is a firefighting tower east-southeast of the building and a large clearing adjacent to the tower which may also have been used for firefighting exercises.

The site vicinity is topographically flat with a land surface elevation of approximately 20 to 25 feet above mean sea level (MSL). An NAS Pensacola water supply well (Well No. 3) is located 0.25 mile south-southwest of the site. There are no existing monitoring wells at Site 7.

## 2.2 Site 20 - Pier Pipe *Leak* Area

A berthing pier is located near the southeast corner of NAS Pensacola on the Pensacola Bay shoreline (see Figure 2-1). The pier area consists of an approximately 30-foot-wide concrete loading area immediately adjacent to the pier seawall, surrounded by a large asphalt parking lot (see Figure 2-3). There is a 1,300,000-gallon, aboveground fuel storage



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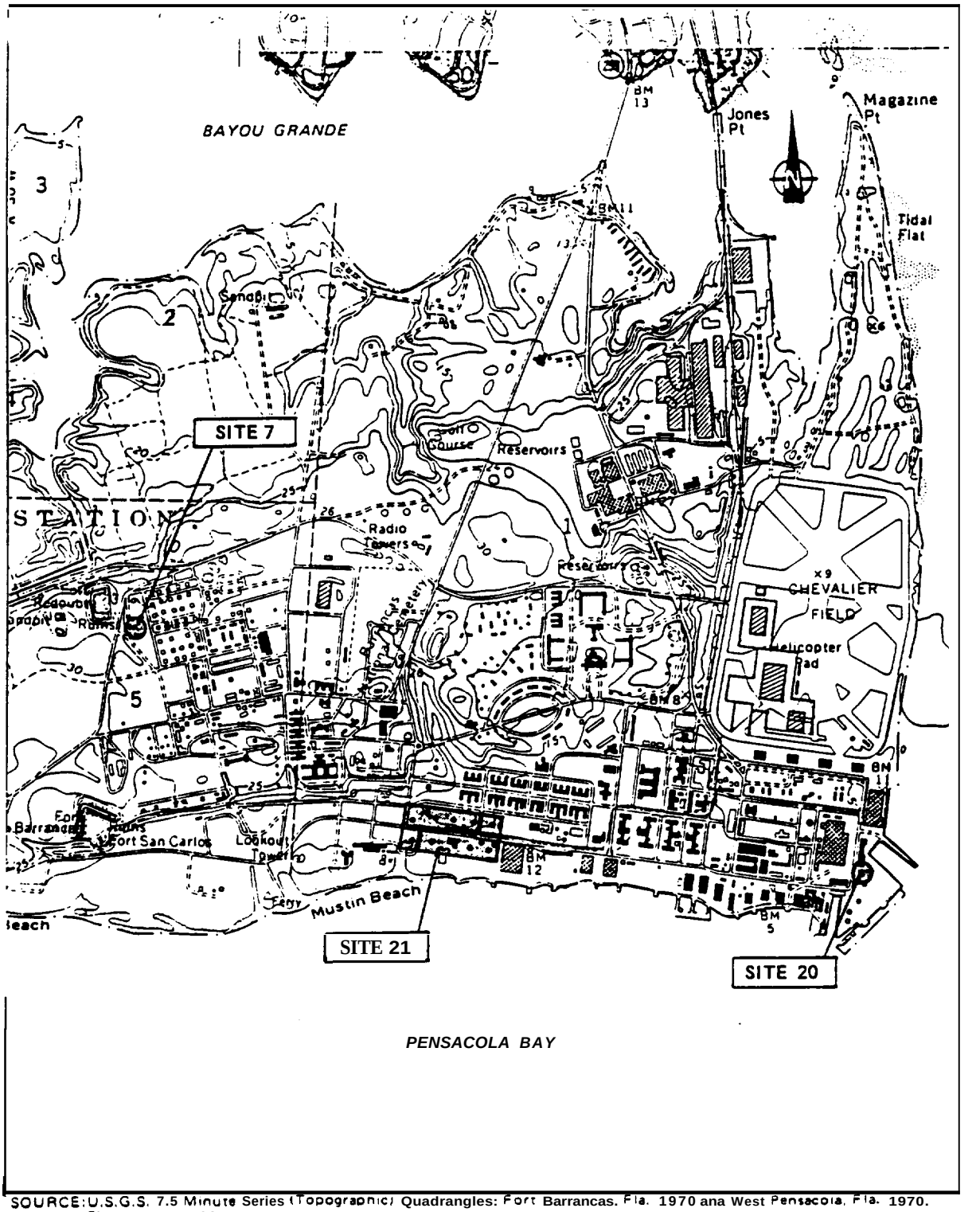


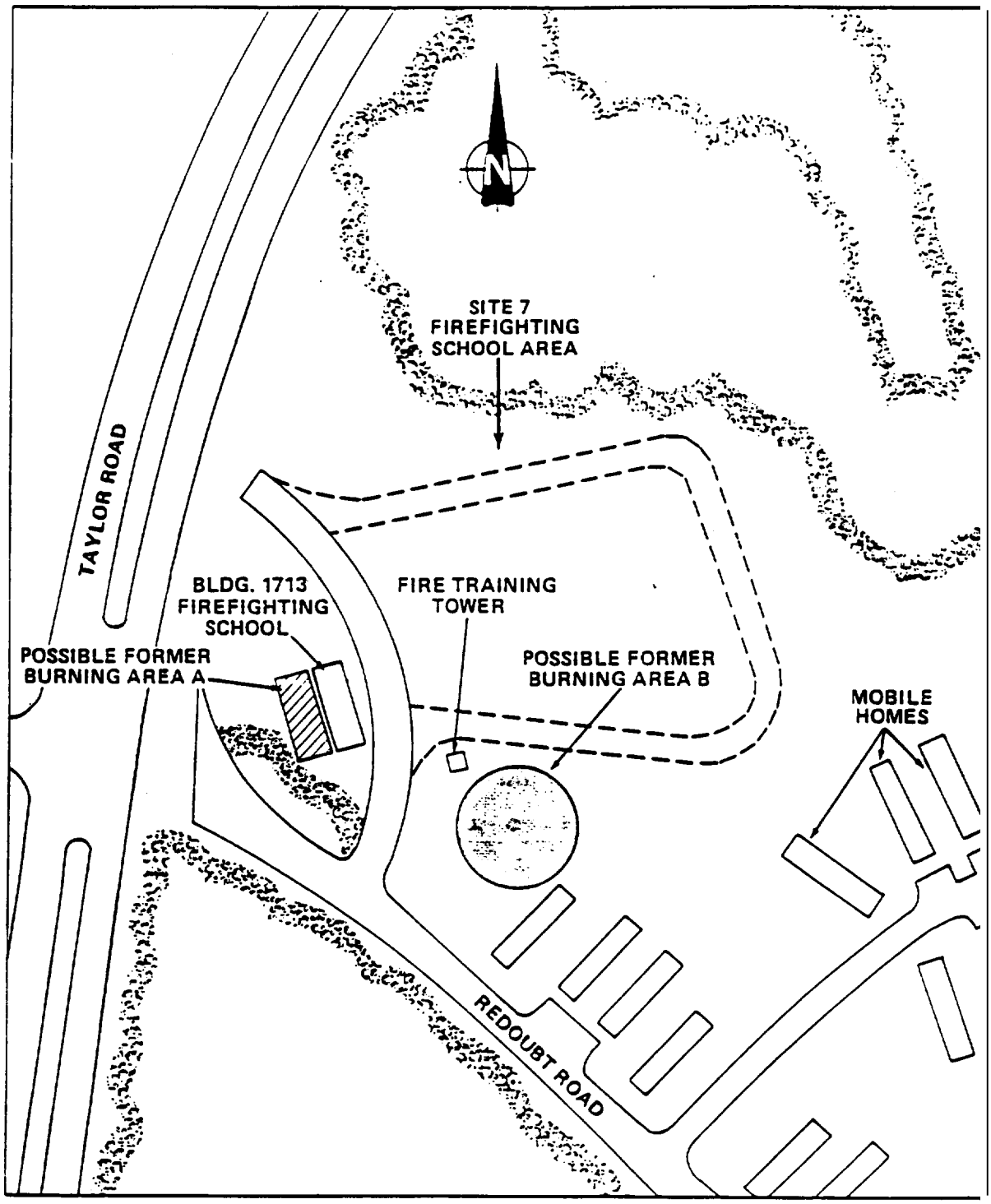

SOURCE: U.S.G.S. 7.5 Minute Series (Topographic) Quadrangles: Fort Barrancas, Fla. 1970 and West Pensacola, Fla. 1970. Photorevised 1987

SCALE

0 ½ 1 MILE

0 .5 1 KILOMETER

**Figure 2–1 LOCATION MAP – NAS PENSACOLA SITES 7, 20, and 21**

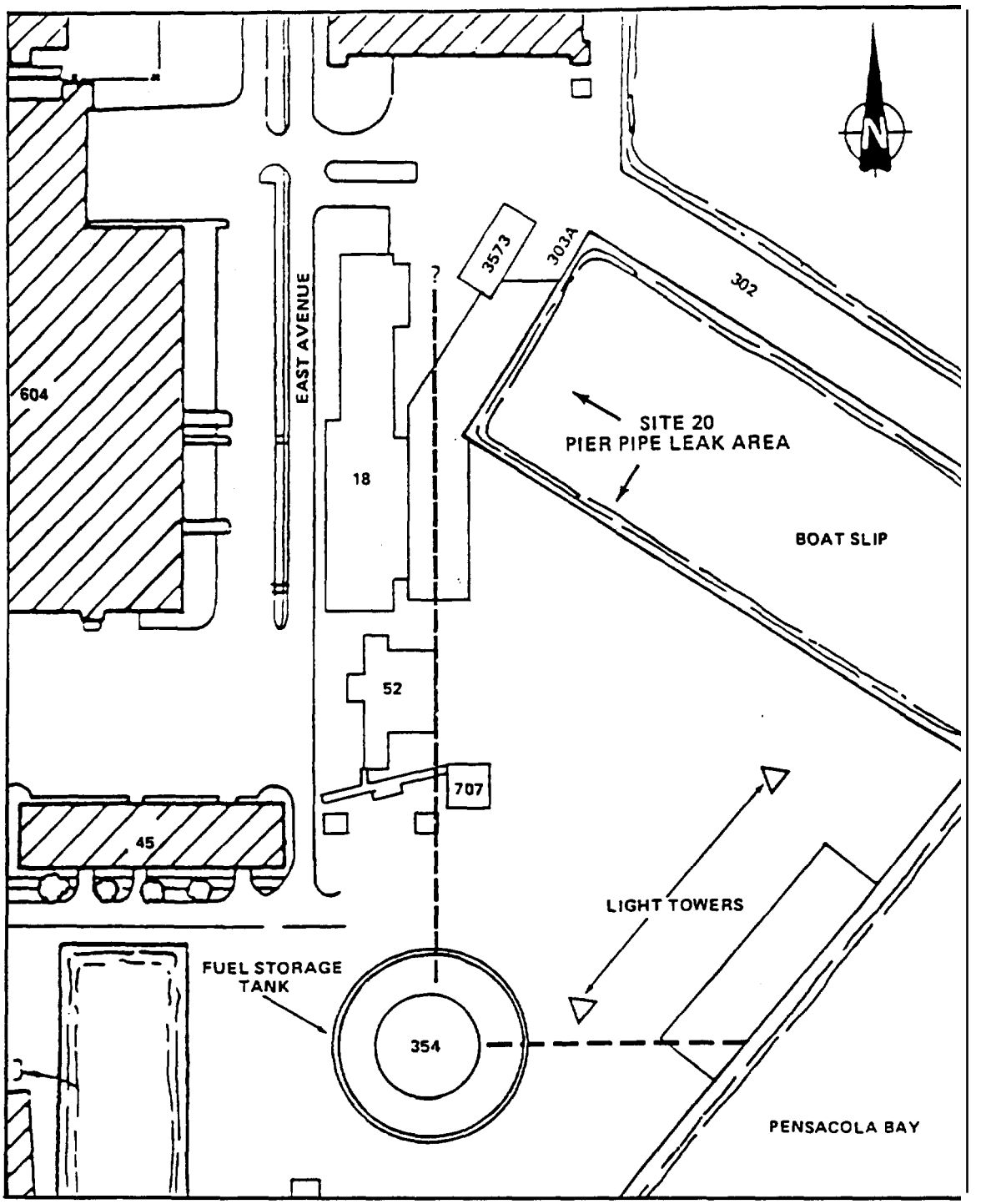



SOURCE: U.S. Naval Air Station, Pensacola, Florida, 1988

SCALE

0 50 100 150 200 FEET

Figure 2–2 SITE MAP – NAS PENSACOLA SITE 7




SOURCE: U.S. Naval Air Station, Pensacola, Florida, 1986

SCALE

0 100 200 400 FEET

KEY:

- Possible Fuel Pipeline
- Approximate Areas Of Previously Identified Potential Contamination
- Building

**Figure 2-3 SITE MAP – NAS PENSACOLA SITE 20**

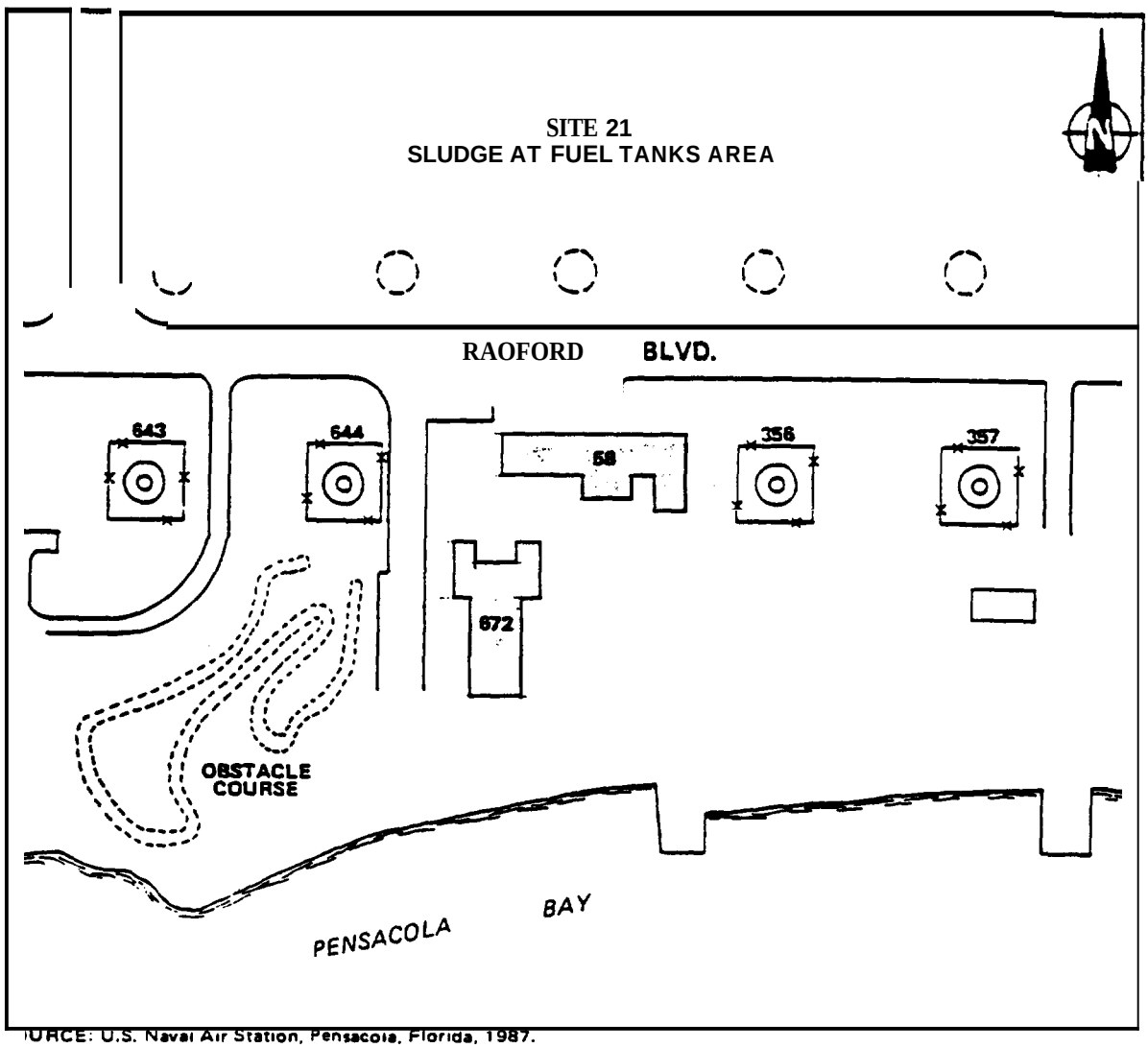
tank (tank number [no.] 354) on the southern end of the site with a surrounding concrete containment wall. The site area extends approximately 1,000 feet north of the storage tank and interfaces with buildings 707, 52, 18, and 3573.

The aboveground storage tank (no. 354) has been used to contain Navy Special Fuel Oil, Distillate DFM, and JP-5 jet fuel since 1926 (NEESA 1983). However, the structure may have been modified or replaced one or more times in the past 66 years. One or more pipelines extend from the fuel storage tank, presumably north toward Building 3573 to the berthing pier (structure no. 303) and possibly to other ship fueling areas. The exact location(s) of the pipeline(s) is not known at this time.

Site 20 is located approximately 1.2 miles and 1.0 mile from NAS Pensacola water supply wells nos. 1 and 2, respectively. According to NEESA (1983), there are four monitoring wells located on the berthing pier and on the seawall (structure no. 303a). The exact locations and the construction details of these wells are not known at this time. The Site 20 vicinity is topographically flat with a land surface elevation of approximately 5 feet above MSL.

23 Site 21 - Sludge at Fuel Tanks Area

Former sludge disposal areas are located around the perimeters of nine aviation gasoline (AVGAS) aboveground storage tanks near the intersection of Duncan Road and Radford Boulevard (see Figure 2-4). These tanks were in use from the 1940s through the 1960s; annual cleaning and sludge removal were performed from about 1951 to 1967 (NEESA 1983). Five of the tanks and containment structures located north of Radford Boulevard have been removed. These five tanks (former tank nos. 638, *640, 641, 642,* and *402)* each had a capacity of 90,000 gallons. Of the four remaining tanks, two (nos. *643* and *644)* have 100,000-gallon capacities and two (nos. 356 and 357) have 90,000-gallon capacities. These remaining four tanks may still be in use. All The tanks are or were presumably asphalt-coated steel, each with a concrete containment vall and a surrounding wire fence.




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

SCALE

0 100 200 300 400 500 FEET

KEY:

Aboveground Fuel Storage Tank and Containment Wall

Former Aboveground Fuel Storage Tank and Containment Wall

Figure 2–4 SITE MAP - NAS PENSACOLA SITE 21

The area in the immediate vicinity of the tanks, except Radford Boulevard and smaller access roads, is primarily unpaved. Buildings 672 and 58 are located in the south-central portion of the tank area. The tank area is located approximately 400 feet north of Pensacola Bay.

NAS Pensacola water supply Well No. 1 is located 0.4 mile north of Site 21. Reportedly, no monitoring wells exist at the site. The Site 21 vicinity is nearly level to gently sloping toward the bay with a land surface elevation of approximately 5 feet above MSL.

# 3. SITE HISTORY

## 3.1 Site 7 - Pirefighting School Area

The Firefighting School in Building 1713 has been in operation since 1940. Training exercises were performed on fires started with gasoline, and possibly other flammable liquids, in an open tank of water reportedly located on the west side of the building (NEESA 1983). The existence of a clearing and firefighting tower east-southeast of the building suggests that training may also have been performed in these areas. NEESA (1983) concluded that, as there was no apparent evidence of hazardous waste disposal, the site did not constitute a threat to human health or the environment and further study was not recommended.

## 3.2 Site 20 - Pier Pipe Leak Area

In 1981, a leak was discovered in the fuel pipeline leading to the berthing pier while a contractor was driving piling for the pier. Apparently, the pipelines had not been in active use for several years, and either the lines had broken during construction or residual fuel had leaked from the pipes during the years of usage (NEESA 1983). The soil in the excavation area appeared soaked with fuel oil, reportedly Navy special fuel oil or marine diesel fuel (NEESA 1983).

The excavation activities resulted in the release of oil to Pensacola Bay. This release was cleaned up and the excavated soils were removed. Four monitoring wells were installed on the berthing pier and on the seawall (structure no. 303A); the precise locations and construction details of these wells are not known at this time. At the time of the IAS investigation, there was no apparent free product in these wells; however, no groundwater samples were collected for laboratory analyses.

The 1983 IAS reported that station personnel commonly observed oil slicks near the berthing pier. NEESA concluded that, because the leak was repaired and oil-soaked soil removed, the site did not constitute a threat to human health or to the environment and no further investigation was recommended.

### 3.3 Site 21 - Sludge at Fuel Tanks Area

From the 1940s through the 1960s, tank-bottom sludges were removed from the nine AVGAS aboveground storage tanks at Site 21 and were disposed of in the surrounding soils. During an approximately 20-year period, an estimated 360 cubic yards of sludge was disposed of around the perimeter of the tanks reportedly creating a doughnut-shaped disposal site with an area of approximately 1,650 square feet and an outside diameter of approximately 50 feet around each tank (NEESA 1983). The sludge was buried to an unknown depth and may contain lead, tetra ethyl lead, and other gasoline components and additives. Because of the site's proximity to Pensacola Bay (within 400 feet), groundwater levels are probably less than 5 feet below land surface (BLS). These probable levels and the high permeability of the soils indicate a high potential for contaminant migration to the bay. NEESA (1983) concluded that the potential for migration from this site warranted further investigation and recommended the collection of surface water and soil samples.

# 4. CLIMATOLOGY

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

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

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



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

# 5. BIOLOGICAL RESOURCES

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

## 5.1 Regional Biological Resources

### 5.1.1 Terrestrial

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

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



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pine), Quercus spp. (scrub oak species, geminata, champanii, myrtifolia, and inopina), Cladonia species, and Ceratiola ericoides (rosemary). This community type has been ranked by FNAI as imperiled statewide because of its rarity and because of its vulnerability to extinction due to some artificial or biological factor. This community type can have three to five distinct habitats (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 racemiflora (swamp titi), and other hydric or riparian species. Open moist savannah areas within flatwoods are dominated by the herbaceous plants Pinguicula spp. (butterwort), Sarracenia spp. (pitcher-plants), Uticularia spp. (bladderworts), Polygala spp. (milkworts), and Drosera spp. (sundews; Wolfe et al. 1988).

Sandhill communities are found in dry soils which are lower in fertility than flatwoods soils. The overstory of this community type is dominated by Pinus palustris (longleaf pine), Quercus laevis (turkey oak), Q. marilandica (bluejack oak), Q. stellata (post oak), and Q. falvata (southern red oak). The understory is dominated by Diospyros virginiana (wild persimmon) and Crataegus lacrimata (Pensacola hawthorn). The more abundant herbaceous plants found in moist areas are Pteridium aquilinum (bracken fern) and Aristida stricta (wire grass). These habitats were verified with walk-through surveys and ground truthing by the Navy in March 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 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 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 gopher tortoise (Gopherus polyphemus) can most likely be found in suitable habitats on the western portions of the facility (see Appendix C). Most of the reptiles and amphibians that may be found on the facility can be expected to use the surface water bodies in some stage of their life cycle. Any contamination of surface water bodies can be detrimental to existing populations of reptiles and amphibians utilizing that water body.

### 5.1.2 Aquatic

Freshwater. Little is known of the flora and fauna inhabiting the streams, swamps, and bogs found on NAS Pensacola. These habitats may have been significantly altered for drainage control and base development. Some of the species associated with aquatic habitats are Semotilus atromaculatus (creek chub), Gambusia affinis (mosquitofish), and Etheostoma sp. (darters). Birds, mammals, reptiles, and amphibians that associate with aquatic habitats may also be found in and around those sites with surface waters (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 saltmarsh cordgrass (Spartina alterniflora) or black needlerush (Juncus roemarianus). A biota survey of these and other potential habitat areas will be conducted to determine the extent of estuarine flora and fauna.



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

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

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

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

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

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

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

Moderate densities of blue crab (Callinectes sapidus), shrimp (Penaeus duorarum, P. setiferus, and P. aztecus), and oysters (Crassostrea virginica) have been collected throughout Pensacola Bay (Heil 1989).



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Shrimp are caught in greater abundances near NAS Pensacola because of the higher salinities. Blue crabs and oysters are more readily caught in the East Bay area. In fact, the only legal shellfishing areas recognized by the Florida Department of Natural Resources (FDNR) are in the East Bay area. Scallops (Aequipecten irradians) are collected only within grassbed areas. No information is available at this time on where scallops are collected by the general public and how many are removed. The nearest seagrass beds to the NAS facility are located in Big Lagoon along the southwest portion of the facility.

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

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

The estuarine system is a very important element in the life history of most of the commercial and sport fishing species sought. Between 65 and



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

**Marine Mammals.** Few mammals have been sighted within the area of the NAS Pensacola facility; most of the 13 species of mammals reported for the northeastern Gulf of Mexico stay predominantly in Gulf waters. The Atlantic bottlenose dolphin (Tursiops truncatus), however, has been sighted regularly off the NAS Pensacola facility. 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 quantitatively ranked as uncommon to common in abundance within the waters surrounding the NAS Pensacola facility.

Threatened and Endangered Species. A number of threatened and endangered species (see Appendix 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, and nesting and feeding animals on the facility grounds. Complete biotic surveys may be necessary to determine the

presence of threatened or endangered species and potential pathways of contamination to these species.

## 5.2 Site-Specific Biological Resources

Site 7 lies within a sand pine scrub vegetated community that has been altered by NAS Pensacola activities. All understory vegetation has been eliminated, and the overstory vegetation, composed primarily of pine and oak tree species, has been reduced. Areas north and south of the site are composed of more natural stands of the sand pine scrub community. It is expected that many faunal species associated with the sand pine scrub community use the site as a feeding area and a migration corridor between the wooded areas north and south of the site. There are no aquatic habitats found on site; however, Bayou Grande is located approximately 0.5 mile to the north.

Terrestrial habitats on sites 20 and 21 have been completely removed during the development of NAS Pensacola facilities. Vegetated communities have been replaced by buildings, paved roads, storage facilities, and berthing piers. It is expected that few, if any, faunal species use these sites as migration corridors, and no faunal species use these sites for feeding or nesting. Pensacola Bay is located within 400 feet of both sites. If contamination is present in the groundwater, the possibility exists that the contamination will affect nearshore marine communities in those areas. Primary faunal species that may be affected are benthic populations of polychaetes, bivalves, decapods, and fish. Organisms which feed on these benthic populations could also be affected by site contamination.



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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 artificial drainage pathways which include many stormwater outfalls. Discharge is mainly to the south into Pensacola Bay; however, some small intermittent streams discharge into Bayou Grande to the north from Sherman Field and Chevalier Field (USGS 1970a, 1970b).

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



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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

Sites 20 and 21 are located within 400 feet of Pensacola Bay. Any soil or groundwater contamination present at these sites may potentially impact the bay primarily via groundwater contaminant transport. The sampling of Pensacola Bay sediments near these areas is planned as part of the investigation of Site 2 (Waterfront Sediments).

No known significant surface water bodies occur in the vicinity of Site 7.

# 7. PHYSIOGRAPHY AND HYDROGEOLOGY

## 7.1 Physiography and Regional Eydrogeology

### 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 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 (VSGS 1970a, 1970b). Sandy soils occur throughout the NAS Pensacola area. As a result, most of the rainfall infiltrates directly into the subsurface. Consequently there are few streams or surface water bodies on the peninsula.

### 7.1.2 Regional Eydrogeology

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 Floridian Aquifer System.

#### 7.1.2.1 Surficial/Sand-and-Gravel Aquifer

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



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

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

and horizontal hydraulic gradients, however, velocities would generally be expected to be high.

**Low** Permeability Zone. Underlying the surficial zone is a zone of lower permeability sediments dominated by clay and silt-sized material. This zone is referred to as the low permeability zone. At NAS Pensacola, this zone is generally composed of gray to blue, sandy, silty, slightly fossiliferous (shelly) clay and clayey sand ranging in thickness from 8 to 40 feet (G 6 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 x $10^{-5}$ to 9.9 x $10^{-2}$ ft/day. Thus, the low permeability zone probably functions as a confining or semiconfining unit inhibiting the flow of groundwater between the surficial zone and the underlying main producing zone. The low permeability zone has been encountered in at least 16 borings at widely spread locations throughout NAS Pensacola (G 6 M 1984, 1986). Although additional boring or geophysical techniques would be required to confirm its presence at a given location, it is likely that this unit is ubiquitous at NAS Pensacola. Few, if any, wells are open to the low permeability zone at NAS Pensacola; thus, no information is available regarding groundwater flow direction.

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

main producing zone can be highly variable; however, it is estimated to be up to about 100 feet at NAS Pensacola. Insufficient data exist for wells open to the main producing zone at NAS Pensacola to determine direction of groundwater flow within 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 semiconfined conditions. At one nested well location on NAS Pensacola (east of Building 648), the water level elevation in a well open to the main producing zone is approximately 7 feet lower than that in an adjacent well open to the surficial zone (G & 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 (Wilkins ~~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). The entire sequence is primarily poor to non-water bearing. However, relatively thin beds of sand which exist within the unit may yield small quantities of water. In the NAS Pensacola area the Intermediate System is approximately 1,100 feet thick and is composed of the lower portion of the Miocene Coarse Clastics, the Upper Member of the Pensacola Clay, the Escambia Sand

Member of the Pensacola Clay, and the Lower Member of the Pensacola Clay; all 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 BLS at NAS Pensacola is the Floridan Aquifer System. The Floridan Aquifer in this area is composed of the Middle to Lower Miocene Chickasawhay Limestone and undifferentiated Tampa Stage Limestone. Groundwater within the Floridan Aquifer in this area is highly mineralized and is not used for water supply (Wagner et al. 1984).

## 7.2 Site Eydrogeology

### 7.2.1 Site 7 - Firefighting School Area

The soils of Escambia County are primarily derived from marine and stream-deposit parent material. The IAS soil association map (NEESA 1983) indicates that the surface soils at Site 7 are predominately sands and sandy loams. Lithologic information from nearby borings indicates that fine- to medium-grained quartz sands primarily occur to depths of approximately 15 to 20 feet BLS.

Currently, there are no monitoring wells on site and no available site-specific hydrogeologic data. However, land surface elevations are approximately 20 to 25 feet above MSL, and the depth to groundwater is a roughly estimated 15 feet. Based on well drilling logs for other areas on NAS Pensacola, a confining or semiconfining zone of low permeability can be expected to occur from approximately 40 to 70 feet BLS.

NAS Pensacola water supply well (Well No. 3) exists approximately 0.25 mile south-southwest of Site 7. This well is infrequently used as a secondary water supply to augment the primary well field located at Corry Station. The supply well was installed in 1969 to a depth of 240 feet BLS with stainless steel screen from approximately 185 to 240 feet BLS (open to the main producing zone). The well yield, when in use, is

about 1,200 gallons per minute (gpm), and depth to the static water level, in 1969, was approximately 45 feet.

### 7.2.2 Site 20 - Pier Pipe Leak Area

The soils of Escambia County are primarily derived from marine and stream-deposit parent material. The IAS soil association map (NEESA 1983) indicates that the surface soils at Site 20 are predominately undifferentiated coastal soils, including dune land and beach-tidal marsh. Lithologic information from nearby borings indicates that primarily fine- to medium-grained quartz sands occur to depths of approximately 15 to 50 feet BLS.

Site 20 is part of a pier that borders Pensacola Bay and is currently completely paved. There are reportedly four monitoring wells on site; however the locations, construction information, and water elevation data are not known at this time. Considering the site's proximity to Pensacola Bay, the depth to groundwater is a roughly estimated 5 feet, and groundwater flow is presumably to the east and south, toward the bay. Based on well drilling logs from other areas of NAS Pensacola, a confining or semiconfining zone of low permeability can be expected to occur beginning at a depth of 40 to 70 feet.

NAS Pensacola water supply well (Well No. 2) is located approximately 1 mile northwest of Site 20. This well is infrequently used as a secondary water supply to augment the primary well field located at Corry Station. The supply well was installed in 1942 to a depth of 178 feet (open to the main producing zone). The well yield, when in use, is about 650 gpm, and the depth to the static water level, in 1942, was approximately 38 feet.

### 7.2.3 Site 21 - Sludge at Fuel Tanks Area

The soils of Escambia County are primarily derived from marine and stream-deposit parent material. The IAS soil association map (NEESA 1983) indicates that the surface soils at Site 21 are predominately undifferentiated coastal soils, including dune land and beach-tidal marsh.

Site 21 is located approximately 400 feet north of Pensacola Bay. Currently, no monitoring wells exist on site, and no site-specific hydrogeologic data are available. However, due to the site's proximity to Pensacola Bay, the depth to groundwater is a roughly estimated 5 feet, and groundwater flow is presumably to the south toward the bay. Based on well drilling logs from other areas of NAS Pensacola, a confining or semiconfining zone of low permeability can be expected to occur beginning at a depth of 40 to 70 feet.

NAS Pensacola water supply well (Well No. 1) is located approximately 0.4 mile north of Site 21. This well is infrequently used as a secondary water supply to augment the primary well field located at Corry Station. The supply well was installed in 1942 to a depth of 174.5 feet (open to the main producing zone). The well yield, when in use, is about 650 gpm, and the depth to the static water level, in 1942, was approximately 32 feet.

# 8. PROJECT MANAGEMENT PLAN

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



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# 9. SITE MANAGEMENT PLAN

The Generic Site Management Plan (GSHP) 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 each site 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 (SSPs) have been developed to provide readily available emergency information and preventative safety measures. The GHSP outlines health and safety procedures and protocols to be followed during all field investigations at each of the [39] sites on NAS Pensacola. The plan includes standard operating procedures (e.g., site entry and decontamination); hazard communication and training (e.g., safety trainings, briefings, and documentation); safety equipment and instrumentation (e.g., monitorings and personnel protective equipment); hazard evaluation by contaminant class (e.g., metals and organics); and hazard evaluation for each task (e.g., drilling and sampling). The 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 (i.e., 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 Code of Federal Regulations [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. This comprehensive document will be referenced for all field and laboratory procedures for this program, and will be used to develop the Site-Specific Quality Assurance Plans (SQAPs).

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

## 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 might have affected hydrologic conditions. The historical perspective gained by studying aerial photographs will provide insight applicable to such tasks as field reconnaissance and monitoring well placement. In addition, the analysis of historical and current aerial photographs, performed in conjunction with geophysical investigation, will aid in the accurate determination of the extent of the formerly used area at the site.

## 13. UTILITIES SURVEY

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

# 14. FIELDWORK METHODOLOGY

## 14.1 Phase I -- Field Screening

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

### 14.1.1 Physical Survey

#### 14.1.1.1 Overall Physical Reconnaissance

A field reconnaissance survey will be conducted on and around each site area (sites 7, 20, and 21). Available aerial photographs and maps will be used as guides in locating surface features. Visual inspections will be made regarding surface conditions, any stressed vegetation, surface drainage patterns, and seeps.

During the reconnaissance survey, the field team will identify areas presenting 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 Section 14.1.2.



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

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

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

During the establishment of the geophysical survey grid network (discussed in Section 14.1.2), a surface emission survey will be conducted at sites 7 and 21 using HNu and/or organic vapor analyzer (OVA) air monitoring equipment. The survey will be conducted in accordance with Section 6.1.1 of the GQAPP. Measurements will be made at each established grid point, and readings will be recorded in the field logbook. At Site 20, which is entirely paved, a limited survey will be conducted by checking for volatile emissions at cracks or joints in the pavement or at other appropriate locations.

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

#### 14.1.1.3 Habitat/Biota Survey

On-site and vicinity vegetation and wildlife will be examined to determine any past, present, or future potential threat resulting from existing contamination, migration of contaminants, investigative work, and/or remedial action, if any.

### 14.1.2 Geophysical Survey

At sites 7 and 21, an electromagnetic conductivity (EM) survey will be performed in conjunction with a magnetometry (Mag) survey. The survey for Site 7 will be conducted along transects at 25-foot intervals. The survey for Site 21 will be conducted at intervals of 50 feet.

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 x and y axes) and flagged at the specified intervals. A transit survey instrument will be used to establish the baselines, and a Brunton compass and tape measure used to complete the grid system for the study area.

The EM survey is intended to identify the location and orientation of potential contaminant plumes and confirm the presence of buried pipes, drums, tanks, etc. The results will aid in the final selection of drilling and sampling sites. A hand-held EM-31 instrument will be used to conduct the survey. The EM-31 can detect and measure small subsurface changes in conductivity caused by chemical contamination or other variations in soil and groundwater constituents. In addition, by measuring the in-phase response, the EM-31 can detect the presence of shallowly buried metallic objects with considerable accuracy. The survey will be performed in accordance with procedures detailed in Section 6.2.1 of the GQAPP.

At sites 7 and 21, a Mag survey will be conducted using a proton magnetometer or gradiometer. The magnetometer will be carried along transects at 25-foot intervals at Site 7 and at 50-foot intervals at Site 21 to identify potential metallic subsurface obstructions such as pipes, drums, or storage tanks. The identification of such objects may aid the identification of potential contaminant sources and the selection of appropriate monitoring well and soil boring locations. The Hag survey and data interpretation will be performed in accordance with procedures discussed in Section 6.2.3 of the GQAPP.

### 14.1.3 Analytical Screening

Phase I sampling activities for sites 7, 20, and 21 will include a soil headspace survey, soil sampling, the installation of shallow temporary monitoring wells, and groundwater sampling. Samples will be analyzed in the laboratory for analytical screening parameters. The analytical screening program has been developed for the Phase I effort as a measure to efficiently and cost-effectively focus subsequent phases of site

characterization and contaminant extent delineation. Analytical screening is addressed in detail in Section 9.1 of the GQAPP. Analytical requirements for samples collected in Phase I are shown in Table 14-1.

#### 14.1.3.1 Soil Headspace Survey

The purpose of the soil headspace survey is to aid in identifying suitable locations for monitoring well installation and soil borings. Soil samples will be collected for headspace analysis at 25-foot grid intervals at Site 7 and at 50-foot grid intervals at sites 20 and 21. Composite soil samples will be collected from each 5-foot depth interval (0 to 5 feet, 5 to 10 feet, etc.) to the depth of the water table. The depth to water is assumed to be 15 feet at Site 7 and 5 feet at sites 20 and 21.

The collection and processing of soil samples for headspace analysis and the recording of OVA measurements are discussed in detail in Section 6.4 of the GQAPP.

#### 14.1.3.2 Laboratory Analyses

Soil--Soil samples will be collected using either a solid stem auger or a hand-operated bucket auger. Borings will be completed to an approximate depth of 15 feet at Site 7, 5 feet at sites 20 and 21, or to the water table, whichever is deeper. The soil samples will be collected from 5-foot intervals (0 to 5 feet, 5 to 10 feet, etc.). In some instances, soil sampling will be conducted during shallow well installation (discussed in the following section).

Tentative sampling locations are shown on figures 14-1 through 14-3. The approximate locations indicated were selected based on site history information pertaining to potential source areas (see Section 2). The numbers and locations of samples are tentative and may be altered subject to the collection of more detailed site-specific data from the physical and geophysical surveys.

TABLE 14-1

PHASE I SAMPLING AND ANALYTICAL REQUIREMENTS—GROUP K

SITE 7

| Medium | No. of Samples | Duplicates | Total | Analytical Suite[a,b] |
|---|---|---|---|---|
| Soil | 39 | 2 | 41 | A |
| Groundwater | 3 | 1 | 4 | A |
| TOTAL | 42 | 3 | 45 | |

SITE 20

| Medium | No. of Samples | Duplicates | Total | Analytical Suite[a,b] |
|---|---|---|---|---|
| Soil | 20 | 1 | 21 | A |
| Groundwater | 7 | 1 | 8 | A |
| TOTAL | 27 | 2 | 29 | |

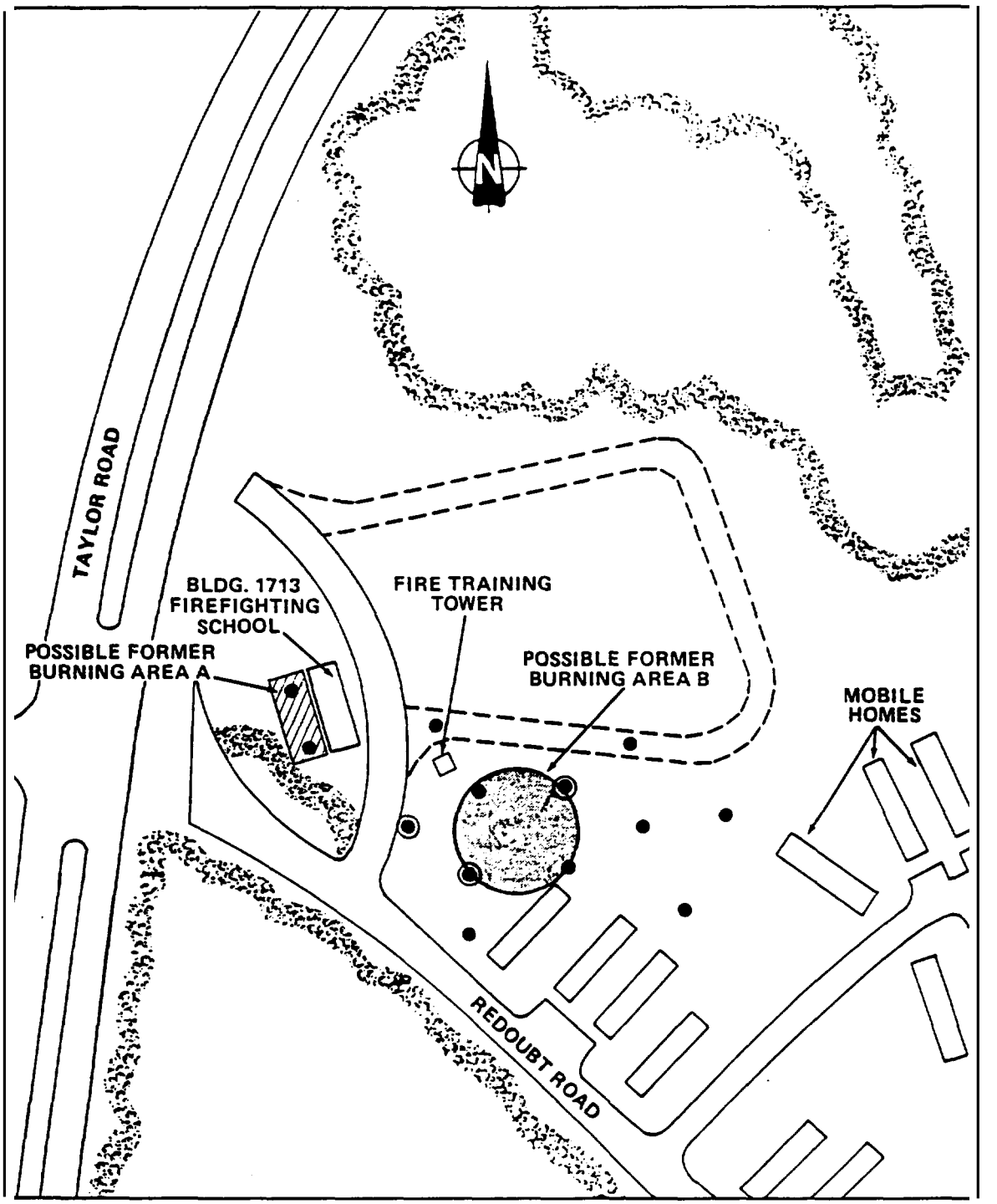
SITE 21

| Medium | No. of Samples | Duplicates | Total | Analytical Suite[a,b] |
|---|---|---|---|---|
| Soil | 37 | 2 | 39 | A |
| Groundwator | 11 | 1 | 12 | A |
| TOTAL | 48 | 3 | 51 | |

'Analytical suite designations are as follows:

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

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

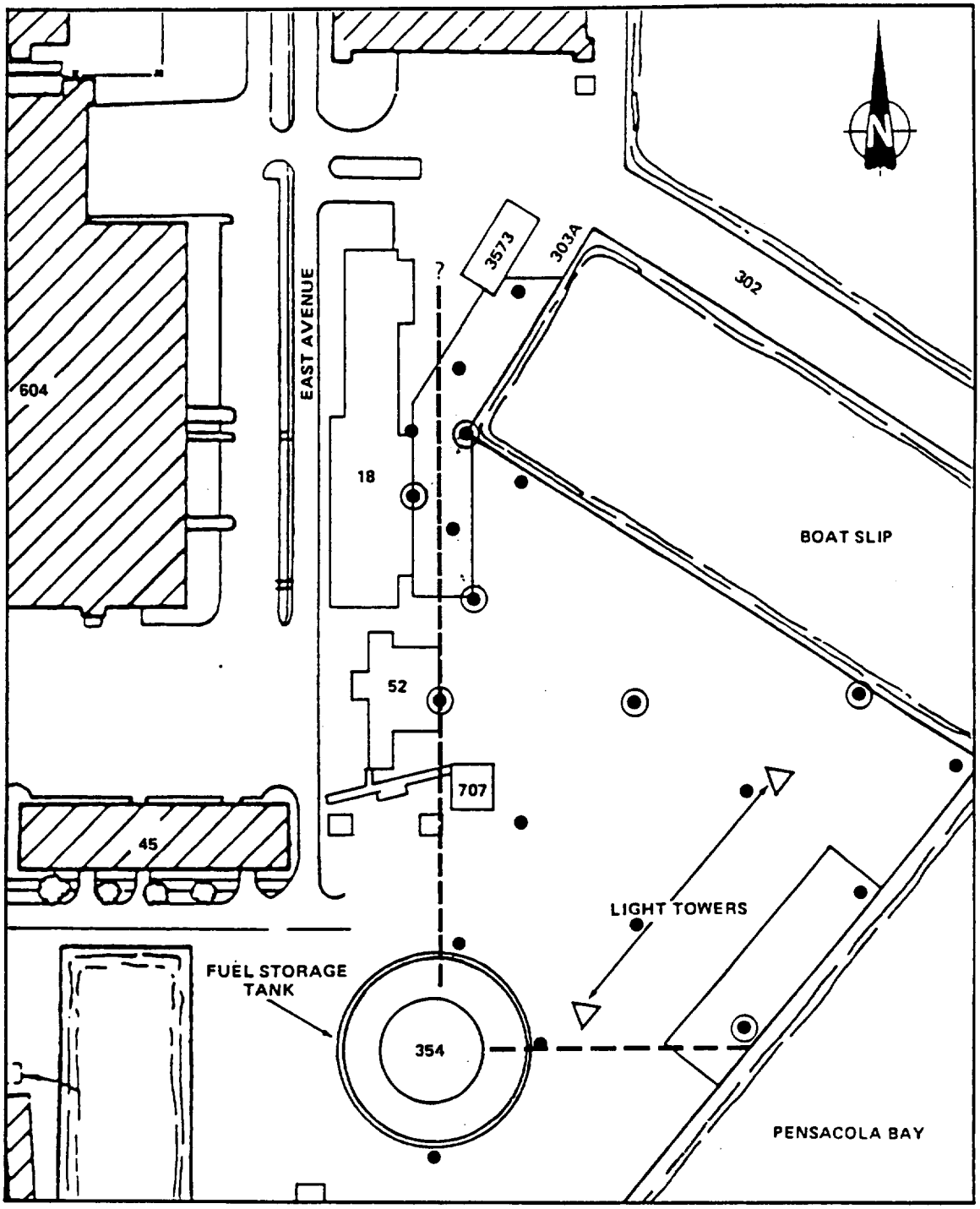



SOURCE: U.S. Naval Air Station, Pensacola, Florida, 1988

SCALE
0 50 100 150 200 FEET

KEY:
● Tentative Soil Boring
○ Tentative Temporary Monitoring Well

**Figure 14–1 TENTATIVE SOIL BORING AND TEMPORARY MONITORING WELL LOCATIONS, SITE 7 – PHASE I**




SOURCE: U.S. Naval Air Station, Pensacola, Florida, 1986

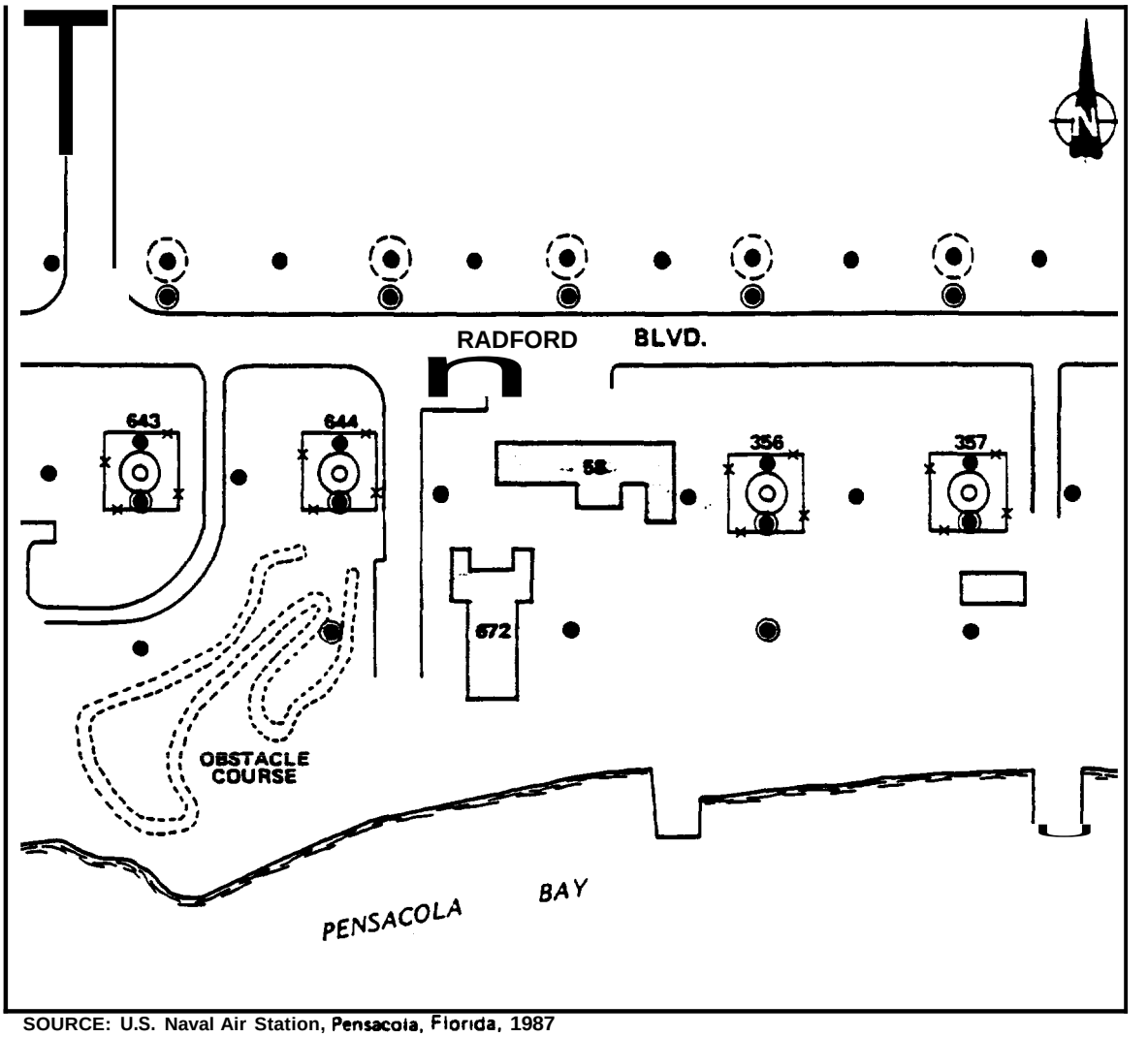
SCALE

0 100 200 400 FEET

KEY:

- Possible Fuel Pipeline
- Approximate Areas Of Previously Identified Potential Contamination
- Building
- Tentative Soil Boring
- Tentative Shallow Monitoring Well

**Figure 14–2 TENTATIVE SOIL BORING AND TEMPORARY MONITORING WELL LOCATIONS, SITE 20 – PHASE I**




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

SCALE

0 100 200 300 400 500 FEET

KEY:

Aboveground Fuel Storage Tank and Containment Wall

Former Aboveground Fuel Storage Tank and Containment Wall

O Tentative Soil Boring

Tentative Temporary Monitoring Well

**Figure 14–3 TENTATIVE SOIL BORING AND TEMPORARY MONITORING WELL LOCATIONS, SITE 21 – PHASE I**

Assuming the water table occurs at a depth of 15 feet at Site 7 and 5 feet at sites 20 and 21, a total of 39 samples will be collected at Site 7, 20 samples at Site 20, and 37 samples at Site 21.

All soil sampling, compositing, and lithologic logging will be conducted in accordance with Section 6.6 of the GQAPP. Equipment decontamination will be conducted in accordance with Section 6.10 of the GPAPP.

Groundwater--Tentatively, three stainless steel temporary monitoring wells will be installed across sites 7 and 20, and 11 will be installed across Site 21 (see figures 14-1 through 14-3). The wells will be installed with 5 feet of 0.010-inch screen set to bracket the water table, allowing for the collection of any immiscible, floating contaminants. In conjunction with well drilling, soil samples will be collected over 5-foot intervals, as described above.

Tentative temporary monitoring well locations are shown on figures 14-1 through 14-3. The approximate locations indicated were selected based on site history information pertaining to potential source areas (see Section 2). The numbers and locations of samples are tentative and may be altered subject to the attainment of more detailed site-specific data from the site reconnaissance and geophysical surveys.

All well drilling, development, purging, and sampling activities will be conducted in accordance with Section 6.8 of the GQAPP. Equipment decontamination will be conducted in accordance with GQAPP Section 6.10.

### 14.1.4 Hydrologic Assessment

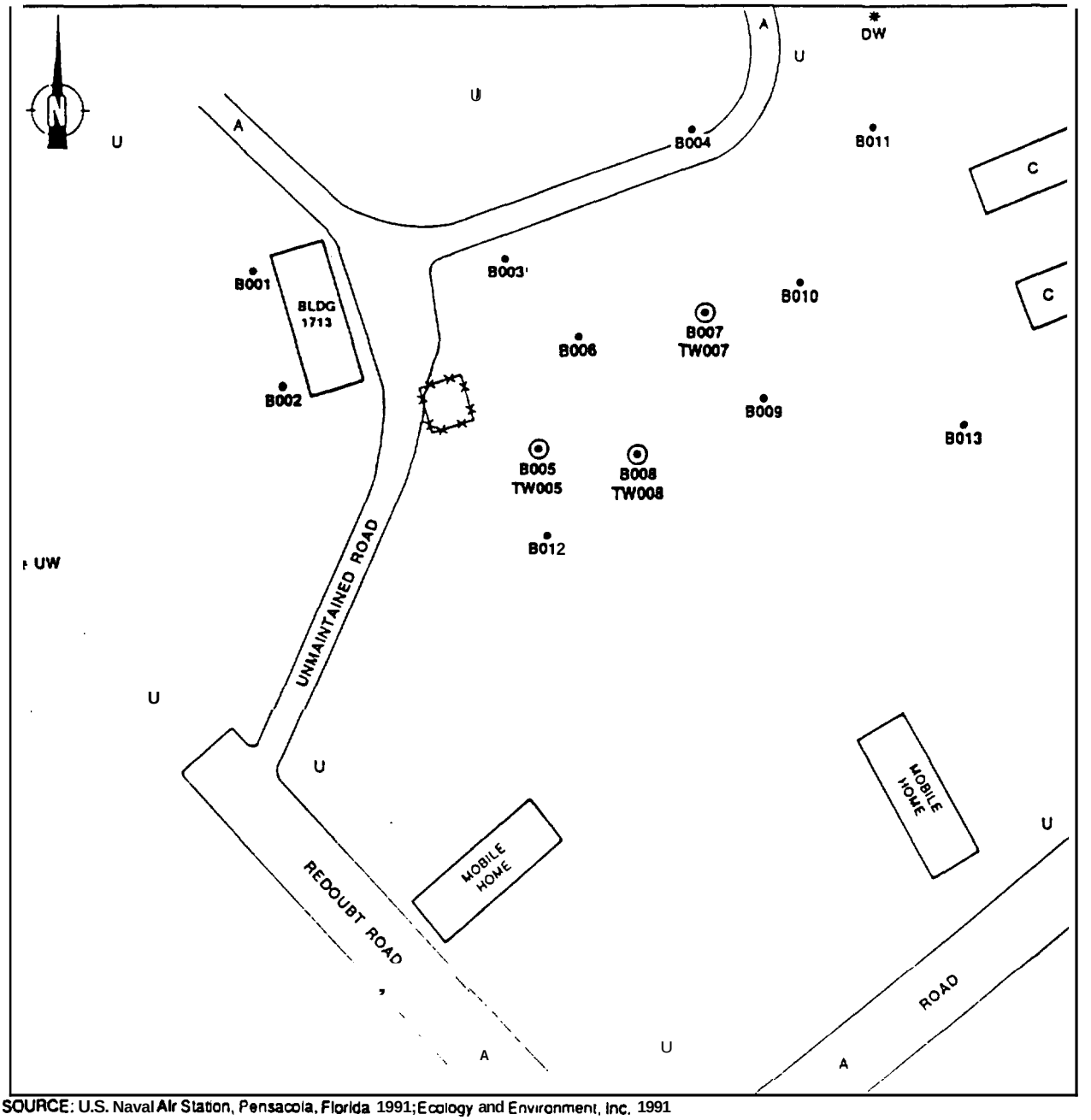
The hydrogeologic assessment will consist of a wellhead elevation survey of all temporary monitoring wells installed in Phase I and the measurement of static water levels in all wells. For the wellhead survey, one wellhead will be assigned an arbitrary elevation and all other recorded elevations will be referenced to this datum.

Hydrologic data collected during Phase I will be evaluated in conjunction with geophysical and analytical screening data. Evidence of potential lateral contaminant migration in shallow groundwater will be assessed from these data. Conclusions drawn from these evaluations will form the basis for permanent monitoring well installation during phases II and 111.

## 14.2 Phase II--Characterization/Extent Delineation

This section of the Contamination Assessment/Remedial Activities Investigation Work Plan--Group K (Site 7, Firefighting School; Site 20, Pier Pipe Leak Area; and Site 21, Sludge at Fuel Tanks), Naval Air Station Pensacola, Pensacola, Florida, has been entirely revised to reflect the results of the Phase I activities proposed in the original work plan document (June 1990). Prior to the performance of Phase I fieldwork activities on Group K (sites 7, 20, and 21), Site 20 was transferred from the Naval Installation Restoration Program (IRP) to the Navy's Underground Storage Tank Program and, therefore, will no longer be included in the Group K operable unit. Consequently, all discussion of Group K Phase II and subsequent activities included in Section 14.2 through the remainder of this work plan, addresses only sites 7 and 21. The original version (June 1990) of Section 14.2 of this work plan is presented in Appendix D. Figures 14-4 and 14-5 show the actual Phase I sampling locations and location designations for sites 7 and 21, respectively. The results of the Phase I investigation of sites 7 and 21 are presented, respectively, in E & E's Final Draft Interim Data Report, Contamination Assessment/Remedial Activities Investigation, Firefighting School (Site 7), Naval Air Station Pensacola, Pensacola, Florida, April 1992, and in E & E's Final Draft Interim Data Report, Contamination Assessment/Remedial Activities Investigation, Sludge at Fuel Tanks (Site 21), Naval Air Station Pensacola, Pensacola, Florida, April 1992.

In general, the results of E & E's Phase I investigation of sites 7 and 21, reviewed in combination with the results of the previous investigations of the sites (NEESA 1983), indicated the following:




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

SCALE
0 50 100 FEET

KEY:

| | | | |
|---|---|---|---|
| BLDG 1713 | Building | • | Soil Boring |
| ✕—✕ | Fence | ○ | Temporary Monitoring Well |
| A | Asphalt Paved | BOOS | Soil Boring Number |
| C | Concrete Paved | TW005 | Temporary Monitoring Well Number |
| U | Unpaved | ✱ | Particulate Air Screening Location |
| | | DW/UW | Downwind/Upwind |

**Figure 14-4**
**PARTICULATE AIR SCREENING, SOIL BORING, AND TEMPORARY MONITORING WELL LOCATIONS**
**NAS PENSACOLA SITE 7 - PHASE I**

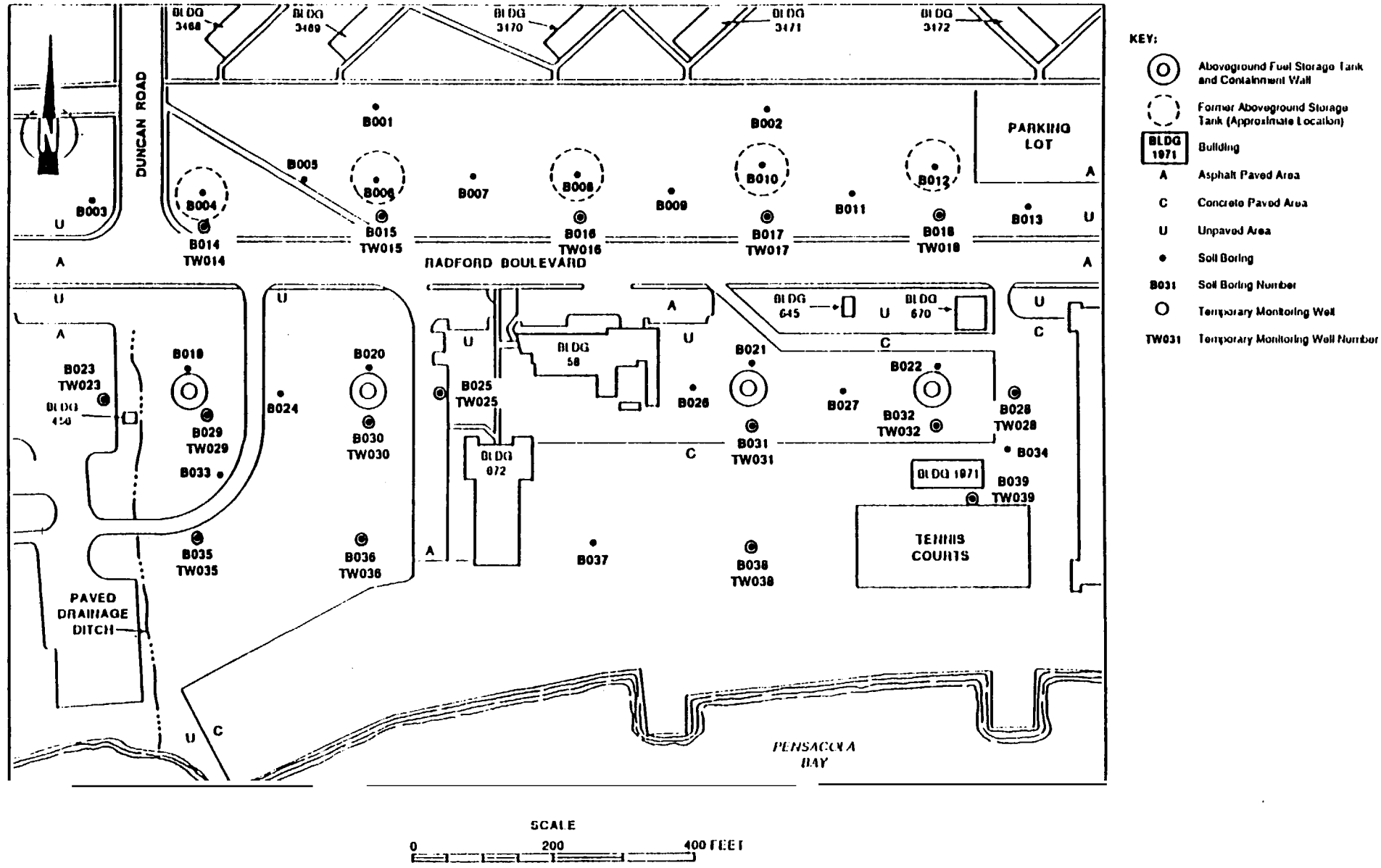



**Figure 14-5**
**SOIL BORING AND TEMPORARY MONITORING WELL LOCATIONS**
**NAS PENSACOLA SITE 21 - PHASE I**

Site 7--Significant levels of soil and groundwater contamination are absent across most of the site area; however, in the immediate vicinity of the suspected former burn area, several soil samples exhibited comparatively elevated total recoverable petroleum hydrocarbon (TRPH) concentrations; one groundwater sample exhibited measureable levels of phenols; two groundwater samples exhibited trace levels of polynuclear aromatic hydrocarbons (PAHs); and one groundwater sample exhibited lead and chromium at concentrations exceeding the Florida primary drinking water standards.

Site 21

- o Elevated levels of metals (primarily lead), TRPHs, volatile organic compounds (VOCs), PAHs, and phenols were detected in soil samples across Site 21:

  - Soil metals and TRPH contamination, present in the vicinity of the former tank areas on the northern side of Radford Boulevard, is probably related to former fuel storage activities in these areas. In addition, metals contamination detected in soil sample S002, located north of the former tank area, may represent an additional source of metals contamination on or in the vicinity of Site 21.

  - Soil metals contamination is present in the vicinities of the currently used fuel storage tanks located south of Radford Boulevard. This contamination extends southward from the currently used tank areas in the western portion of the site and is probably attributable to past and/or present on-site fuel storage and transport activities.

  - High levels of soil TRPH, VOC, PAH, and phenol contamination, present in the vicinities of the currently used tanks, is probably attributable to past and/or present on-site fuel storage and transport activities.

  - An isolated occurrence of soil phenols contamination, detected in the northwest corner of the site (soil sample S003), possibly represents an isolated or off-site contaminant source.

- Lead, TRPH, VOC, PAH, and phenol contamination was detected in groundwater across Site 21:
  - Groundwater lead concentrations exceeding the Florida standard are widespread across Site 21.
  - Widespread TRPH, aromatic-type VOC, PAH, and phenols groundwater contamination are present in the vicinity of both the former and current fuel tank locations and are probably attributable to past and/or current on-site fuel storage/transport activities.
  - VOC and phenol contamination detected near the southeast corner of the site (temporary well TW039) may reflect the presence of additional localized or off-site contaminant sources.

In light of the Phase I results summarized above, the objectives of the Phase II investigations of sites 7 and 21 will be as follows:

Site 7--Confirm the presence, characterize the nature/magnitude, and delineate the overall extent of potentially significant levels of soil and groundwater contamination in the immediate vicinity of the suspected former burn area. However, a full-scale RI/FS will probably not be warranted at this site.

Site 21

- Identify, to the greatest extent possible, the on-site sources of metals and organic contamination, the impact of any off-site sources of contamination, and any potential ambient sources of contamination in the site vicinity;
- Fully characterize the nature and magnitude and delineate the overall extent of on-site soil and groundwater contamination; and
- Initiate the Risk Assessment and Feasibility Study for the site.

Based on the Phase I investigation results, a full-scale RI/FS is warranted at Site 21.

In order to meet the above objectives, the Phase II investigation of sites 7 and 21 will include the following elements:

- Interim remedial measure (IRM) design (Site 21 only);
- Contaminant source survey;
- Sediment and surface water sampling (Site 21 only);
- Soil sampling;
- Installation of shallow and (Site 21 only) intermediate monitoring wells;
- Collection of groundwater samples from all newly installed wells;
- Hydrologic assessment; and
- Engineering survey.

The specific scope of work associated with each of the above elements is described in sections 14.2.1 through 14.2.5. In developing the specific scopes of work, the Phase I and previous analytical results have both been evaluated regarding all requirements of the CERCLA and Superfund Amendments and Reauthorization Act (SARA), as well as all other ARARs. For sites 7 and 21, these ARARs include:

- Resource Conservation and Recovery Act (RCRA);
- Clean Water Act (CWA);
- Safe Drinking Water Act (SDWA);
- 40 CFR Parts 264, 265, 270, and 271 (Corrective Action for Solid Waste Management Units at Hazardous Waste Management Facilities; Proposed Rule);
- Chapter 17-3, FAC (Water Quality Standards [Site 21 only]);
- Chapter 17-302, FAC (Surface Water Quality Standards [Site 21 only]);
- Chapter 17-550, FAC (Drinking Water Standards, Monitoring, and Reporting); and

- Chapter 17-770, FAC (State Underground Petroleum Environmental Response).

Formal, quantitative air sampling will not be conducted during Phase II at sites 7 and 21 because no evidence that these sites represent a potential source of airborne volatile or particulate contaminants was revealed by the Phase I surface emissions survey, particulate air screening, or fieldwork air monitoring activities. Biota sampling also will not be conducted during Phase II because the potential contaminants of concern have not been sufficiently characterized. However, base-wide biota sampling will be conducted in conjunction with the investigation of operable units (OUs) 15, 16, and 17 (Bayou Grande Area, NAS Pensacola Wetlands, and Pensacola Bay Area, respectively).

Based on the results of the activities identified above, during Phase II E & E will initiate the appropriate Risk Assessment and, as warranted, Feasibility Study activities. However, it is not anticipated that Risk Assessment and Feasibility Study activities will be required at Site 7.

Risk Assessment activities, required for Site 21, will be directed toward identification of contaminants of concern as well as identification of data gaps that must be eliminated to support the eventual completion of a Baseline Risk Assessment for the sites. If no data gaps are identified, the Baseline Risk Assessment will be completed during Phase 11.

Feasibility Study activities, required for Site 21, will be directed toward identification of data gaps that must be eliminated to support the eventual completion of a comprehensive Feasibility Study for the site. If no data gaps are identified, the Feasibility Study will be completed during Phase 11.

In addition, if warranted, E & E will evaluate the Phase II results to identify whether any additional IRMs are required and develop recommendations for implementation of these IRMs (see Section 14.2.1). IRMs will only be implemented following receipt of EPA approval.

All Phase II investigation activities and results will be discussed in a separate interim data report for each site structured in the required format of a formal draft remedial investigation (RI) report. This Phase II interim data report will provide a complete data synthesis incorporating the results of E & E's Phase I and Phase II investigations, as well as the results of previous investigations. The interim data report will specify whether additional Phase III assessment activities are required or whether the formal draft RI report for the site can be prepared.

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

### 14.2.1 Interim Remedial Measure Design

An IRM will be designed for Site 21 to address mitigation of the heavily contaminated soils south of storage tanks 643 and 644 as continuing sources of on-site contamination (see Figure 14-6). Design and subsequent implementation of this IRM are required because Phase I investigation results clearly indicate that these tank area soils represent both primary current sources and long-term, continuing sources of Site 21 groundwater contamination. The designed IRM will only be implemented following receipt of EPA approval.

At a minimum, the IRM design will address all soils above the water table in the areas south of tanks 643 and 644. In developing the IRM design, various remediation alternatives for contaminated soils will be fully considered. These include excavation and on- or off-site incineration and/or on- or off-site disposal; land farming; excavation/electrochemical destruction; and/or ~~in situ~~ methods (e.g., air sparging and bioremediation). The evaluation of these alternatives will primarily consider their effectiveness, cost efficiency, and impact on the overall Site 21 remedial program schedule.



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

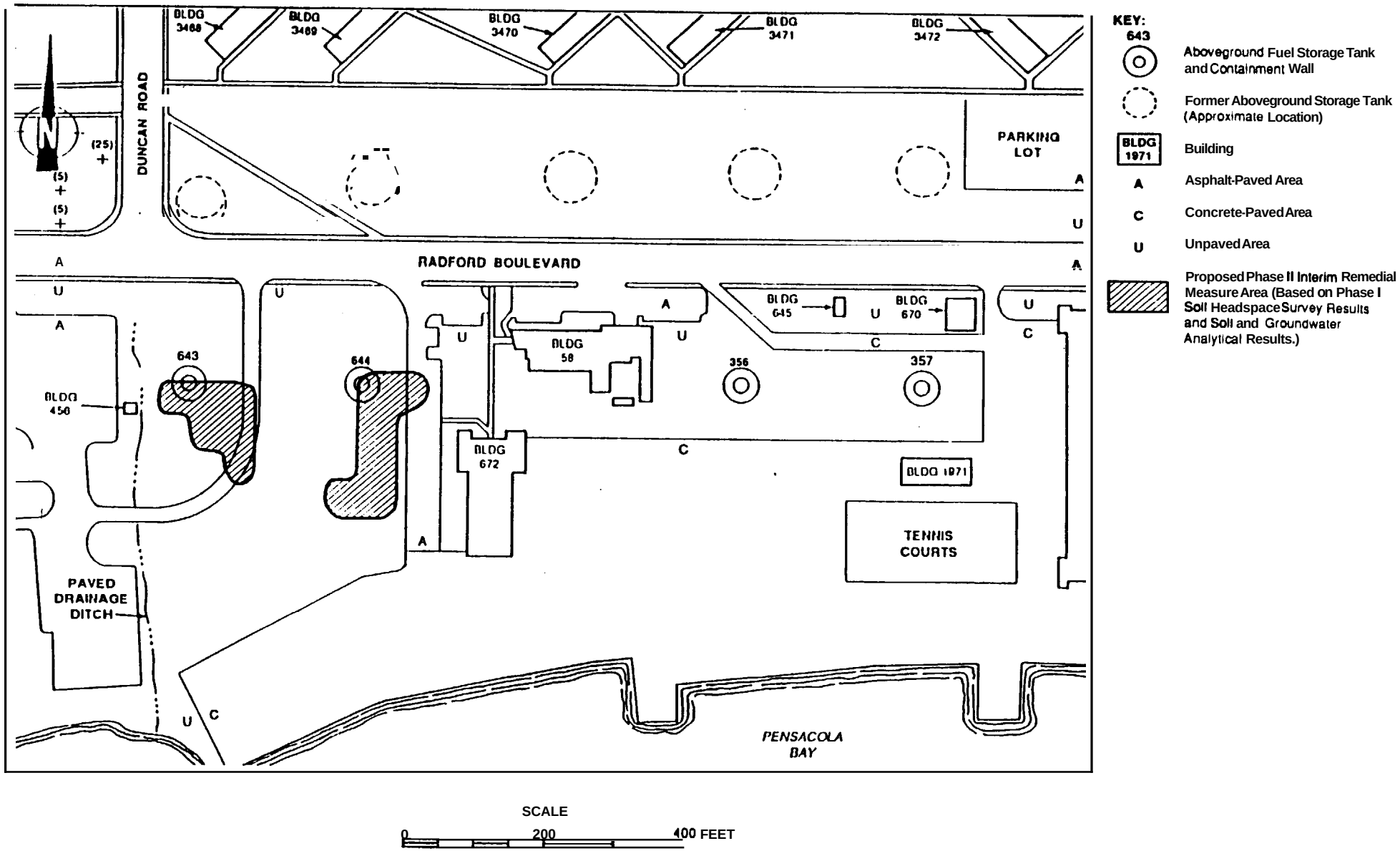



**Figure 14-6**
**PROPOSED SOIL INTERIM REMEDIAL MEASURE AREA**
**NAS PENSACOLA SITE 21 - PHASE II**

During the sites 7 and 21 field investigation activities, circumstances on site may require additional IRMs. IRMs will be initiated on a case-by-case basis and only following receipt of EPA approval. Rapid response will be emphasized. An additional IRM could involve the installation of security fences and warning signs; construction of berms, caps, and/or recovery and treatment systems; and removal of soil, sediment, and/or drums. A detailed, explanatory report of any IRM(s) conducted will be developed by E & E and provided to the Navy and EPA.

### 14.2.2 Contaminant Source Survey

A supplemental contaminant source survey will be performed at sites 7 and 21 to obtain a comprehensive understanding of potential additional contaminant sources in the site vicinities. This survey will include the following:

Site 7--Determination of whether any normal, daily, facility-specific and/or base-wide activities, such as aircraft operations, may have created potential, low-level, ambient sources of TRPH contamination.

Site 21

- Location of former and existing on-site underground utilities, especially fuel transfer and distribution lines;
- Identification of any off-site and/or ambient sources of the soil PAH contamination detected in the northwest corner of the site (Phase I boring B003) or sources that may be contributing contamination to the on-site stormwater drainage system; and
- Determination of whether any normal, daily, facility-specific and/or base-wide activities, such as aircraft operations, may have created potential, low-level, ambient sources of TRPH or other contamination.

The survey will utilize existing information in NAS Pensacola files, previous investigative reports, and interviews with current and former employees of the NAS Pensacola facility. All background source survey work will be conducted in close communication with the facility

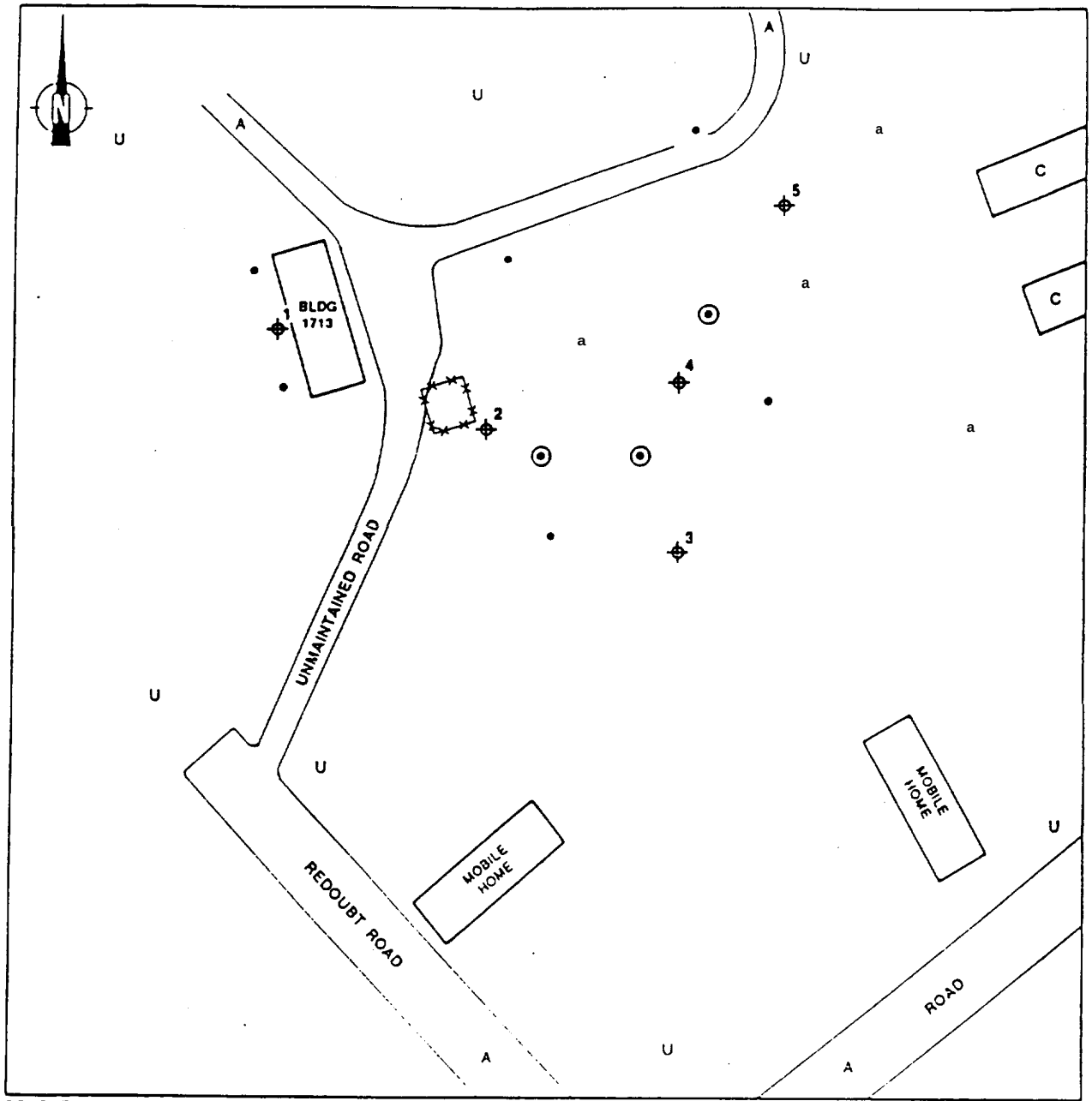
Installation Restoration (IR) coordinator as the survey may need to access repositories and/or individuals at several locations among the various tenant commands.

### 14.2.3 Sampling and Analysis

Figure 14-7 shows the proposed Phase II soil boring and monitoring well locations for Site 7; Figure 14-8 shows the proposed Phase II surface water and sediment sample, soil boring, and monitoring well locations for Site 21. Tables 14-2 and 14-3 summarize the sampling and analytical requirements, including QA/QC samples, for the Phase II investigations of sites 7 and 21, respectively. Tables 14-4 and 14-5 provide the specific rationale for each proposed Phase II Site 7 soil boring and monitoring well location, respectively, and for the associated analytical suite. Tables 14-6, 14-7, and 14-8 provide the specific rationale for each proposed Phase II Site 21 surface water and sediment sample, soil boring, and monitoring well location, respectively, and for the associated analytical suite.

The sample location reference numbers listed in tables 14-4 and 14-5 correspond to the location numbers on Figure 14-7; and the sample location reference numbers listed in tables 14-6, 14-7, and 14-8 correspond to the location numbers on Figure 14-8.

During Phase 11, it is proposed to sample all newly installed wells and analyze the samples for analytical suite A to provide a uniform, time-synchronous perspective on sites 7 and 21 groundwater conditions. This perspective will be critical to properly evaluate the groundwater migration pathway. In addition, during Phase II field activities at NAS Pensacola site groups A through E, soil borings, shallow monitoring wells, and intermediate monitoring wells will be completed at three background locations across the base, and--together with the three existing on-base deep supply wells--sampled for analytical suite A. (Soil samples collected below the water table will be analyzed for Target Analyte List [TAL] metals.) These background locations will help provide a perspective on the on-site occurrences of potential




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

SCALE

0 50 100 FEET

KEY:

| | | | |
|---|---|---|---|
| BLDG 1971 | Building | ● | Phase I Soil Boring |
| —×—×— | Fence | ○ | Phase I Temporary Monitoring Well |
| A | Asphalt-Paved Area | ⊕ | Proposed Phase II Soil Boring and *shallow* Monitoring Well |
| C | Concrete-Paved Area | 4 | Location Reference Number |
| U | Unpaved Area | | |

**Figure 14-7**
**PROPOSED SOIL BORING AND SHALLOW MONITORING WELL LOCATIONS**
**NAS PENSACOLA SITE-7 - PHASE II**

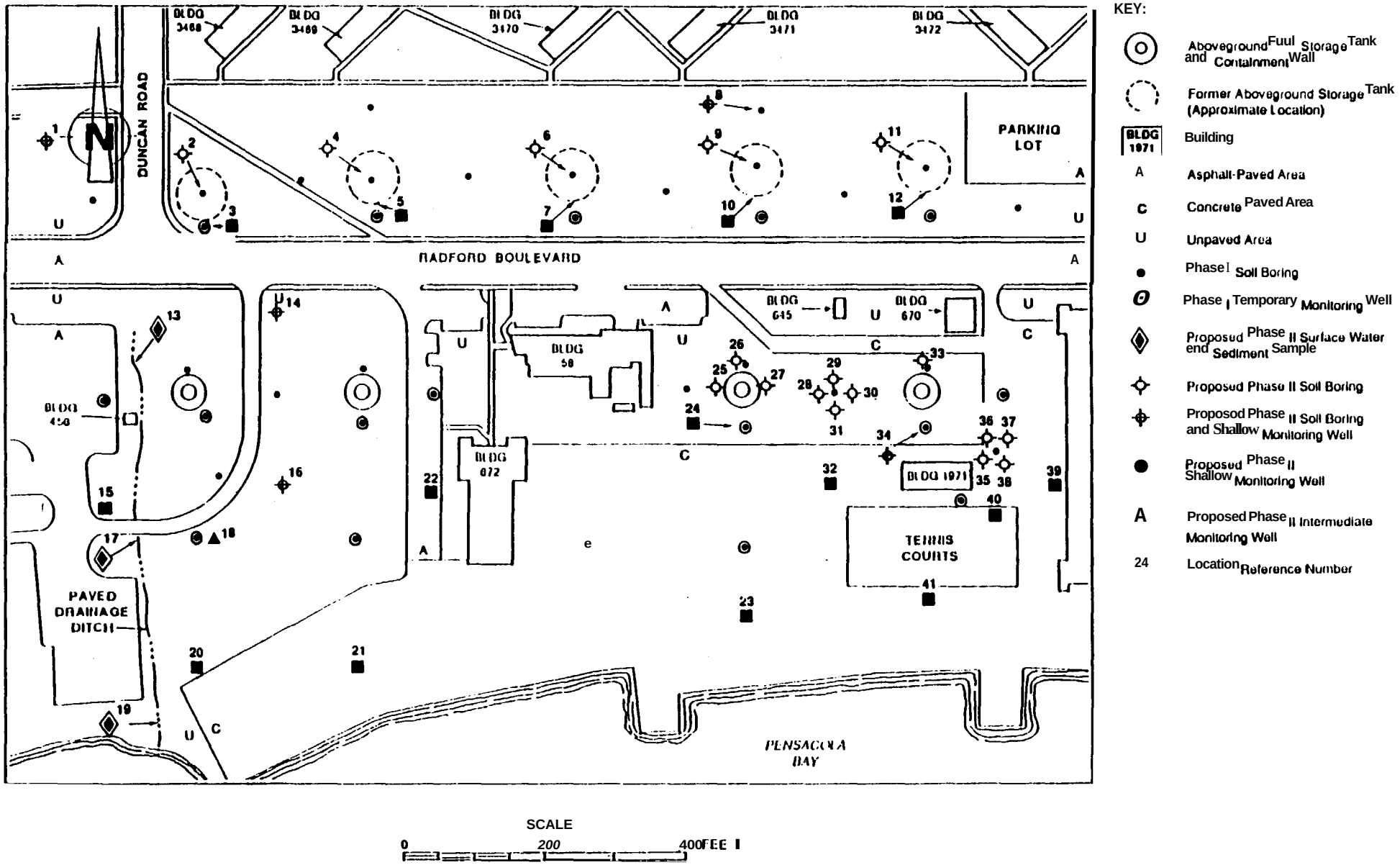



**Figure 14-8**
**PROPOSED SURFACE WATER AND SEDIMENT SAMPLE, SOIL BORING, AND MONITORING WELL LOCATIONS — NAS PENSACOLA SITE 21- PHASEII**

**Table 14-2**

**PHASE II SAMPLING AND ANALYTICAL REQUIREMENTS**
**NAS PENSACOLA SITE 7**

| Medium | No. of Samples[a] | Dupli-cates | Trip Blanks[b] | Preservative Blanks[b] | Field Blanks | Rinsate Blanks | Total[h] | Analytical Suite[c,d] |
|---|---|---|---|---|---|---|---|---|
| Soil[e] | 20 | 2 | 1 | NR[f] | NR | 1 | 24 | A |
| | (4) | NR | NR | NR | NR | NR | (4) | B |
| Groundwater[g] | 5 | 1 | 1 | 1 | 1 | 1 | 10 | A |
| | (2) | -- | -- | -- | -- | -- | (2) | C |
| TOTAL | 25 | 3 | 2 | 1 | 1 | 2 | 34 | |
| | (6) | NR | NR | NR | NR | NR | (6) | |

14[NASP]UH8000:T0482/1386/11

Key:

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

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

[c]Analytical suite dosignations are as follows:

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

B = pH, alkalinity, percent moisture, grain size, BTV contont, ash contont. total organic halogens, sulfur, ignitability, and cation exchange capacity (CEC).

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

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

[h]Total of 5 boring locations x 4 depth intervals = 20 samples.

[f]NR = Not required.

[g]Total of 5 now on-site shallow wells = 5 samples.

Source: Ecology and Environment, Inc., 1992.



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

Table 14-3

**PHASE II SAMPLING AND ANALYTICAL REQUIREMENTS**
**NAS PENSACOLA SITE 21**

| Medium | No. of Samples[a] | Dupli-cates | Trip Blanks[b] | Preservative Blanks[b] | Field Blanks | Rinsate Blanks | Total' | Analytical Suite[c,] |
|---|---|---|---|---|---|---|---|---|
| Surface Water | 3 | 1 | 1 | -- | -- | 1 | 6 | A |
| | (1) | NR[e] | NR | NR | NR | NR | (1) | C |
| Sediment | 3 | 1 | 1 | NR | NR | 1 | 6 | A |
| | (1) | NR | NR | NR | NR | NR | (1) | D |
| Soil[f] | 24 | 2 | 1 | NR | NR | 1 | 28 | A |
| | 57 | 6 | 2 | NR | NR | 2 | 67 | B |
| | (33) | NR | NR | NR | NR | NR | (33) | D |
| Groundwator[g] | 8 | i | 1 | 1 | 1 | 1 | 13 | A |
| | 13 | 1 | 2 | NR | NR | 2 | 18 | B |
| | (7) | NR | NR | NR | NR | NR | (7) | C |
| TOTAL | 108 | 12 | 8 | 1 | 1 | 8 | 138 | |
| | (42) | NR | NR | NR | NR | NR | (42) | |

14[NASP]UH8000:T0482/1387/11

Key:

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

[b]Trip blanks will bo analyzod for Targot Compound List (TCL) volatile organic compounds (VOCs) only. Preservative blanks will bo analyzod for TCL VOCs, total recoverable petroleum hydrocarbons (TRPHs), dissolvod Target Analyto List (TAL) metals, and cyanido.

'Analytical suite dosignations are as follows:

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

B = TCL VOCs, TCL BNAs, TRPHs, and TAL load (total and dissolvod [wator only]).

C = Total suspended solids, total Kjeldahl nitroqon (TKN), ammonia nitroqon, orthophosphate phosphorus, dissolvod oxygen (in field), 5-day bioloqical oxygen demand ($BOD_5$), and chemical oxygen demand (COD).

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

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

[e]NR = Not required.

[f]15 boring locations x 4 depth intervals = 60 samples, plus 7 boringq locations x 3 depth intervals = 21 samples (total of 81 samples).

'Total of 21 new on-site wells (20 shallow and 1 intermediate) = 21 samples.

Source: Ecology and Environmont, Inc., 1992.

**Table 14-4**

**RATIONALE FOR PROPOSED PHASE II SOIL SAMPLE LOCATIONS AND ANALYSES NAS PENSACOLA SITE 7**

| Location Reference Number(s) | Sample Type(s)[a] | Location Rationale | Analytical Suite(s)[b] | Analytical Rationale |
|---|---|---|---|---|
| 1 | AWT | Possible former burn area; confirm absence of soil contamination observed in Phase I soil borings B001 and 8002 | A | Confirm absence of contamination in this area of the site. |
| 2. 3, 5 | AWT | Determine extent of potential soil contamination in possible former burn area (TRPHs detected in Phase I soil borings 8006 and 8009). | A | Characterize full spectrum of potential contaminants |
| 4 | AWT | Possible former burn area: determine nature, magnitude, and extent of potential soil contamination (TRPHs detected in Phase I soil borings 8006 and B009). | A | Characterize full spectrum of potential contaminants |
| | | | B | Support potential site remediation planning activities |

14[NASP]UH8000:T0482/1389/7

Key:

[a] AWT = Soil samples collected above water table at following intervals (BLS): 0-0.5 foot, 0.5-2.5 foot, 2.5-5 feet, and 5-10 feet.

[b] Specific parameters included within each analytical suite are given in Table 14-2.

TRPH = Total recoverable petroleum hydrocarbon.

Source: Ecology and Environment, Inc., 1992.

Table 14-5

**RATIONALE FOR PROPOSED PHASE II MONITORING WELL LOCATIONS AND GROUNDWATER SAMPLE ANALYSES NAS PENSACOLA SITE 7**

| Location Reference Number(s) | Sample Type(s)[a] | Location Rational. | Analytical Suito(s)[b] | Analytical Rational. |
|---|---|---|---|---|
| 1 | SGW | Confirm suspoctod absence Ot groundwator contamination in this suspoctod former burn area (not sampled during Phaso I). | A | Confirm absence of contamination or characterize full spoctrum of potontial contaminants |
| 2, 3, 5 | SGW | Delineate extent of shallow groundwater contamination dotoctod in suspoctod former burn area during Phaso I. Proposed wells either hydraulically downgradient (locations 2 and 3) or upgradient (location 5) ot detected Phaso I contamination. | A | Characterize full spoctrum of potential contaminants |
| | | | C (Location 5 only) | Support potential site romediation planning activities |
| 4 | SGW | Characterize nature and magnitude of shallow groundwator contamination dotoctod in possible former burn area during Phaso I. | A | Characterize full spoctrum of potential contaminants |
| | | | C | Support potential site remediation planning activities |

14[NASP]UH8000:T0482/1391/7

Key:

[a]SGW = Groundwater sample from shallow monitoring well.
[b]Specific parameters included within each analytical suite are given in Table 14-2.

Source: Ecology and Environment, Inc., 1992.

**Table 14-6**

**RATIONALE FOR PROPOSED PHASE II SURFACE WATER AND SEDIMENT SAMPLE LOCATIONS AND ANALYSES NAS PENSACOLA SITE 21**

| Location Reference Number(s) | Sample Type(s)[a] | Location Rational. | Analytical Suite(s)[b] | Analytical Rational. |
|---|---|---|---|---|
| 13, 17, 19 | SW | Determine presence or absence of contamination in tho Site 21 stormwater drainage system | A | Characterize full spectrum of potential contaminants |
| | | | C (Location 17 only) | support potential site remediation planning activities |
| 13, 17, 19 | SD | Determine presence or absence of contamination in tho Site 21 stormwater drainago system | A | Charactorizo full spectrum of potetial contaminants |
| | | | D (Location 17 only) | Support potential site remediation planning activities |

14[NASP]UH8000:T0482/1388/7

Key:

[a]SW = Surface water; SD = sediment.
[b]Specific parameters included within each analytical suite are given in Table 14-3.

Source: Ecoloqy and Environment, Inc., 1992.

Table 14-7

**RATIONALE FOR PROPOSED PHASE II SOIL SAMPLE LOCATIONS AND ANALYSES NAS PENSACOLA SITE 21**

| Location Reference Number(s) | Sample Type(s)[a] | Location Rational. | Analytical Suite(s)[b] | Analytical Rational. |
|---|---|---|---|---|
| 1 | AWT | PAHs dotoctod in nearby Phaso I soil sample S001 | A | Characterize full spoctrum of potential contaminants |
| | | | D | Support potontial site remediation planning activitirs |
| 2, 4 | AWT | Former tank locations; confirm absence of contamination observed in Phaso I soil samples S004 and S006 | B | Load, TRPHs. VOCs, and BNAs are only concorn hero |
| 6, 9 | AWT | Former tank locations; confirm contamination detected in Phaso I soil samples S008 and S010 (metals and TRPHs) | A | Characterize full spoctrum of potontial contaminants |
| | | | D (Location 9 only I | Support potontial site romediation planning activitirs |
| 11 | AWT | Former tank location; confirm contamination detected in Phaso I soil sample S012 (metals and TRPHsI | B | Load, TRPHs, VOCs, and BNAs are only concorn here |
| | | | D | Support potontial sitr remediation planning activities |
| 8 | AWT | Confirm contamination detected in Phaso I soil sample S002 (metals and TRPHs) | A | Characterize full spoctrum of potential contaminants |
| | | | D | Support potontial site remediation planning activities |

14[NASP]UH8000:T0482/1390/7

Key at end of table.

**Table 14-7 (Cont.)**

| Location Reference Number(s) | Sample Type(s)[a] | Location Rationale | Analytical Suite(s)[b] | Analytical Rational. |
|---|---|---|---|---|
| 14, 16, 34 | AWT | Determine potential lateral extent of soil contaamination dotoctod during Phase I soil sampling | A | Characterize full spectrum of potential contaminants |
| | | | D | Support potential site remediation planning activitior |
| 25-31, 33, 35-38 | AWT | Determine potential lateral extent of soil contamination dotoctod during Phase I soil sampling | B | Load, TRPHs, VOCs, and BNAs are only concern hero |
| | | | D (locations 26, 31, and 36 only) | support potential site remediation planning activities |

14[NASP]UH8000:T0482/1390/7

Key :

[a]AWT = At locations 1, 2, 4, 6, 8, 9, and 11, soil samples colloctod above water table at following intervals (BLS): 0-0.5 toot, 0.5-2.5 feet, and 2.5-5 feet. At locations 14, 16, 25-31, and 33-38, soil samples colloctod above water table at following intervals (BLS): 0-0.5 toot, 0.5-2.5 foot, 2.5-5 foot. and 5-10 foot.
[b]Specific parameters included within each analytical suite are given in Table 14-3.

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

Source: Ecology and Environmont. Inc., 1992.

Table 14-8

RATIONALE FOR PROPOSED PHASE II MONITORING WELL LOCATIONS AND GROUNDWATER SAMPLE ANALYSES NAS PENSACOLA SITE 21

| Location Reference Number(s) | Sample Type(s)[a] | Location Rational. | Analytical Suite(s)[b] | Analytical Rationale |
|---|---|---|---|---|
| 1 | SGW | Determine presence and nature of potential shallow groundwater contamination in area not sampled in Phase I | A | Characterize full spectrum of potential contaminants |
| | | | C | Support potential site remediation planning activitios |
| 3,5,7,10,12, 24,34 | SGW | Confirm nature and magnitudo of shallow groundwater contamination detected in Phase I temporary wells TW014 and TW016 (metals); TW015 (metals, TRPHs, and phenols); TW017 (metals, TRPHs, and xylenes); TW018 (zinc and phenols); TW031 (metals and TRPHs); and TW034 (metals, TRPHs, VOCs, and phenols) | A (locations 7, 10, and 34 only) | Characterize full spectrum of potential Contaminants |
| | | | B (locations 3, 5, 12, and 24) | Lead, TRPHs, VOCs, and BNAs are only concern here |
| | | | C (locations 10, 24, and 34 only) | Support potential site remediation planning activitios |
| 8 | SGW | Determine presence and nature of potential groundwater contamination in area where metals contamination was detected in Phase I soil sample S002 | A | Characterize full spoctcum of potential contaminants |

14[NASP]UH8000:T0482/1392/7

Key at end of table.

Table 14-0 (Cont.)

| Location Reference Number(s) | Sample Typo(s)[a] | Location Rational. | Analytical Suite(s)[b] | Analytical Rational. |
|---|---|---|---|---|
| 14,15,16,20, 21,22,23,32, 39,40,41 | SCW | Delineate extent of qroundwator contamination detected across Site 21 during Phase I. Proposod wells hydraulically upgradient (location 14), cross-gradient (locations 15, 16, and 39), or downgradient (locations 20, 21, 22, 23, 32, 40, and 41) of Phase I Site 21 contamination | A (locations 14 and 16 only) | Confirm absence of contamination or confirn full spoctrun of potential contaminants |
| | | | B (locations 15, 20-23, 32, 39-41) | Lead, TRPHs, VOCs, and BNAs ace only concern here |
| | | | C (locations 14, 16, and 40 only) | Support potential site remediation planning activities |
| 18 | IGW | Determine presence and nature of intermediate-depth groundwater contamination. Proposed well is downgradient of areas of shallow groundwater contamination. | A | Characterize full spectrum of potential contaminants |

14[NASP]UH8000:T0482/1392/7

Key :

[a]SGW = Groundwater sample from shallow monitoring well; IGW = groundvator sample from intermediate monitoring well.
[b]Specific parameters included within each analytical suite are given in Table 14-3.

TRPHs = Total recoverable petroleum hydrocarbons.
VOCs = Volatile organic compounds.
BNAs = Base/neutral and acid extractable organic compounds.

Source: Ecology and Environment, Inc., 1992.

contaminants as well as aid in evaluating the impact of potential, base-wide ambient contaminant sources. The collection of these background soil and groundwater samples is discussed in the work plan for Group A--Site 1 (Sanitary Landfill; E & E 1991).

Tables 14-2 and 14-3 indicate that trip blanks for sites 7 and 21 will not be analyzed for full analytical suite A parameters but only for Target Compound List (TCL) VOCs. It should also be noted that the number of required trip blanks shown on tables 14-2 and 14-3 reflects the total number of trip blanks required for the entire sampling program for each site.

As noted above, tables 14-4 through 14-8 provide specific rationales for proposed Phase II sampling locations and analyses for each site. Sampling locations were selected based on the Phase I results in accordance with one of the following criteria:

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

Sampling locations selected according to the first criterion are required to allow identification of the full spectrum of potential on-site contaminants as well as the maximum levels of occurrence. Locations selected according to the second criterion are required to delineate the distribution of contamination on site and in the site vicinity. Locations selected according to the third criterion are required to confirm that the extent of contamination has been completely delineated. The specific, detailed rationales provided in tables 14-4 through 14-8 for each sampling location or group of locations meet one or more of the three general criteria defined above (including the Site 7 rationales, even though only limited contamination was detected at Site 7 and a full-scale RI/FS will probably not be warranted).

All three of the above criteria must be met to complete, as warranted, a Baseline Risk Assessment and Feasibility Study for each site (these activities will probably not be required at Site 7). Furthermore, in most instances, meeting the above criteria requires that the collected samples be analyzed for the full suite of parameters in analytical suite A. However, in some cases (e.g., extent delineation of petroleum fuel contamination detected in Phase I soil samples), a more limited analytical program (e.g., TAL lead, TRPHs, TCL VOCs, and TCL base/neutral and acid-extractable organic compounds [BNAs] in soils) is warranted.

Finally, to support potential remediation planning activities for these sites (probably not required for Site 7), selected samples from each medium also must be analyzed for those parameters which directly control the viability of various remedial alternatives (see analytical suites B [Table 14-21, C [tables 14-2 and 14-31, and D [Table 14-31.

#### 14.2.3.1 Surface Water and Sediment Sampling

**Site 7**

No surface water or sediment samples will be collected on or in the vicinity of Site 7.

**Site 21**

During the Phase II sampling, three surface water samples and three sediment samples will be collected on Site 21. These combined surface water and sediment samples will be collected at three locations: near the head of the Site 21 stormwater drainage ditch, approximately 100 feet south of Radford Boulevard; at the midpoint of the drainage ditch where it is crossed by an access road, approximately 350 feet south of Radford Boulevard; and near the drainage ditch outfall to Pensacola Bay (see Figure 14-8).

Surface water samples will be collected in accordance with Section 6.9.1 of the GQAPP. If the water in the outfall is shallower than 1 foot, the sample will be collected from the surface directly into the sampling container, whenever possible. If not possible, a glass or stainless

steel beaker or similar sampling device will be used. If the water is greater than 1 foot deep, the sample will be collected within 1 foot of the bottom using a Kemmerer or similar sampling device. All equipment decontamination will be conducted in accordance with Section 6.10 of the GQAPP.

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

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

The three surface water and three sediment samples will be analyzed for the parameters included on Table 14-3 (see also Table 14-6).

#### 14.2.3.2 Soil Sampling

All Phase II soil sampling, compositing, and lithologic logging will be performed in accordance with Section 6.6 of the GQAPP. Equipment decontamination will be performed in accordance with Section 6.10 of the GQAPP. The number and types of soil field QA/QC samples to be collected during Phase II were determined in accordance with Section 11.1 of the GQAPP.

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

Site 7

During the soil boring and shallow monitoring well installation (Section 14.2.3.3), soil samples will be collected at five soil boring locations across Site 7. At each location, composite soil samples will be collected from each of the following depth intervals: 0 to 0.5 foot BLS, 0.5 foot to 2.5 feet BLS, 2.5 to 5 feet BLS, and then every 5-foot interval to the water table. For the purpose of estimating sample numbers, the depth to the water table is assumed to be 10 feet BLS across the site.

The 20 soil samples will be analyzed for the parameters indicated on Table 14-2 (see also Table 14-4).

Site 21

During the Phase II soil boring and monitoring well installation (Section 14.2.3.3), soil samples will be collected at 22 locations across Site 21 (see Figure 14-8). At each location, composite soil samples will be collected from each of the following depth intervals: 0 to 0.5 foot BLS, 0.5 foot to 2.5 feet BLS, 2.5 to 5 feet BLS, and then every 5-foot interval to the water table. For the purpose of estimating sample numbers, the depth to the water table is assumed to be 5 feet BLS across the portion of Site 21 that is north of Radford Boulevard (seven locations; see Figure 14-8) and 6 feet BLS across the portion of Site 21 that is south of 'Radford Boulevard (15 locations; see Figure 14-8).

The 81 soil samples will be analyzed for the parameters listed in Table 14-3 (see also Table 14-7).

### 14.2.3.3 Soil Boring Completion and Permanent Monitoring Well Installation and Development

A total of five permanent monitoring wells will be installed at Site 7, and 21 will be installed at Site 21. These wells will be located and designed to supplement the Phase I investigation results regarding the lateral and vertical extents of groundwater contamination. The number and target completion depths of these wells are as follows:

Site 7--Five shallow wells, each of which will be approximately 20 feet deep.

Site 21:

- o Twenty shallow wells, each of which will be approximately 15 feet deep; and
- o One intermediate well, approximately 40 feet deep.

Figures 14-7 and 14-8 show the locations of the proposed monitoring wells at each site, and tables 14-5 and 14-8 provide a detailed rationale for the selection of each of the monitoring well locations and target depths at each site.

In order to detect the presence of any floating product at sites 7 and 21, the shallow wells will be completed into the upper portion of the surficial zone of the Sand-and-Gravel Aquifer so that the well screen brackets the water table. At Site 21, the intermediate well will be installed to investigate the vertical extent of groundwater contamination, particularly any dense nonaqueous phase liquids (DNAPLs). The intermediate well will be completed into the lower portion of the surficial zone immediately above the first confining/semi-confining unit.

All the shallow wells on sites 7 and 21 and the intermediate well on Site 21 will be installed using hollow-stem auger methods, and constructed of 4-inch-diameter, threaded, flush-joint, polyvinyl chloride (PVC) casing terminating in 10 feet of 0.015-inch, factory-slotted screen.

At Site 21, to prevent the potential downward migration of any shallow contaminants during drilling, the intermediate well (location 18; see Figure 14-8) will be installed, using either hollow-stem auger or hydraulic rotary methods, through an 8-inch-diameter PVC surface casing. The surface casing will be grouted in place and allowed to set 24 hours prior to drilling the well borehole to the target depth, in accordance

with Section 6.7.4 of the GQAPP. The intermediate well surface casing will be set at approximately 30 feet BLS. The intermediate well installed through the surface casing will be constructed in the same manner as the shallow wells. All drilling and finished monitoring well construction will be conducted in accordance with sections 6.7.2 and 6.7.3 of the GQAPP. In addition, all newly installed wells will be protected above surface grade with a steel surface casing and locking wellhead cover. In paved or heavily traveled areas, the wells will be protected at surface grade with a flush-mount security cover and locking cap.

In conjunction with the drilling of the well boreholes, continuous split-spoon samples will be collected to the target completion depth of each well in accordance with Section 6.7.2.3 of the GQAPP.

After installation, each of the new monitoring wells will be developed using a submersible pump and/or bailer in accordance with Section 6.7.5 of the GQAPP. Development waste will be contained in 55-gallon drums, labeled, and moved to a storage area on NAS Pensacola, as directed by the Navy (see also Section 14.6.2).

All drilling equipment will be decontaminated prior to use and between the installation of each well in accordance with Section 6.10 of the GQAPP. All borehole cuttings and drilling fluids will be stored in 55-gallon drums, labeled, and moved to a storage area on NAS Pensacola, as directed by the Navy (see also Section 14.6.2)

#### 14.2.3.4 Groundwater Sampling

Purging and sampling of each well will be performed in accordance with sections 6.8.2 and 6.8.3 of the GQAPP, respectively. Equipment decontamination activities will be performed in accordance with Section 6.10 of the GQAPP. The number and types of groundwater field QA/QC samples to be collected were determined in accordance with Section 11.1 of the GQAPP.

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

### Site 7

During Phase II, groundwater samples will be collected from the five newly installed on-site monitoring wells at Site 7 (see Figure 14-7). The five samples will be analyzed for the parameters listed in Table 14-2 (see also Table 14-5).

### Site 21

During Phase II, groundwater samples will be collected from the 21 newly installed monitoring wells on Site 21 (see F gure 14-8). The 21 samples will be analyzed for the parameters listed in Table 14-3 (see also Table 14-8).

### 14.2.4 Hydrologic Assessment

The main objective of the Phase II hydrologic assessment is to further delineate the hydrogeologic character of the underlying aquifer at sites 7 and 21. Slug and short-term specific capacity tests, rather than long-term aquifer pumping tests, have been proposed for Phase II because the location and distribution of contaminants in the underlying aquifer have not yet been precisely identified. The hydrologic assessment at sites 7 and 21 will include a wellhead elevation survey of all the newly installed permanent monitoring wells; static water level measurements in all the newly installed permanent wells and, at Site 21, the on-site surface water bodies; and short-term specific capacity and/or slug tests on all the newly installed permanent wells.

All of the newly installed monitoring wells will be surveyed during the engineering survey (Section 14.2.5), and referenced to a USGS benchmark, in accordance with Section 6.7.6 of the GQAPP. In addition, staff gauges will be placed in all surface water bodies on Site 21 (the drainage ditch and Pensacola Bay) and will be surveyed relative to the same datum as the wells.

A rain gauge will be installed at or near each site and monitored regularly during the fieldwork.

At sites 7 and 21, static water levels will be measured in all the newly installed wells and, at Site 21, in the on-site water bodies on at least four occasions: once during the sampling of the newly installed wells; once approximately two to four weeks after sampling to obtain an estimate of the short-term temporal variability in water levels; once during a low tidal phase; and once during a high tidal phase. The measurements taken during opposing tidal phases will be collected on the same day in order to accurately evaluate tidal influences on water level elevations at these sites.

Limited aquifer testing will be conducted on all newly installed monitoring wells. This testing will consist primarily of performing short-term specific capacity tests on wells that are capable of sustaining a measurable yield. The specific capacity testing at sites 7 and 21 will be conducted during the development of the newly installed wells. The procedure for specific capacity testing involves measuring the initial static water level in the well and then withdrawing groundwater from the well at a constant rate for a designated period. The sustained water level during pumping is then noted, and the pump is turned off. The water level recovery in the well is then recorded continuously over time until the water level equilibrates to the initial static level. In addition to measuring drawdown in the developing well during the specific capacity testing, water levels will be measured in adjacent shallow or intermediate monitoring wells to determine the extent to which the respective, monitored zones may be hydraulically connected.

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

instantaneous change in water level. The water level is then recorded continuously over time until the water level equilibrates to the initial static level.

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

### 14.2.5 Engineering Survey

A comprehensive engineering survey will be conducted to accurately identify all site sampling locations and cultural and topographic features. All sampling and monitoring well locations will be identified both horizontally and vertically. In addition, any utilities, aboveground structures, and improvements (such as pavement) will be located. Any pertinent information found during the contaminant source survey (Section 14.2.2) will be incorporated into this survey. The survey also will delineate topographic variability using contour intervals of 2 feet.

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

### 14.2.6 Report

Refer to Section 20 of this work plan (revised April 1992) for a description of the Phase II report.

## 14.3 Phase 111--Extent Delineation

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

### 14.3.1 Biota Sampling

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

### 14.3.2 Soil Sampling

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

### 14.3.3 Shallow Uonitoring Well Installation and Development

Additional shallow monitoring wells may be required to further determine the horizontal extent of shallow groundwater contamination.

### 14.3.4 Intermediate and Deep Uonitoring Well installation and Development

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

### 14.3.5 Groundwater Sampling

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

### 14.3.6 Hydrologic Assessment

All wells installed during Phase III will require a wellhead survey to obtain top of casing (TOC) elevations. Water level measurements will be made for all site monitoring wells and nearby surface water bodies. Horizontal and vertical hydraulic gradients will be determined. Aquifer testing will be performed, as required, to determine aquifer physical characteristics. On sites where contamination is found in the surficial zone during phases I and/or 11, the low permeability zone will be further characterized during Phase III and any subsequent phases. It is intended that soil sample results, lithologic logs, isopach maps, permeability testing, aquifer testing, etc., will be utilized as required to determine the lateral extent and/or continuity of the low permeability zone, as well as the degree to which hydraulic connection exists between the surficial zone and underlying main producing zone at each site.

### [14.3.7 Engineering Survey

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

### 14.3.[8] Air Sampling

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

## 14.4 Phase IV--Extent Delineation

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

- Soil sampling;
- Shallow monitoring well installation and development;
- Intermediate and deep monitoring well installation and development;
- Groundwater sampling;
- Hydrologic assessment; [and
- Bngineering Survey.]

## 14.[5] Field Quality Assurance/Quality Control

### 14.[5].1 Documentation

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

### 14.[5].2 Field Quality Assurance/Quality Control Samples

Samples collected for laboratory analysis (both screening and non-screening) during all phases of fieldwork will require the preparation of field QA/QC samples as described in Section (11.11 of the GQAPP. The estimated numbers of required field QA/QC samples for phases I and II are shown in tables *14-1, 14-2,* and *14-3.*

## 14.[6] Decontamination and Waste Management Procedures

### 14.[6].1 Decontamination Procedures

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

### 14.[6].2 Waste Management Procedures

[All investigation-derived waste handling will be performed in accordance with Section 6.11 of the GQAPP and EPA's guidance for investigation-derived waste.] All water generated during monitoring well purging and development activities on each site will be discharged onto the ground surface away from the well, or will be containerized, labeled, and moved to a storage area on NAS Pensacola, as directed by the Navy.

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

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

# 15. LABORATORY QUALITY ASSURANCE/QUALITY CONTROL

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



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

# 16. GROUNDWATER MODELING

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

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

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

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

# 17. TREATABILITY STUDY

As indicated in tables *14-2* [and 14-31, a number of the analyses to be performed on the samples collected during phases II through IV are required in support of the treatability study. Characterization of samples in terms of parameters listed in tables *14-2* and *14-3,* together with treatability tests, will provide the basic data required for the evaluation of physical, chemical, and biological remedial technologies. Some of the treatability tests that may be examined are incineration tests, solubility tests, soil leaching tests, and coagulation-flocculation jar tests.



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

# 18. BASELINE RISK ASSESSMENT

As part of the Remedial Activities Investigation, a baseline risk assessment will be conducted to determine the level of effort required in the 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 hydro-geological conditions), the potential human and environmental receptors, the potential exposure routes and the extent of actual or expected exposure, the extent of impact or threat (i.e., risk characterization), and the level or levels of uncertainty associated with all of the above. The complexity of the site will determine the level of effort required to conduct the baseline risk assessment. The conclusions'of the baseline risk assessment will determine the level of effort required in the risk assessment to be conducted in the FS.

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

## 18.1 Contaminant Identification

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

## 18.2 Exposure Assessment

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

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

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

The final step in the exposure assessment is to integrate the information and develop a qualitative and/or quantitative estimate of

the expected exposure levels resulting from the actual or potential release of contaminants from the site.

### 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 potentially adverse effects to human health or environment of each scenario derived is developed and summarized. By integrating information developed during the exposure and toxicity assessments, estimates of risk can be developed to include carcinogenic risks, noncarcinogenic risks, and environmental risks. To characterize environmental risks, the potential exposures to the surrounding ecological receptors must be identified, and the potential effects associated with such exposure(s) must be determined. Important factors to examine include disruptive effects to populations (plant and animal) and the extent of perturbations to the ecological community. 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, and retirement homes);
- Activities (recreational and/or occupational) which take place near the sites and the estimated number of people involved;
- Records of any environmental and/or health complaints regarding the sites; and
- Log of any actions taken by a health unit regarding health issues, complaints, and concerns.

The results of the baseline risk assessment may indicate that the site poses little or no threat to human health or the environment. In such cases, the 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 (e.g., hydrogeologists, chemists, and risk assessors), the Navy, and the reviewing 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.

# 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 work plan after the initial phases of the fieldwork have been completed. However, it is anticipated that if contamination of some degree is identified on site, the general approach described below will be followed.

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

## 19.1 Screening of Applicable Remedial Technologies

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

## 19.3 Risk Assessment

Based on the results of the baseline risk assessment conducted during the Remedial Activities Investigation, E & 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 considering potential advantages or disadvantages of technologies applied in combination. In this task, individual technologies will be assembled into remedial action alternatives for the site. During the assembly and evaluation of the action alternatives, criteria including technical feasibility, environmental and public health, institutional impacts, and comparative costs will be considered.

## 19.5 Selection of Recommended Remedial Action Alternatives

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

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

## 19.6 Feasibility Study Report

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

## 20. REPORT

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

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

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



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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.

## 21. DOCUMENT REVISION

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

# 22. PROJECT MANAGEMENT

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

# 23. PROJECT SCHEDULE

Figures 23-1, 23-2, 23-3, and 23-4 show the project schedules for phases I, II, 111, and IV, respectively. Given that the scopes of work for Phase II and beyond are dependent on the results of the preceding phases, the project schedules for phases 11, III, and IV are tentative. In addition, the length of time between phases is subject to the schedule in the Federal Facilities Agreement Site Management Plan (FFASHP). The schedule in the FFASMP will be updated yearly.



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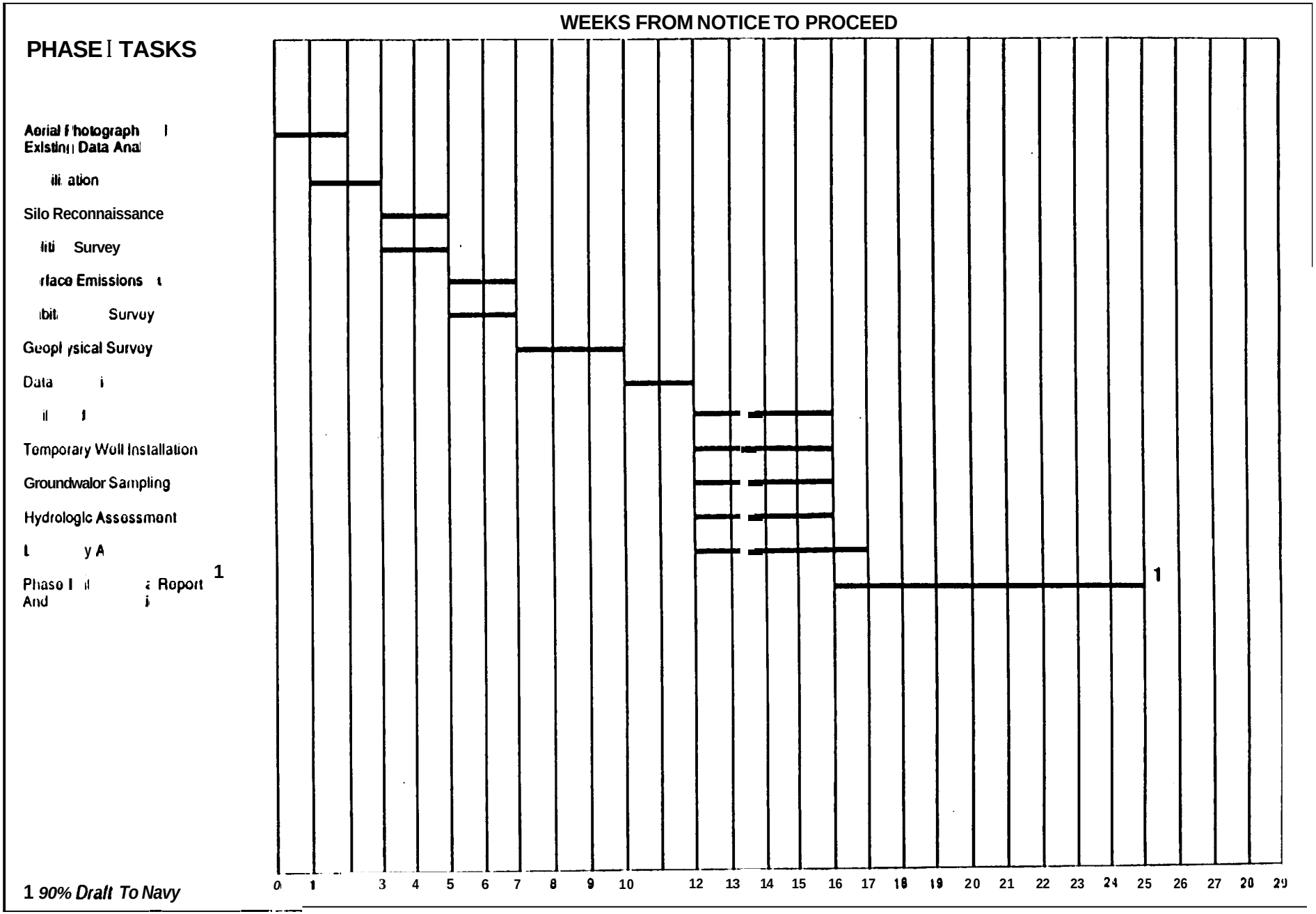


Figure 23-1 PHASE I PROJECT SCHEDULE -- GROUP K

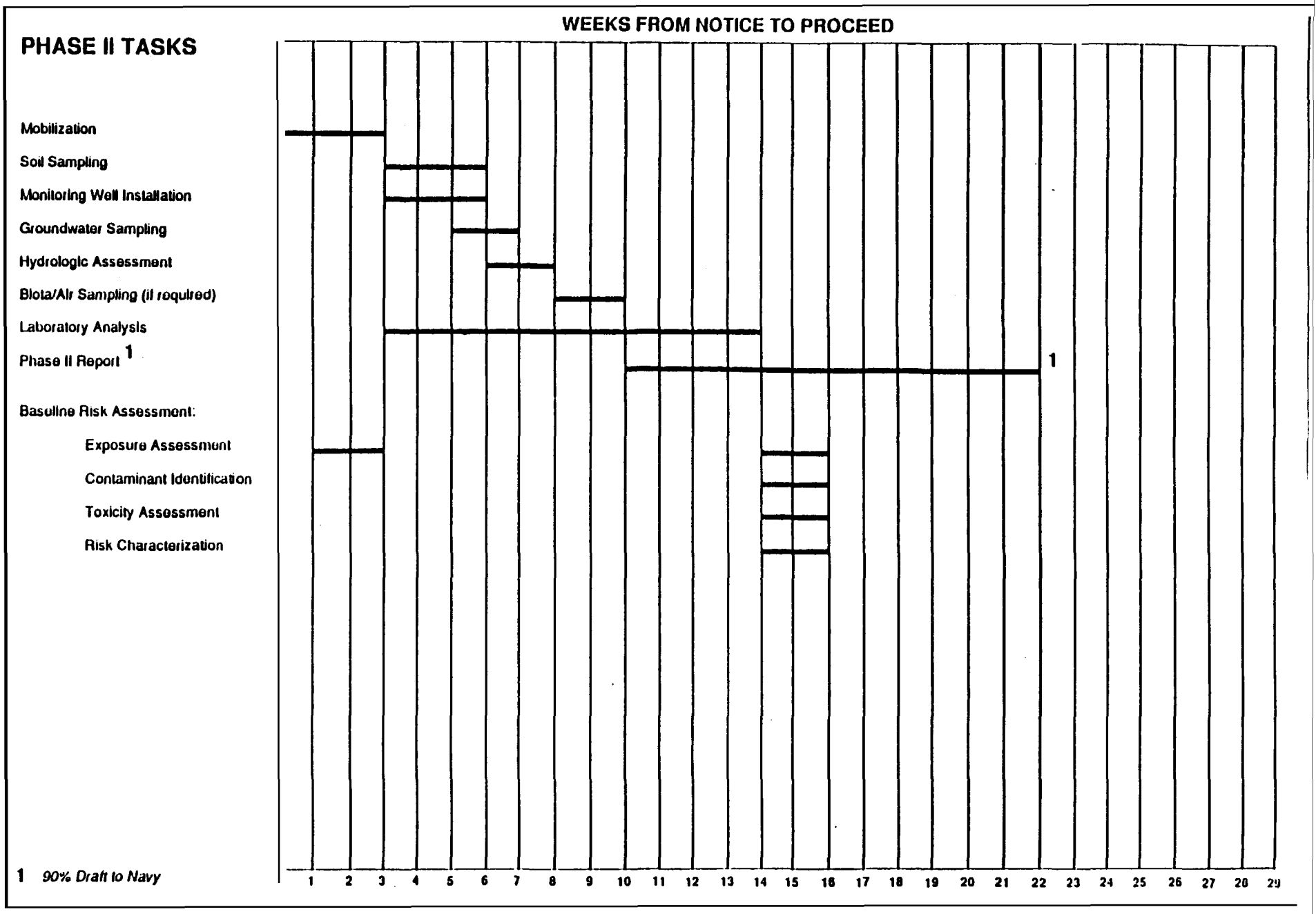


Figure 23-2 PHASE II PROJECT SCHEDULE – GROUP K

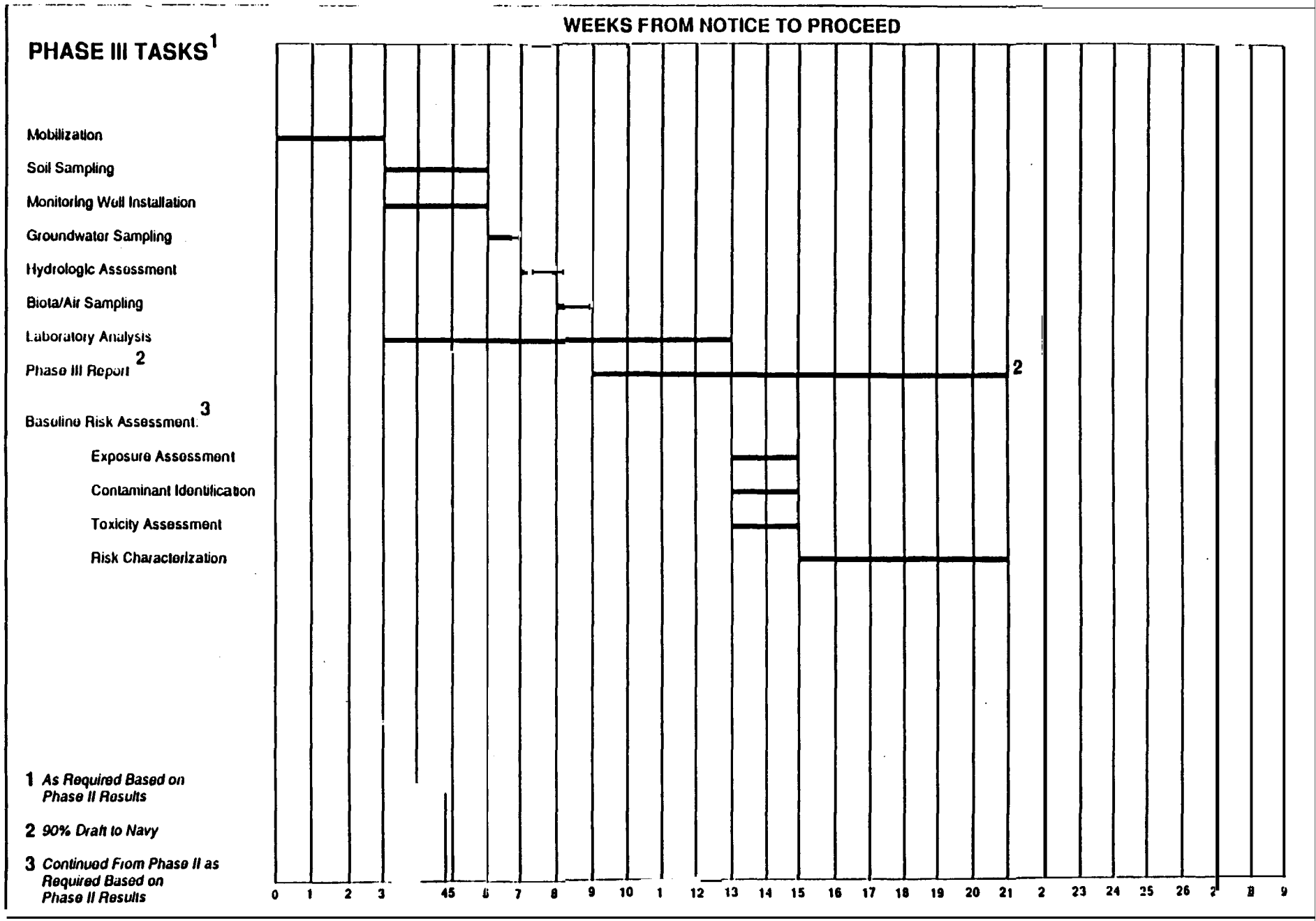


Figure 23-3 PHASE III PROJECT SCHEDULE – GROUP K

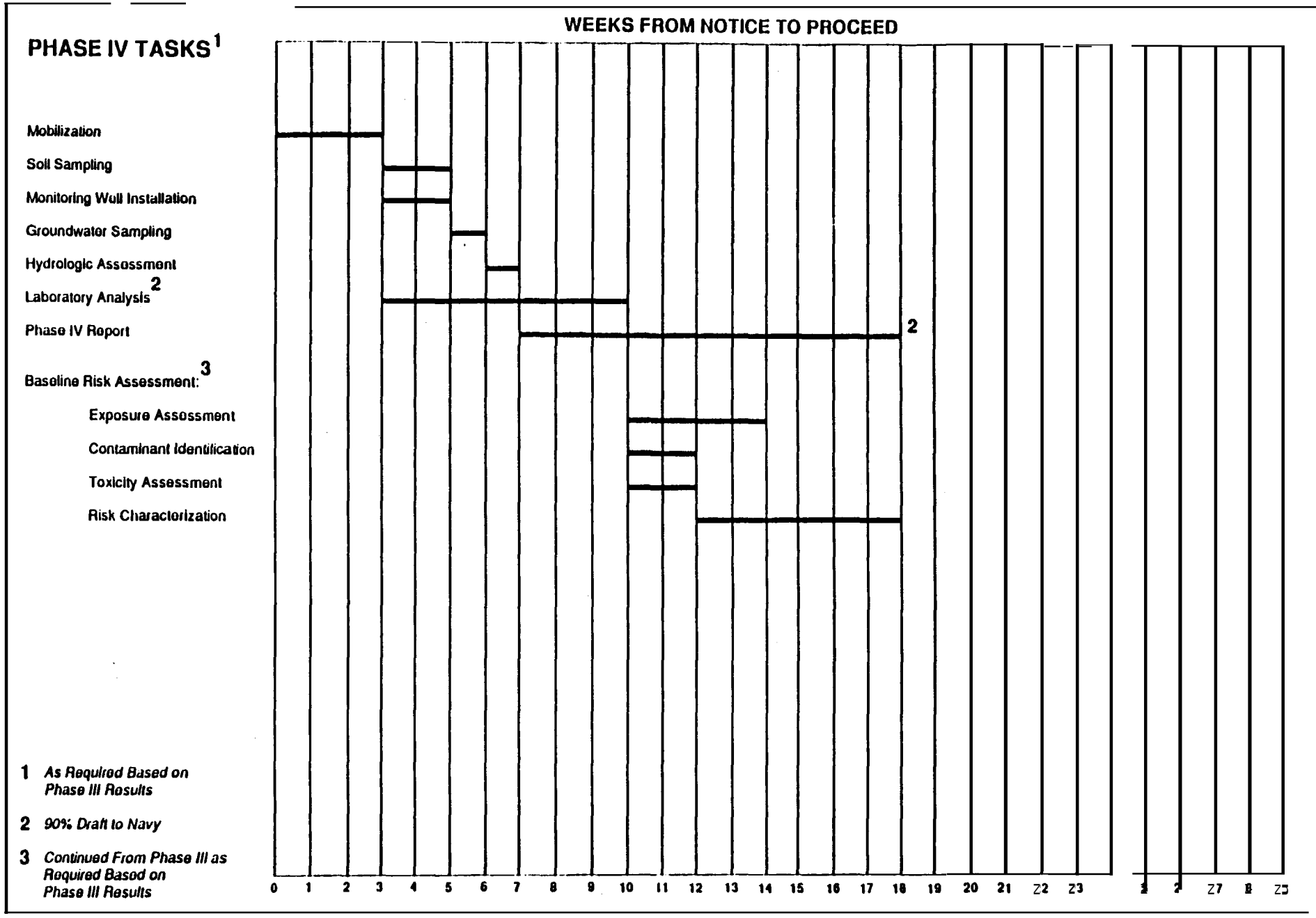


Figure 23-4 PHASE IV PROJECT SCHEDULE -- GROUP K

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# APPENDIX A

## SITE-SPECIFIC *SAFETY* PLAN



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ecology and environment, inc.

# SITE SAFETY PLAN

Version 9XX

## A. GENERAL INFORMATION

Project Title: Site 7 - Firefighting School

Project No.: UH8000

TDD/Pan NO. :

Project Manager: John Barksdale

Project Dir.: Gerry Gallagher

Location(s): Firefighting School - at Building 1713, near the intersection of Redoubt and Taylor roads.

Prepared by: Dan Foss

Date Prepared: 3-23-92

Approval by: Sybil Nowchurch

Date Approved: 3-30-92

Site Safety Officer Review:

Date Reviewed:

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

Proposed Date of Field Activities: December 1992

Background Into: Complete: [ X 1 Preliminary (No analytical data available) [ ]

Documentation/Summary:

| | | | | |
|---|---|---|---|---|
| Overall Chemical Hazard: | Serious | [ ] | Moderate | 1 |
| | LOW | [ ] | Unknown | X ] |
| Overall Physical Hazard | Serious | [ ] | Moderate | X ] |
| | LOW | [ ] | Unknown | 1 |

## B. SITE/WASTE CHARACTERISTICS

Waste Type(s):

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

Characteristic(s):

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Flammable/ Ignitable | [ X I | Volatile | [ X ] | Corrosive | [ 1 | Acutely Toxic | [ ] |
| Explosive | [ X ] | Reactive | [ ] | Carcinogen | [ X ] | Radioactive. | [ ] |

Other :

Physical Hazards :

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Overhead | [ X ] | Confined. Space | [ 1 | Below Grade | [ ] | Trip/Fall | [ X ] |
| Puncture | [ ] | Burn | I ] | Cut | [ ] | Splash | [ X ] |
| Noise | [ X ] | Other: | Vehicular traffic in tho site vicinity. Heat stress/Cold stress. | | | | |

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

[NASP]UH8000:T0482:1

Site History/Description and Unusual Features (see Sampling Plan for detailed description): Tho firefighting school in Building 1713 has boon operating 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 (1983) report on tho site concluded that thoro was no apparent evidence of hazardous vasto disposal on tho site. Low levels of metals (primarily As, Cr, and Pb), TRPHs (soils only), and PAHs and phenols (groundwater only) were detected in Phase I soil and groundvator samples.

Locations of Chemicals/Wastes: Subsurface

Estimated Volume of Chemicals/Wastes: Unknown

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

---

## C. HAZARD EVALUATION

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

Physical Hazard Evaluation:

1) Soil sampling - Personal contamination. overhead, noiso, automobiles

2) Monitoring well installation - Ovorhoad, noiso, automobiles

3) Groundvator sampling - Splash, personal contamination. noiso, automobiles

4) Decontamination procedures - Solvents, acid solutions

5) Physical surveys - Slips, trips, falls, noiso, automobiles

6) Hydrologic assessment - Splash, personal contarination, noiso, automobiles.

Chemical Hazard Evaluation:

| Compound | PEL/TWA | Route of Exposure | Acute Symptoms | Odor Threshold | Odor ascription |
|---|---|---|---|---|---|
| Hydrochloric Acid | 5 ppm | Inh, Ing, Con. | Corrosive | | Acrid |
| Nitric Acid | 2 ppm | Inh, Ing, Con. | corrosive | 0.3 - 1 ppm | Acrid |
| Sulfuric Acid | 1 $mg/m^3$ | Inh, Ing, Con. | corrosive | N/A | Odorloss |
| Sodium Hydroxido | 2 $mg/m^3$ | Inh, Ing, Con. | Corrosive | N/A | Odorloss |
| Isopropyl Alcohol | 440 ppm | Inh, Ing, Con. | Drowsiness, Head | 7.5 - Z00 ppn | Rubbing Alcohol |
| Arsenic | 0.5 $mg/m^3$ | Inh, Ing. Con, Abs | Naua, vomit, diarrhea | N/A | N/A |
| Chromium | 1 $mg/m^3$ | Inh, Ing. Con | Cough, wheezing, Head | N/A | N/A |
| Lord | 0.05 $mg/m^3$ | Inh, Inq, Con | Vomit. diarrhea | N/A | N/A |
| Gasoline | 300 ppm | Inh, Ing, Con | Dizzy, Uncon | | |
| Diesel | — | Inh, Ing, Con | Vomit, Diarrhea | 0.082 ppm | Petroleum |
| Phenols | 5 ppm | Inh. Ing. Con | Vomit, Diarrhea | .05 ppm | Sweet pungent |

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

---

## D. SITE SAFETY WORK PLAN

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

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 |
| Task 5 | | | | X |
| Task 6 | | | | X |

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

- o Lovol D: $O_2$ <19.5% or >25%, explosive atmosphere >10% LEL, organic vapors above background levels, particulatos >_____ $mg/m^3$, othor _____
- o Level C: $O_2$ <19.5% or >25%, explosive atmosphere >25% $LEL_3$ (California-20%), unknown organic vapor in breathing zone) >1 ppm, particulatos >_____ $mg/m^3$, othor _____
- o Lovol E: $O_2$ <19.5% or >25%, explosive atmosphere >25% $LEL_3$ (California-20%), unknown organic vapors (in breathing zone) >5 ppm, particulatos >_____ $mg/m^3$, othor _____
- o Lovol A: $O_2$ <19.5% or >25%, explosive atmosphere >25% LEL (California-2021, unknown organic vapors >500 ppm, particulatos >_____ $mg/m^3$, othor _____

Air Monitoring (daily calibration unless otherwise noted):

| Contaminant Ot Interest | Type of Sample (area, personal) | Monitoring Equipment | Frequency of Sampling |
|---|---|---|---|
| Volatile Organics | 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.:

Alconox + tap water wash, tap water rinso, two isopropanol rinses, organic-fro. wator rinse, and air dry.

Teflon implements used for tho collection ot samples for metals analyses will have a 10% nitric acid solution rinse after tho tap wator rinse followed by another tap water rinse, two isopropanol rinses, and air dry.

Personnel Decon Protocol: Boot and glove wash - Alconox + tap water wash with clean water rinse. Expendables will bo double-bagged and drummed for disposal. Field personnel will take a hygienic shower off site, following conplotion of each day's fioldwork.

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

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

Site Entry Procedures and Special Considerations: E & E's "buddy system" will bo employed at a11 times during fieldwork activities. Personnel will exercise caution in tho vicinity of nearby roadways. If above background radiation levels are encountered, team members will evacuate the sampling area and contact tho corporato health physics group to reassess tho site.

Work Limitations (time of day, weather conditions, etc.) and Heat/Cold Stress Requirements: All fioldwork activities will bo performed during daylight hours. Team members will break as needed to prevent heat stress and replace fluids. Cooling vests may bo used to prevent heat stress.

General Spill Control, if applicable: N/A

Investigation-Derived Material Disposal (i.e., expendables, decon waste, cuttings): All fioldwork waste materials will bo double bagged, drummed, labeled, and transported to designated location for final disposal by tho Navy.

Sample Handling Procoduros Including Protoctivo Wear: During a11 handling of samples, a11 field team members will wear surgical gloves. Goggles will bo worn during sample preservation with acids.

| Team Member* | Responsibility |
|---|---|
| To bo determined. | Team Leader |
| | Site Safety Officer/Sampler |
| | Geologist/Sampler |
| | Sampler |
| | |
| | |

*All entries into exclusion zone require Buddy System use. All E & E field staff participate in medical monitoring program and have completed applicable training per 29 CFR 1910.120. Respiratory protection program roots requirements of 29 CFR 1910.134, and ANSI 288.2 (1980).

## E. EMERGENCY INFORMATION

(Use supplemental shoots, if necessary)

### LOCAL RESOURCES

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

Ambulance: On base: (904) 452-4130: Off base: 911

Hospital Emergency Room: NAS Dispensary - Building 3600: (904) 452-2733: Baptist Hospital: (904) 434-4013 (Life Flight)

Poison Control Center:

Police (include local, county sheriff, state): 911

Fire Department: 911

Airport:

U.S. Coast Guard: Erorqoncy: (904) 453-0170: General Information: (904) 453-0202

Laboratory: E & E ASC: (716) 631-0360

rod. Express: (800) 230-5355

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

Site Contact: NAS Pensacola Environmental Coordinator, Ron Joyner: (904) 452-4515

### SITE RESOURCES

Site Emergency Evacuation Alarm Method: N/A

Water Supply Source: on site

Telephone Location, Number: To bo dotorminod on site

Cellular Phone, if available: To bo dotorminod on site

Radio:

Other: On-sit. warehouse number to bo determined

### EMERGENCY CONTACTS

1. Dr. Raymond Harbison (Univ. of Florida) ..... (501) 221-0465 or (904) 462-3277, 3201
   Alachua, Florida (501) 370-0263 (24 hours)

2. Ecology and Environment, Inc., Safety Director
   Paul Jonmaire ..... (716) 684-0060 (office
   (716) 655-1260 (home)

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

4. Regional Office Manager - Rick Rudy ..... (904) 077-1970 (office
   (904) 893-7245 (home)

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## MEDTOX HOTLINE

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

   What to report:

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

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

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

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

## EMERGENCY ROUTES

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

Directions to hospital (include map) from site 7

NAS Dispensary - From tho site follow Taylor Road oast to Duncan Road. Turn right onto Duncan Road and follow it south to tho intersection with Turner Stroot. Turn loft onto Turnor Stroot. Tho NAS Dispensary is located on Turner Stroot in Building 3600.

Baptist Hospital - Take Duncan Road (Navy Blvd.) north to exit tho base. Navy Blvd. becomes HWY 98 and curves to tho oast. Follow Navy Blvd./Hwy. 98 oast approx. 3 mi to Pace Blvd. Turn loft (north) on Pace Blvd. and proceed approx. 1 mi 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 Get Off-Site Emergency egress routes will bo located if emergency exit routes become blocked by construction, etc.

[NASP]UH8000:T0482:1

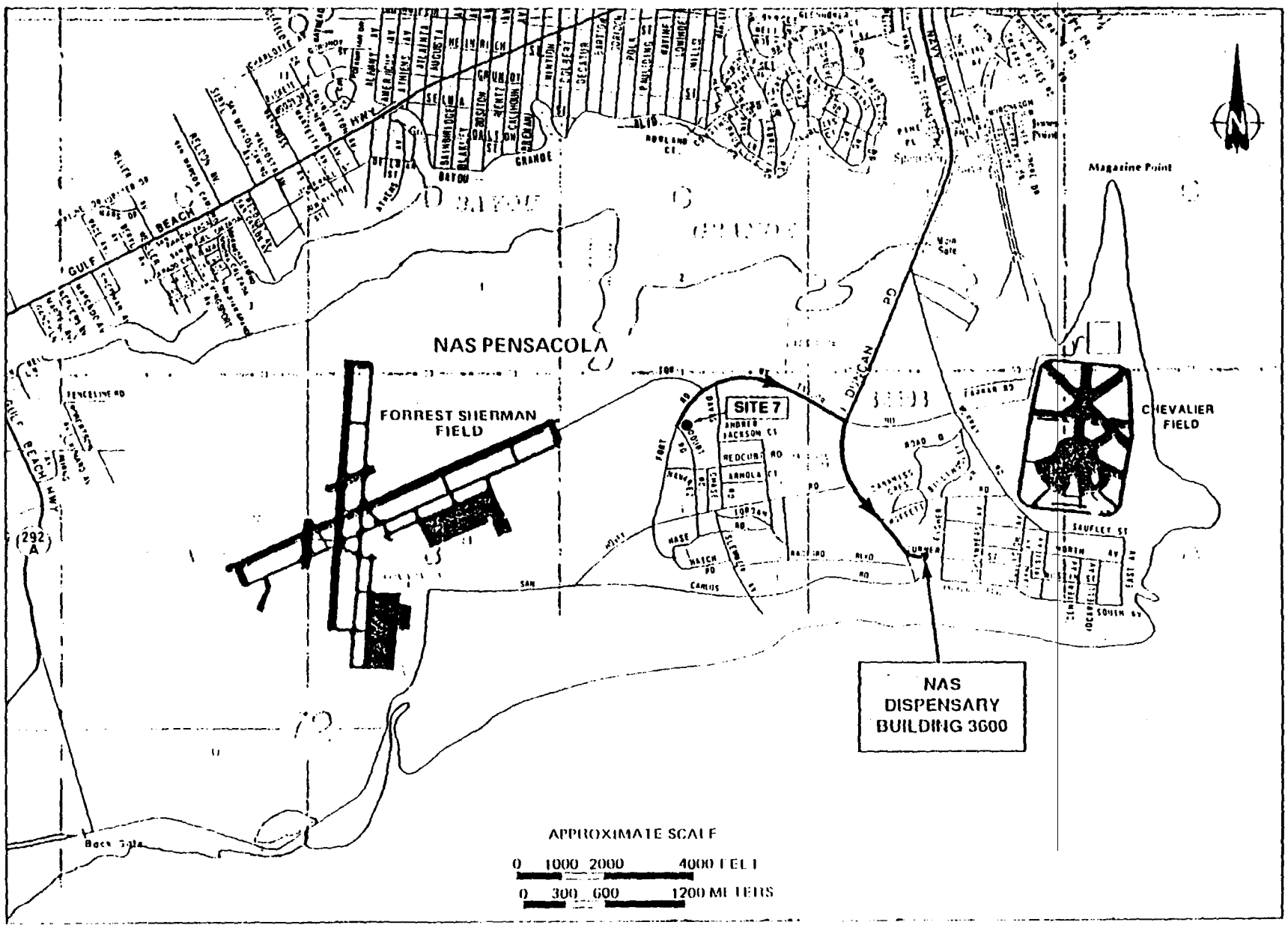
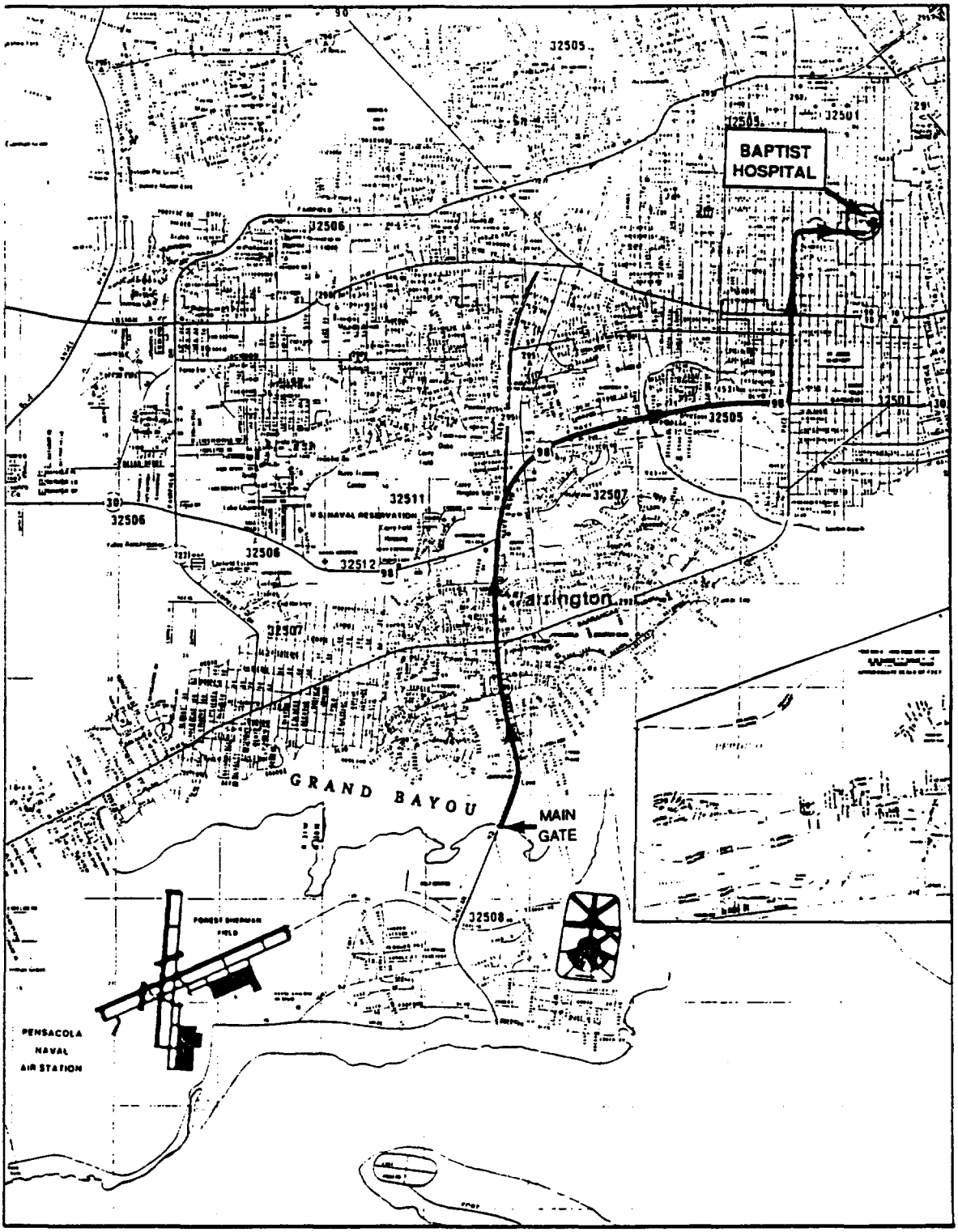



Figure [illegible] LOC [illegible] [illegible] [illegible]DISPENSARY




SOURCE: Ecology and Environment, Inc., 1992

APPROXIMATE SCALE IN FEET

0 2000 4000 6000 8000

Figure A-2 LOCATION OF BAPTIST HOSPITAL

## F. EQUIPMENT CHECKLIST

**PROTECTIVE GEAR**

| Level A | No. | Level B | No. |
|---|---|---|---|
| SCBA | | SCBA | |
| SPARE AIR TANKS | | SPARE AIR TANKS | |
| ENCAPSULATING SUIT (Typo _____) | | PROTECTIVE COVERALL (Typo _____) | |
| SURGICAL GLOVES | | RAIN SUIT | |
| NEOPRENE SAFETY BOOTS | | BUTYL APRON | |
| BOOTIES | | SURGICAL GLOVES | |
| GLOVES (Typo _____) | | GLOVES (Typo _____) | |
| OUTER WORK GLOVES | | OUTER WORK GLOVES | |
| HARD HAT | | NEOPRENE SMETY BOOTS | |
| CASCADE SYSTEM | | BOOTIES | |
| 5-MINUTE ESCAPE COOLING VEST | | HARD HAT WITH FACE SHIELD | |
| | | CASCADE SYSTEH | |
| | | MANIFOLD SYSTEH | |
| | | | |
| **Level C** | | **kvol D** | |
| ULTRA-TWIN RESPIRATOR | | ULTRA-TWIN RESPIRATOR (Available) | X |
| POWER AIR PURIFYING RESPIRATOR | | CARTRIDGES (Type GMC-H _____) | |
| CARTRIDGES (Type _____) | | 5-MINUTE ESCAPE MASK (Available) | |
| 5-MINUTE ESCAPE MASK | | PROTECTIVE COVERALL (Type Tyvek _____) | X |
| PROTECTIVE COVERALL (Typo _____) | | RAIN SUIT | |
| RAIN SUIT | | NEOPRENE SAFETY BONDS | |
| | | BOOTIES | X |
| SURGICAL GLOVES | | WORK GLOVES | |
| GLOVES (Typo _____) | | HARD HAT WITH FACE SHIELD | X |
| OUTER WORK GLOVES | | SAFETY GLASSES | X |
| NEOPRENE SAFETY BOOTS | | | |
| HARD HAT WITH FACE SHIELD | | | |
| BOOTIES | | | |
| HARDHAT | | | |
| | | | |
| | | | |
| | | | |
| | | | |

| INSTRUMENTATION | No. | DECON EQUIPMENT | NO. |
|---|---|---|---|
| OVA | | WASH TUBS | X |
| THERMAL DESORBER | | BUCKETS | X |
| O2/EXPLOSIMETER W/CAL. KIT | X | SCRUB BRUSHES | X |
| PHOTOVAC TIP | | PRESSURIZED SPRAYER | X |
| HNu (Probe 10.2 eV ) | X | DETERGENT (Type ) | |
| MAGNETOMETER | | SOLVENT (Type ) | |
| PIPE LOCATOR | | PLASTIC SHEETING | X |
| WEATHER STATION | | TARPS AND POLES | |
| DRAEGER PUMP, TUBES | | TRASH BAGS | X |
| BRUNTON COMPASS | | TRASH CANS | |
| MONITOX CYANIDE | | MASKING TAPE | X |
| HEAT STRESS MONITOR | | DUCT TAPE | X |
| NOISE EQUIPMENT | | PAPER TOWELS | X |
| PERSONAL SAMPLING PUMPS | | FACE MASK | |
| | | FACE MASK SANITIZER | |
| | | FOLDING CHAIRS | |
| | | STEP LADDERS | |
| RADIATION EQUIPMENT | | DISTILLED WATER | X |
| DOCUMENTATION FORMS | | | |
| PORTABLE RATEMETER | | | |
| SCALER/RATEMETER | | SAMPLING EQUIPMENT | |
| NaI Probe | | 8 OZ. BOTTLES | X |
| ZnS Probe | | HALF-GALLON BOTTLES | X |
| GM Pancake Probe | | VOA BOTTLES | X |
| GM Side Window Probe | | BAILER CORD | X |
| MICRO R METER | | HAND BAILERS | X |
| ION CHAMBER | | THIEVING RODS WITH BULBS | |
| ALERT DOSIMETER | | SPOONS | X |
| POCKET DOSIMETER | | KNIVES | |
| MINI RAD | X | FILTER PAPER | |
| FIRST AID EQUIPMENT | | PERSONAL SAMPLING PUMP SUPPLIES | |
| FIRST AID KIT | X | | |
| OXYGEN ADMINISTRATOR | | | |
| STRETCHER | | | |
| PORTABLE EYE WASH | X | | |
| BLOOD PRESSURE MONITOR | | | |
| FIRE EXTINGUISHER | X | | |

| VAN EQUIPMENT | No. | MISCELLANEOUS (Cont.) | No. |
|---|---|---|---|
| TOOL KIT | X | | |
| HYDRAULIC JACK | | | |
| LUG WRENCH | | | |
| TOW CHAIN | | | |
| VAN CHECK OUT | | | |
| Gas | | | |
| Oil | | | |
| Antifreeze | | | |
| Battery | | | |
| Windshield Wash | | | |
| Tire Pressure | | | |
| | | | |
| | | | |
| | | | |
| | | SHIPPING EQUIPMENT | |
| MISCELLANEOUS | | COOLERS | X |
| PITCHER PUMP | | PAINT CANS WITH LIDS, 7 CLIPS EACH | |
| SURVEYOR'S TAPE | | VERMICULITE | X |
| 100 FIBERGLASS TAPE | | SHIPPING LABELS | X |
| 300 NYLON ROPE | | DOT LABELS: "DANGER" | |
| NYLON STRING | | "UP" | |
| SURVEYING FLAGS | | "INSIDE CONTAINER COMPLIES ..." | |
| FILM | | "HAZARD GROUP" | |
| WHEEL BARROW | | STRAPPING TAPE | X |
| BUNG WRENCH | | BOTTLE LABELS | X |
| SOIL AUGER | | BAGGIES | X |
| PICK | | CUSTODY SEALS | X |
| SHOVEL | | CHAIN-OF-CUSTODY FORMS | X |
| CATALYTIC HEATER | | FEDERAL EXPRESS FORMS | X |
| PROPANE GAS | | CLEAR PACKING TAPE | X |
| BANNER TAPE | | | |
| SURVEYING METER STICK | | | |
| CHAINING PINS & RING | | | |
| TABLES | | | |
| WEATHER RADIO | | | |
| BINOCULARS | | | |
| MAGAPHONE | | | |

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# ON-SITE SAFETY MEETING

Project _____ TDD/Pan _____

Date _____ Time _____ Job No. _____

Address _____

Specific Location _____

Type of Work _____

## SAFETY TOPICS PRESENTED

Protective Clothing/Equipment _____

Chemical Hazards _____

Radiation Hazards _____

Physical Hazards _____

Emergency Procedures _____

Hospital/Clinic _____ Telephone _____

Hospital Address _____

Special Equipment _____

Other _____

Checklist

1. Emergency information reviewed? _____ and made familiar to all team members? _____
2. Route to nearest hospital driven? _____ and its location known to a11 team members? _____
3. Site safety plan readily available and its locatron known to a11 team members? _____

Meeting shall bo attended by a11 personnel who rill bo working within tho exclusion area. Daily informal update meetings will bo hold when site tasks and/or conditions change.

| Name Printed | Signature |
|---|---|
| | |
| | |
| | |

Meeting Conducted by: _____ (Print) _____ (Signature)

_____ (Site Safety Coordinator) _____ (Team Leader)



[NASP]UH8000:T0482:1

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# SITE SAFETY PLAN

Version 988

## A. GENERAL INFORMATION

Project Title: Site 21 - Sludge at Fuel Tanks Area  Projoct No.: UH8000

TDD/Pan No.:

Projoct Manager: John Barksdale  Projoct Dir.: Gerry Gallagher

Location(s):

Prepared by: Dan Foss  Dato Proparod: 3/23/92

Approval by: Sybil Nowchurch  Date Approved: 3/30/92

Site Safety Officer Review:  Dato Reviewed:

Scope/Objective of Work: Field activities will include surface water and sediment sampling, soil sampling, permanent monitoring well installation, groundwater sampling, physical surveys, and hydrologic assessment.

Proposed Dato of Field Activities: December 1992

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

**Documentation/Summary:**

| | | |
|---|---|---|
| Overall Chemical Hazard: | Serious [ ] | Moderate [ ] |
| | Low [ X ] | Unknown [ ] |
| Overall Physical Hazard | Serious [ ] | Moderate [ X ] |
| | Low [ ] | 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/Fa11 [ X ] |
| Puncture [ ] | Burn [ ] | Cut [ ] | Splash [ X ] |
| Noise [ X ] | Other: Four tanks used for JP-5 storage, 5 tanks no longer exist. Heat/cold stress. | | |

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

[NASP]UH8000:T0482:2

Site History/Description and Unusual Features (see Sampling Plan for detailed description): From tho 1940s through tho 1960s, tank bottom sludges wore removed from tho nine aboveground AVGAS storage tanka and disposed of in tho surrounding soils. Tho sludge was buried at unknown depths. Elevated levels of metals (primarily Cr and Pb), TRPHs, VOCs, PAHs, and phenols were detected in Phase I aoil and groundwater samples.

Locations of Chemicals/Wastes: Subsurface

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) Surface water and sediment sampling - Splash, personal contamination, slips, trips, falls, noise

2) Soil sampling - Personal contamination. ovorhoad, noise, automobiles

3) Monitoring well installation - Overhead, noise, autonobiloa

4) Groundwater sampling - Splash, personal contamination', noiao, autonobiloa

SI Decontamination procedures - Solvents, acid solutions

6) Physical surveys - Slips, trips, falls, noiao, automobiles

7) Hydrologic assessment - Splash, personal contamination, noiao, automobiles.

Chemical Hazard Evaluation:

| compound | PEL/TWA | Route of Exposure | Acute Symptoms | Odor Threshold | Odor Description |
|---|---|---|---|---|---|
| Hydrochloric Acid | 5 ppm | Inh, Ing, Con | Corroaivo | ? | Acrid |
| Nitric Acid | 2 ppm | Inh, Inq, Con | Corrosive | 0.3 - 1 ppm | Acrid |
| Sulfuric Acid | 1 $mg/m^3$ | Inh, Ing, Con | Corrosive | N/A | Odorless |
| Sodium Hydroxido | 2 mg/m3 | Inh. Ing. Con | Corroaivo | N/A | Odorlesa |
| Isopropyl Alcohol | 440 ppm | Inh, Ing, Con | Drowsiness, Head | 7.5 - 200 ppm | Rubbing Alcohol |
| Ethylbenzene | 100 ppm | Inh. Ing, Con, Abs | Irr. eyes, Hoad, Derm | 0.1 ppm | Swoot, aromatic |
| Methylene Chloride | 500 ppm | Inh. Con | Dizzy, Naus, Vomit | 214 ppm | Sweet odor |
| Toluene | 200 ppm | Inh, Inq, Con, Abs | Fatigue, Head | 0.2 ppm | Aromatic |
| Xylene | 100 ppm | Inh. Ing, Con, Abs | Hoad. Naus, Couqh | 0.5 ppm | Sweet |
| Chromium | 1 $mg/m^3$ | Inh, Inq, Con | Couqh, Wheezing, Head | | N/A |
| Lead | 0.05 $mg/m^3$ | Inh, Ing, Con | Vomit, Diarrhea | N/A | N/A |
| Phenols | 5 ppm | Inh, Ing, Con | Vomit, Diarrhea | .05 ppa | Sweet pungent |

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

## D. SITE SAFETY WORK PLAN

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

Perimeter identified? [Yes] Site secured? [No ]

Work Areas Designated? [Yes] Zone(s) of Contamination Identified? [No ]

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

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

| | A | B | C | D |
|---|---|---|---|---|
| Task 1 | | | | X |
| Task 2 | | | | X |
| Task 3 | | | | X |
| Task 4 | | | | X |
| Task 5 | | | | X |
| Task 6 | | | | X |
| Tank 7 | | | | X |

(Expand if necessary)

Modifications: Modified level O with tyvok, neoprene gloves and boots, safety glasses, APR available when upgrade to level C is necessary based on OVA roadings.

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

- o Lovol D: $O_2$ <19.5% or >25%, explosive atmosphere >10% LEL, organic vapors above background levels, particulatos >_____ mg/m$^3$, othor _____
- o Lovol C: $O_2$ <19.5% or >25%, oxplosivo atmosphoro >25% LEL (California-20%), unknown organic vapor (in breathing zone) >1 ppm, particulates >_____ mg/m$^3$, othor _____
- o Lovol B: $O_2$ <19.5% or >25%, oxplosivo atmosphoro >25% LEL (California-20%), unknown organic vapors (in breathing zone) >5 ppm, particulatos >_____ mg/m$^3$, othor _____
- o Level A: $O_2$ <19.5% or >25%, oxplosivo 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 |
|---|---|---|---|
| Volatile Organics | 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, otc.:

Alconox + tap water wash, tap wator rinso, two isopropanol rinses, organic-fro. water rinso. and air dry. Teflon implements used for tho collection of samples for metals analyses will have a 10% nitric acid solution rinso after tho tap wator rinso followed by another tap wator rinso, two isopropanol rinses, and air dry.

Personnel Decon Protocol: Boot and glove wash - Alconox + tap water wash with clean water rinse. Expendables will bo double-bagged and drummed for disposal. Field personnel will take a hygienic shower off site, following completion of each day's fioldwork.

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

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

Site Entry Procoduros and Special Considerations: E L E's "buddy system" will bo employed at a11 times during fioldwork activitios. Porsonnol will exercise caution in tho vicinity of nearby roadways. If above background radiation levels are oncountorod, team mombors will evacuate tho sampling area and contact tho corporato health physics group to reassess tho site.

Work Limitations (time of day, weather conditions, etc.) and Heat/Cold Stress Requirements: All fioldwork activitios will bo performed during daylight hours. Team members will break as needed to provont heat stress and replace fluids. Cooling vests ray bo used to provont heat stress.

General Spill Control, if applicable: N/A

Investigation-Derived Material Dirposal (i.e., expendables, decon waste, cuttings): All fioldwork waste materials will bo double bagged, drummed, labeled, and transported to designated location for final disposal by tho Navy.

Sample Handling Procoduros Including Protective Wear: During a11 handling of samples, a11 field team mombors will wear surgical gloves. Goggles will bo worn during sample preservation with acids.

| Team Member* | Responsibility |
|---|---|
| To bo dotorminod. | Team Leader |
| | Site Safety Officer/Sampler |
| | Geologist/Sampler |
| | Sampler |
| | |
| | |

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

## E. EMERGENCY INFORMATION

(Use supplemental shoots, if necessary)

### LOCAL RESOURCES

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

Ambulance: On base: (904) 452-4138: Off base: 911

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

Poison control Center: _____

Police (include local, county shorift, state): 911

Fire Department: 911

Airport: _____

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

Laboratory: E & E ASC: (716) 631-0360

Cod. Express: (800) 238-5355

Client Contact: U.S. Navy Southern Division, Enginoor-In-Chargo, Suzanne D. Sanborn: (803) 743-0574

Site Contact: NAS Pensacola Environmental Coordinator, Ron Joyner: (904) 452-4515

### SITE RESOURCES

Site Emergency Evacuation Alarm Method: N/A

Water Supply Source: On site

Telephone Location, Number: To bo dotorminod on site

Cellular Phone, if available: To bo dotorminod on site

Radio: _____

Othor: On-sit. warehouse number to bo dotorminod

### EMERGENCY CONTACTS

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

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

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

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

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## MEDTOX HOTLINE

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

   What to roport:

   - State: "this is an omorgoncy."
   - 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 s ocia ı) will cont ct you. Repeat tho information given to tho answering sorvico.

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

   a. 24 hour hotline - (716) 684-8940
   b. Corporato Safety Director - Paul Jonmaire - homo # (7161 655-1260
   c. Assistant Corp. Safety Officer - Steven Sherman - home # (716) 688-0084

## EMERGENCY ROUTES

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

Directions to hospital (include map) from Site 21

Dispensary - From tho site, follow Duncan Road north to its intersection with Turnor Street. Turn right on Turnor Stroot. Tho NAS Dispensary is located on Turnor Stroot in Building 3600.

Baptist Hospital - Take Duncan Road (Navy Blvd.) north to exit tho base. Navy Blvd. becomes HWY 98 and curves to tho east. Follow Navy Blvd./Hwy. 98 east approx. 3 mi to Pace Blvd. Turn loft (north) on Pace Blvd. and proceed approx. 1 mi 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-Sit0 Emergency egress routes will bo located if emergency exit routes become blocked by construction, otc.

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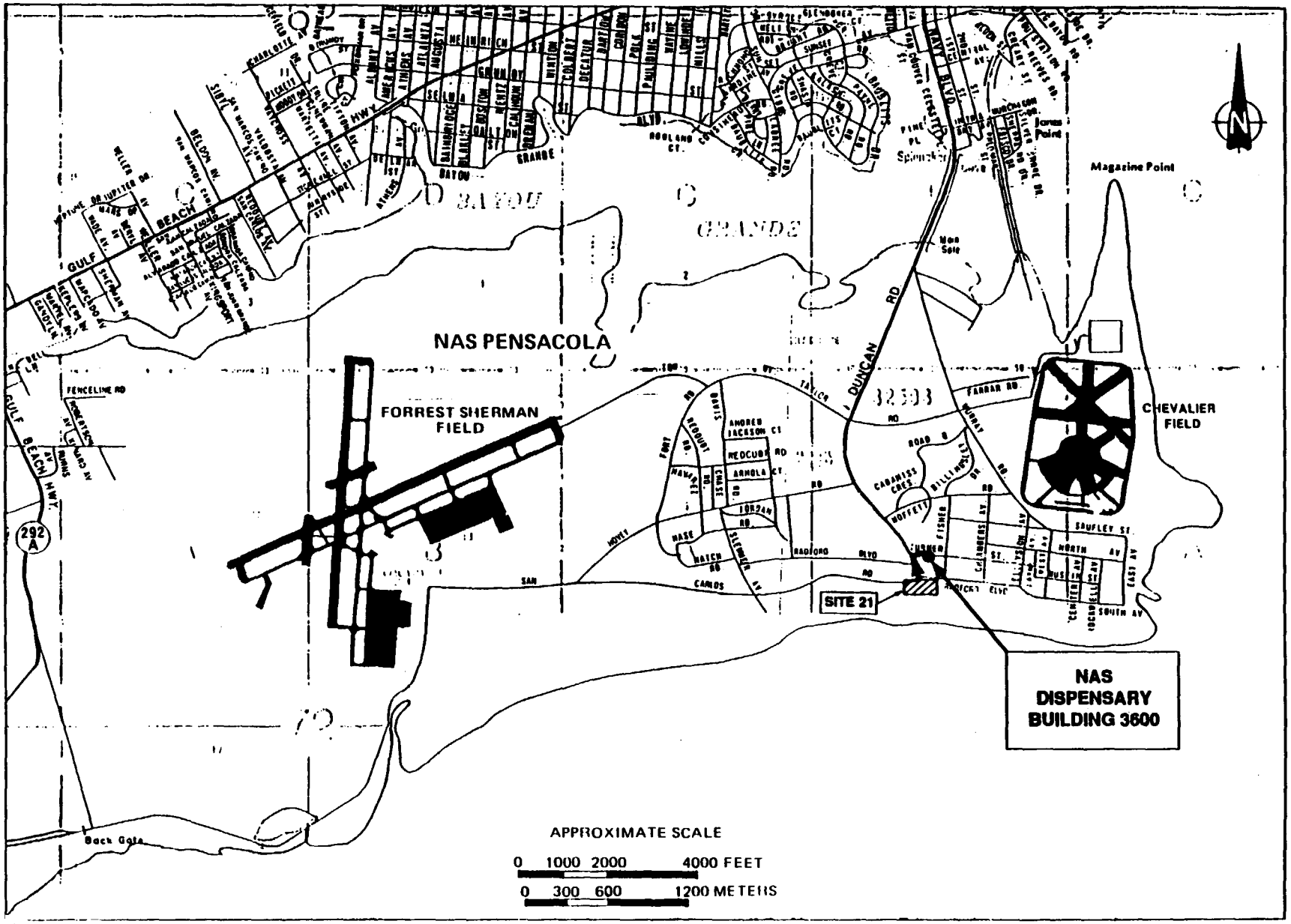


**Figure A-3 LOCATION OF NAS DISPENSARY**

| Level A | NO. | Level B | No. |
|---|---|---|---|
| SCBA | | SCBA | |
| SPARE AIR TANKS | | SPARE AIR TANKS | |
| ENCAPSULATING SUIT (Type _____) | | PROTECTIVE COVERALL (Type _____) | |
| SURGICAL GLOVES | | RAIN SUIT | |
| NEOPRENE SAFETY BOOTS | | BUTYL APRON | |
| BOOTIES | | SURGICAL GLOVES | |
| GLOVES (Typo _____) | | GLOVES (Type _____) | |
| OUTER WORK GLOVES | | OUTER WORK GLOVES | |
| HARD HAT | | NEOPRENE SAFETY BOOTS | |
| CASCADE SYSTEH | | BOOTIES | |
| 5-MINUTE ESCAPE COOLING VEST | | HARD HAT WITH FACE SHIELD | |
| | | CASCADE SYSTEM | |
| | | MANIFOLD SYSTEM | |
| | | | |
| **Level C** | | **Level D** | |
| ULTRA-TWIN RESPIRATOR | | ULTRA-TWIN RESPIRATOR (Available) | X |
| POWER AIR PURITYING RESPIRATOR | | CARTRIDGES (Type GMC-H _____) | |
| CARTRIDGES (Type _____) | | 5-MINUTE ESCAPE MASK (Available) | |
| 5-MINUTE ESCAPE MASK | | PROTECTIVE COVERALL (Type Tyvek _____) | X |
| PROTECTIVE COVERALL (Typo _____) | | RAIN SUIT | |
| RAIN SUIT | | NEOPRENE SATETY BONDS | |
| BUTYL APRON | | BOOTIES | X |
| SURGICAL GLOVES | | WORK GLOVES | |
| GLOVES (Typo _____) | | HARD HAT WITH TACE SHIELD | X |
| OUTER WORK GLOVES | | SAFETY GLASSES | X |
| NEOPRENE SATETY BOOTS | | | |
| HARD HAT WITH FACE SHIELD | | | |
| BOOTIES | | | |
| HARDHAT | | | |
| | | | |
| | | | |
| | | | |
| | | | |

| INSTRUMENTATION | No. | DECON EQUIPMENT | NO. |
|---|---|---|---|
| OVA | | WASH TUBS | X |
| THERMAL DESORBER | | BUCKETS | X |
| O2/EXPLOSIMETER W/CAL. KIT | X | SCRUB BRUSHES | X |
| PHOTOVAC TIP | | PRESSURIZED SPRAYER | X |
| HNu (Probe 10.2 eV ) | X | DETERGENT (Type ) | |
| MAGNETOMETER | | SOLVENT (Typo ' | |
| PIPE LOCATOR | | PLASTIC SHEETING | X |
| WEATHER STATION | | TARPS AND POLES | |
| DRAEGER PUMP, TUBES | | TRASH BAGS | X |
| BRUNTON COMPASS | | TRASH CANS | |
| MONITOX CYANIDE | | MASKING TAPS | X |
| HEAT STRESS MONITOR | | DUCT TAPE | X |
| NOISE EQUIPMENT | . | PAPER TOWELS | X |
| PERSONAL SAMPLING PUMPS | | FACE MASK | |
| | | FACE MASK SANITIZER | |
| | | FOLDING CHAIRS | |
| | | STEP LADDERS | |
| RADIATION EQUIPMENT | | DISTILLED WATER | X |
| DOCUMENTATION FORMS | | | |
| PORTABLE RATEMETER | | | |
| SCALER/RATEMETER | | SAMPLING EQUIPMENT | |
| NaI Probo | | 8 OZ. BOTTLES | X |
| ZnS Pcobo | | HAL?-GALLON BOTTLES | X |
| GM Pancake Probo | | VOA BOTTLES | X |
| GM Side Window Probo | | BAILER CORD | X |
| MICRO R METER | | HAND BAILERS | X |
| ION CHAMBER | | THIEVING RODS WITH BULBS | |
| ALERT DOSIMETER | | SPOONS | X |
| POCKET DOSIMETER | | KNIVES | |
| MINI RAD | X | FILTER PAPER | |
| FIRST AID EQUIPMENT | | PERSONAL SAMPLING PUMP SUPPLIES | |
| FIRST AID KIT | X | | |
| OXYGEN ADMINISTRATOR | | | |
| STRETCHER | | | |
| PORTABLE EYE WASH | X | | |
| BLOOD PRESSURE MONITOR | | | |
| FIRE EXTINGUISHER | X | | |

| VAN EQUIPMENT | No. | MISCELLANEOUS (Cont.) | No. |
|---|---|---|---|
| TOOL KIT | 1 x | r | |
| HYDRAULIC JACK | 1 | | |
| LUG WRENCH | | | |
| TOW CHAIN | | | |
| VAN CHECK OUT | | | |
| Gas | | | |
| Oil | | | |
| Antifreeze | | | |
| Battery | | | |
| Windshield Wash | | | |
| Tire Pressure | | | |
| | | | |
| | | | |
| | | | |
| | | SHIPPING EQUIPMENT | |
| MISCELLANEOUS | | COOLERS | x |
| PITCHER PUMP | | PAINT CANS WITH LIDS, 7 CLIPS EACH | |
| SURVEYOR'S TAPE | | VERMICULITE | x |
| 100 FIBERGLASS TAPE | | SHIPPING LABELS | x |
| 300 NYLON ROPE | | DOT LABELS: "DANGER" | |
| NYLON STRING | | "UP" | |
| SURVEYING FLAGS | | "INSIDE CONTAINER COHPLIES ..." | |
| FILM | | "HAZARD GROUP" | |
| WHEEL BARROW | | STRAPPING TAPE | x |
| BUNG WRENCH | | BOTTLE LABELS | x |
| SOIL AUGER | | BAGGIES | x |
| PICK | | CUSTODY SEALS | x |
| SHOVEL | | CHAIN-OF-CUSTODY FORMS | x |
| CATALYTIC HEATER | | FEDERAL EXPRESS FORMS | x |
| PROPANE GAS | | CLEAR PACKING TAPE | x |
| BANNER TAPE | 1 | | |
| SURVEYING METER STICK | | | |
| CHAINING PINS & RING | | | |
| TABLES | | | |
| WEATHER RADIO | | | |
| BINOCULARS | | | |
| MAGAPHONE | | | |

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# ON-SITE SAFETY MEETING

Project _____ TDD/Pan _____

Date _____ Time _____ Job lo. _____

Address _____

Specific Location _____

Type of Work _____

_____

## SAFETY TOPICS PRESENTED

Protoctivo Clothing/Equipment _____

_____

Chemical Hazards _____

_____

Radiation Hazards _____

_____

Physical Hazards _____

_____

Emergency Procedures _____

Hospital/Clinic _____ Telephone _____

Hospital Address _____

Special Equipment _____

Othor _____

Checklist

1. Emergency information reviewed? _____ and made familiar to a11 team members? _____
2. Route to nearest hospital driven? _____ and its location known to a11 tear members? _____
3. Site safety plan readily available and its location known to all team members? _____

Hooting shall bo attended by all personnel rho will bo working within tho exclusion area. Daily informal update meetings will be held when site tasks and/or conditions change.

ATTENDEES
(Expand on back of sheet if necessary)

| Name Printod | Signature |
|---|---|
| | |
| | |

Hooting Conducted by: _____ (Print) _____ (Signature)

_____ (Site Safety coordinator) _____ (Team Loader)



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

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

REVISED: JANUARY 1990

Prepared by

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# 1 INTRODUCTION

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

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

# 2 OPERATION OF DRILLING EQUIPMENT BY E & E

## 2.1 RESPONSIBILITIES AND AUTHORITY OF SITE SAFETY OFFICER

The duties of the Site Safety Officer (SSO) on drilling sites are the same as in other types of operations with the exception of the increased emphasis on the hazards unique to drilling work. This section details specific drilling concerns of an SSO.

E & E personnel are restricted from the borehole area during active drilling. Vhen E 6 E personnel are doing drilling; they will be restricted from the borehole area by means of a "super exclusion zone" delineated by placing a 4- by 8-foot sheet of plywood over the borehole.

## 2.2 RESPONSIBILITIES AND AUTHORITY OF E & E DRILLER

At the beginning of each work day, the E 6 E driller must inspect the rig to ensure the following components have been properly inspected, maintained, or replaced, or procedures have been performed:

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

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

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

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



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

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

### 2.3 RESPONSIBILITY AND AUTHORITY OF OTHER E & E PERSONNEL

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

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

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

## 3 TRAINING REQUIREMENTS FOR SITE PERSONNEL

### 3.1 E 6 E SITE SAFETY OFFICER

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



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### 3.2 E 6 E DRILLER AND HELPER

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

### 3.3 OTHER E 6 E DRILLING PERSONNEL

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

### 3.4 SUBCONTRACT DRILLER AND OTHER SUBCONTRACT DRILLING PERSONNEL

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



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# 4 SUPERVISION OF SUBCONTRACT DRILLERS

## 4.1 RESPONSIBILITIES AND AUTHORITY OF SITE SAFETY OFFICER

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

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

- The mast must be located at least 25 feet from any overhead or underground utility lines.
- The location and operation of operational and unencumbered kill switches must be reiterated to all site personnel.
- Outriggers, stabilizers, or jacks are in place, and the rig is level.
- A geophysical survey (electromagnetic or ground-penetrating radar) or a reliable site history must be obtained to verify absence of buried obstacles, tanks, or drums.
- A first aid kit and filled eyevash must be readily available.
- A fire extinguisher should be charged to the proper pressure and staged at rear of rig during drilling.
- The condition of ropes, chains, and cables must be checked.
- A lifeline or safety belt must be available if mast climbing is necessary.
- The Site Safety Plan (SSP) must be posted with emergency phone list and map of hospital route.
- A "super exclusion zone" must be established around the borehole, using a 4- by 6-foot sheet of plyvood. This defined area will be entered during active drilling only by the Driller, except in emergency situations.

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



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

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

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

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

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

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

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



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- Location and operation of kill switches, fire extinguisher, and first aid kit;
- Heat and cold stress hazards;
- "Super exclusion zone" around borehole; and
- Warnings to Subcontractors about hazards of climbing the mast without safety belt and other equipment.

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

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

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

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

## 4.2 RESPONSIBILITIES AND AUTHORITY OF OTHER E & E PERSONNEL

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

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

E 6 E personnel are forbidden from approaching augers during drilling. Activities at the borehole, such as sampling, require that equipment be stopped.



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# 5 GENERAL DRILLING SITE SAFETY CHECKLISTS

## 5.1 SAFETY CHECKLISTS FOR SPECIFIC TYPES OF DRILLING ACTIVITIES

### 5.1.1 General Drilling Site Safety Checklist

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



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

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

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

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

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

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

### 5.1.2 Rotary and Core Drilling

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

- Rotary drilling tools should be safety checked prior to drilling:

  - Rods and bit should be open and clear.

  - Vater swivels and hoisting plugs should be lubricated and checked for "frozen" bearings before use.

  - Drill rod chuck javs should be checked periodically and replaced vhen necessary.

  - The capacities of hoists and sheaves should be checked against the anticipated weight of the drill rod string, in addition to other expected hoisting loads.

  - All hoses to and from the pump should be checked for properly installed couplings: couplings should be secured with locking devices on "quick connect" fittings or wire on "Chicago-Style" couplings.



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

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

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

- Drill rods should not be braked while being lovered into the hole with chuck jaws.

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

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

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

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

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

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

### 5.1.3 Cathead Usage

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

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

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

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

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

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

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

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

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

- Position all other hoist lines to prevent contact with the operating cathead tope.

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

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

5.1.4 Continuous-Flight or Hollov-Stem Augers

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



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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

- Avoid sudden loading in cold weather.

- Never use frozen ropes.

- Protect wire rope from sharp corners or edges.

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

- Clutches and brakes on hoists should be periodically tested.

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

- Always vear gloves when handling wire rope.

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



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

## 6 REFERENCES

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

Diedrich D-50 Safety Manual.

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

Wire Rope Users Manual, American Iron and Steel Institute.



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

REVISED JANUARY 1990

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## 1 INTRODUCTION

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

## 2 SCOPE

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

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

## 3 OBJECTIVES

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

## 4 EFFECTS OF BEAT

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

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

Heat produced vithin the body is brought to the surface largely by the bloodstream and escapes to the cooler surroundings by conduction and radiation. If air movement such as a breeze strikes the body, additional heat is lost by convection. Hovever, when the temperature of the surrounding air becomes equal to or rises above that of the body, all of the heat must be lost by vaporization of the moisture (sveat) from the skin surface. As the air becomes more humid (contains mora moisture), vaporization from the skin slows down. Thus, on a day when the temperature is 95°F to 100°F, vith high humidity and little or no breeze, heat is retained within the body, It is on such a day or, more commonly, after 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.

## 4.1 BEAT CRAMPS

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

### 4.1.1 Symptoms

The symptoms of heat cramps include the folloving:

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

### 4.1.2 Emergency Care

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

## 4.2 HEAT EXHAUSTION

Heat exhaustion occurs in individuals vorking in hot environments and may be associated vith heat cramps. Heat exhaustion is caused by the pooling of blood in the vessels of the skin. The heat is



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

### 4.2.1 Symptoms

The symptoms of heat exhaustion are as follows:

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

### 4.2.2 Emergency Care

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

## 4.3 HEAT STROKE

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



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### 4.3.1 Symptoms

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

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

### 4.3.2 Emergency Care

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

## 5 PREVENTION OF HEAT STRESS

Please note that in the case of heat cramps or heat exhaustion, Gatorade or its equivalent is suggested as part of the treatment regime. The reason for this type of liquid refreshment is that such beverages will return much-needed electrolytes to the body's system. Without these electrolytes, body systems cannot function properly, and the represented health hazard will be increased. Therefore, vhen personnel are working in situations where the ambient temperatures and humidity are high, and especially in situations vhere levels A, B, and C of protective apparel are required, the SSO must follov the procedures listed belov:

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



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

## 5.1 GUIDELINES FOR USE OF PROTECTIVE CLOTHING

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

| Ambient Temperature (°F) | Maximum Wearing Time per Excursion (min) |
|---|---|
| Above 90 | 15 |
| 85 to 90 | 30 |
| 80 to 85 | .60 |
| 70 to 80 | 90 |
| 60 to 70 | 120 |
| 50 to 60 | 180 |

## 5.2 HEARTRATE HONITORING

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

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

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



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5.3 HONITORING PERSONNEL BODY TEHPERATURE AND BLOOD PRESSURE

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

5.4 HONITORING THE WORK AREA FOR HEAT STRESS CONDITIONS

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

## 6 DECONTAMINATION

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



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# MALLINCKRODT

## Material Safety Data Sheet

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

Emergency Telephone Number: 314-982-5000

# HYDROCHLORIC ACID, 37%

## PRODUCT IDENTIFICATION:

Synonyms: Muriatic acid

Formula CAS No.: 7647914

Molecular Weight: 36.46 (HCl)

Chemical Formula: HCl

Hazardous Ingredients: Hydrogen chloride

## IONARY SURES

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

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

## EMERGENCY/FIRST AID

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

**DOT Hazard Class:** Corrosive Material

## SECTION 1 Physical Data

Appearance: Clear, colorless fuming liquid.

Odor: Pungent odor of hydrogen chloride.

Solubility: Infinite in water with slight evolution of heat.

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

Melting Point: -74°C (-101°F)

Specific Gravity: 1.18

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

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

Evaporation Rate: No information found.

## SECTION 2 Fire and Explosion Information

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

**Explosion:**
Not considered to be an explosion hazard.

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

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

## SECTION 3 Reactivity Data

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

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

**Hazardous Polymerization:**
Will not occur.

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

E

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

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

Ensure compliance with local, state and federal regulations.

AD

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

## SECTION 5 Health Hazard Information

### A. EXPOSURE / HEALTH EFFECTS

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

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

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

Eye Contact:
Corrosive! Vapors arc irritating and may cause damage lo the eps. Splashes may cause severe burns and permanent eye damage

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

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

### B. FIRST AID

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

Ingestion:
DO NOT INDUCE VOMITING! Give large quantities of water or milk if available. Never give anything by mouth lo rn 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 muse. Get medical attention immediately.

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

### C. TOXICITY DATA (RTECS, 1986)

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

## SECTION 6 Occupational Control Measures

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

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

**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 worn.

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

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

## SECTION 7 Slo ial 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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## ISOPROPYL ALCOHOL

## PRODUCT IDENTIFICATION:

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

Formula CAS No.: 67-63-0

Molecular Weight: 60.10

Chemical Formula: $(CH_3)_2CHOH$

Hazardous Ingredients: Not applicable.

## PRECAUTIONARY MEASURES

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

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

## EMERGENCY/FIRST AID

If swallowed, give water to drink. Induce vomiting if medical help is not immediately available. Never give anything by mouth lo 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-DUAC = 1) 2.83

## SECTION 2 Fire and Explosion Information

Fire:
Flammable Liquid
Flashpoint: 12°C (53°F). (closed cup).
Autoignition temperature: 399°C (750°F).
Flammable limits in air, % by volume:
lel: 2.0; 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 loam. or carbon dioxide. Water spray may be used to keep fire exposed containers cool.

Special InCormation:
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 lo non-flammable mixtures. Vapors can flow along surfaces to distant ignition source and flash hack.

## SECTION 3 Reactivity Data

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

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

Hazardous Polymerization:
Will not occur.

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

## SECTION 4 Leak/Spill Disposal Information

Remove all sources of ignition. Ventilate area of leak or spill. Clean-up personnel require protective clothing and respiratory protection from vapors. Small spills may be absorbed on paper towels and evaporated in a fume hood. Allow enough time lor fumes to clear hood, then ignite paper in a suitable location away from combustible materials. Contain and recover liquid Cor 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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## ISOPROPYL ALCOHOL

### PRODUCT IDENTIFICATION:

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

Formula CAS No.: 67-63-0

Molecular Weight: 60.10

Chemical Formula: $(CH_3)_2$ CHOH

Hazardous Ingredients: Not applicable.

### PRECAUTIONARY MEASURES

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

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

### EMERGENCY/FIRST AID

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

SEE SECTIONS.

DOT Hazard Class: Flammable Liquid

recycle, and or incinerate

### 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:
lcl: 2.0; uel: 12.0.

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

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

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

### SECTION 3 Reactivity Data

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

Hazardous Decomposition Products:
Toxic gases and vapors such as carbon monoxide may be released it 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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## NITRIC ACID, 70%

## PRODUCT IDENTIFICATION;

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

Formula CAS No.: 7697-37-2

Molecular Weight: 63.00

Chemical Formula: $HNO_3$

Hazardous Ingredients: Not Applicable

## PRECAUTIONARY MEASURES

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

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

## EMERGENCY/FIRST AID

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

DOT Hazard Class: Oxidizer

## SECTION 1 Physical Data

Appearance: Clear, colorless to slightly yellow liquid.

Odor. Suffocating acrid.

Solubility: Infinite in water.

Boiling Point: 122°C (252°F)

Melting Point: -34°C (-29°F)

Specific Gravity: 1.41

Vapor Density (Air = 1) 2-3 approximately

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

Evaporation Rate: No information found.

## SECTION 2 Fire and Explosion Information

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

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

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

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

## SECTION 3 Reactivity Data

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

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

**Hazardous Polymerization:**
Will not occur.

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

## SECTION 4 Leak/Spill Disposal Information

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

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

Ensure compliance with local, state and federal regulations.

AD

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

## SECTION 5 Health Hazard Information

### A. EXPOSURE / HEALTH EFFECTS

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

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

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

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

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

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

### B. FIRST AID

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

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

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

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

### C. TOXICITY DATA (RTECS, 1982)

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

## SECTION 6 Occupational Control Measures

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

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

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

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

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

## SECTION 7 Storage and Special Information

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



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## SODIUM HYDROXIDE

### PRODUCT IDENTIFICATION:

**Synonyms:** Caustic soda; lye; sodium hydroxide solid; sodium hydrate

Formula CAS No.: **1310-73-2**

Molecular Weight: 40.00

Chemical Formula: NaOH

Hazardous Ingredients: None.

### ITIC MEASU

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

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

### FIR LA

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

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

### SECTION 1 Physical Data

Appearance: White, deliquescent pellets.

Odor: Odorless.

Solubility. **111 g/100 g of water.**

Boiling Point: 1390°C (2534°F)

Melting Point: 318°C (604°F)

Specific Gravity (water = 1): 2.13

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

Vapor Pressure (mm Hg): Negligible.

Evaporation Rate: No information found.

### SECTION 2 Fire and Explosion Information

**Flrt:**
Not considered to be a fire hwnl. Hot or molten material ern react violently with water.
G n react with certain metals, such as aluminium. to generate flammable hydrogen gas.

**Explosion:**
Not considered to be an explosion hazard.

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

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

### SECTION 3 Reactivity Data

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

**Hazardous Decomposition Products:**
Sodium oxide.

**Hazardous Polymerization:**
This substance does not polymerize.

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

### SECTION 4 Leak/Spill Disposal Information

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

Ensure compliance with local. state and federal regulations.

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

## SECTION 5 Health Hazard Information

### A. EXPOSURE / HEALTH EFFECTS

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

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

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

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

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

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

### B. FIRST AID

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

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

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

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

### C. TOXICITY DATA (RTECS, 1982)

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

## SECTION 6 Occupational Control Measures

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

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

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

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

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

## SECTION 7 Storage and Special Information

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

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## SULFURIC ACID *96%*

### PRODUCT IDENTIFICATION:

Synonyms: Oil of Vitriol

Formula **CAS** No.: *7664-93-9*

Molecular Weight: *98.07*

Chemical Formula: $H_2SO_4$

Hazardous Ingredients: Not applicable.

### PRECAUTIONARY MEASURES

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

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

### EMERGENCY/FIRST AID

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

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

Evaporation Rate: No information found.

### SECTION 2 Fire and Explosion Information

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

**Explosion:**
Not combustible, but substance is a strong oxidizer and its heat of reaction with reducing agents or combustibles may cause igirition.

**Fire Extinguishing Media:**
Dry 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:**
Toric fumes of oxides of sulfur. Will react with water or steam to produce toxic and corrosive fuma. Reacts with carbonates to generate carbon dioxide gas, and with cyanides and sulfides to form poisonous hydrogen cyanide and hydrogen sulfide respectively.

**Hazardous Polymerization:**
Will not occur.

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

### k II )I sal 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. Rush 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, pin, 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 mnuth to an unconscious person.

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

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

### C TOXICITY DATA (RTECS, 1982)

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

## SECTION 6 Occupational Control Measures

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

**Ventilation System:**
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source. preventing dispersion d i t 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. lah coal, apron or coveralls to prevent skin contact.

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

## SECTION 7 Storage and Special Information

Store in cool, dry. ventilated storage area with arid 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 arid to water; never add water to the acid.



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# HAZARD EVALUATION OF CHEMICALS

Chemical Name Arsenic  Date 3/26/92

DOT Name/U.N. No. 1558  Job No. UH8000

CAS Number 7784-42-1

References Consulted (circle):

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

*Toxic* and Hazardous Safety Manual  ACGIH  Other:

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

Chemical Proportioa: (Synonyms: Arsenia)

Chemical Formula As  Molecular Weight 74.9

Physical State Solid  Solubility (H2O) Insoluble  Boiling Point Sublimes

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

Specific Gravity 5.73  Odor Characteristic N/A  Flammable Limits Non

Incompatabilities STRONG OXIDIZERS, BROMINE AZIDE, HYDROGEN GAS

Biological Proportioa:

TLV-TWA 0.002 $mg/m^3$  PEL 0.010 mg/m3  Odor/Odor Threshold Odorless

IDLH 100 $mg/m^3$  Human  Aquatic  Rat/Mouse

Route of Exposure Inh, Abs, Ing, Con

Carcinogen Yes  Teratogen  Mutagen

Handling Recommendations: (Personal protective measures)

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

Monitoring Recommendations:

Continuoua Mini-Ram

Disposal/Waste Treatment:

Health Hazards and First Aid:

Eye: wash immediately; akin: wash immediately; Swallow: immediate nodical attention - irritation from exposure requires immediate medical attontion.

Symptoms: Acute: Headache, dizziness, nausea, vomiting, convulsions

Chronic: Coma



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# HAZARD EVALUATION OF CHEMICALS

Chemical Name: Chromium (hexavalent) Date: 3/23/92

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

CAS Number: 7440-47-3

References Consulted (circle):

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

Toxic and Hazardous Safety Manual  ACGIH  Other: SAX, Aldrich

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

Chemical Proportioa: (Synonyms: Chromic Oxide, soluble chromic salts)

Chemical Formula: Cr  Molecular Weight: 52

Physical State: solid  Solubility (H2O): insoluble  Boiling Point: 4788°F

Flash Point: N/A  vapor Pressure/Density: 0 mm  Freezing Point: 3452°F

Specific Gravity: 7.14  odor Charactoristic:  Flammable Limits:

Incompatabilities: Strong oxidizers

Biological Proportioa:

TLV-TWA: 0.5 mg/m$^3$  PEL: 1 mg/m$^3$  Odor/Odor Threshold:

IDLH: N/A  Human:  Aquatic:  Rat/Mouse:

Route of Exposure: Inhalation, Ingestion

Carcinogen:  Teratogen:  Mutagen:

Radiological Proportioa:

Handling Recommendations: (Personal protective measures)

APR: any detectable limit- SCBA. Wear gloves and booties. Prevent skin/eye contact.

Monitoring Recommendations:

Disposal/Waste Treatment:

Health Hazards and First Aid:

ING: give large amounts of water, induce vomiting, immediate medical attontion. INH: move to fresh air, CPR it necessary, immediate medical attontion. DER: Rinse with largo amount. of water.

Symptoms: Acute: Contact dermatitis; irritation of mucous membranes and upper respiratory tract, coughing, wheezing, headache, fever, nausea, vomiting.

Chronic: Carcinogen, liver and kidney damage, bronchitis, ulceration of akin, lung cancer.

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# HAZARD EVALUATION OF CHEMICALS

Chemical Name: Diesel Fuel  Date: 3/23/92

DOT Name/U.N. No.: 1993  Job No.: UH8000

CAS Number:

References Consulted (circle):

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

Toxic and Hazardous Safety Manual  ACGIH  Other:

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

Chemical Properties: (Synonyms: JP5, Jet Fuel, Diesel Oil, Fuel Oil #2)

Chemical Formula: CHx (mixture of hydrocarbons)  Molecular Weight: varies

Physical State: liquid  Solubility (H2O): unsoluble  Boiling Point: 340°F- 675°F

Flash Point: 100 F- 136 F  Vapor Pressure/Density: N/A  Freezing Point: N/A

Specific Gravity: 0.879  odor Charactoristic: 0.082 ppn  Flammable Limits:

Incompatabilities: Strong oxidizers

Biological Properties:

TLV-TWA: —  PEL: —  Odor/Odor Threshold: petroleum odor

IDLH: ---  Human:  Aquatic:  Rat/Mouse:

Route of Exposure: Inhalation, Ingostion, Dermal

Carcinogen: possible  Teratogen:  Mutagen:

Radiological Proportios:

Handling Recommendations: (Personal protective measures)

Impervious clothing, neoprene gloves and boots, APR at high concentrations

Monitoring Recommendations:

OVA or HNu with 10.2 eV probe.

Disposal/Waste Treatment:

Health Hazards and First Aid:

Wash skin upon contact: do not induce vomiting if ingested. Seek medical attontion.

Symptoms: Acute: vomiting, diarrhea, pulmonary edema

Chronic: pneumonia, respiratory paralysis. CNS depressant

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# HAZARD EVALUATION Or CHEMICALS

Chemical Name Ethylbenzene Date 3/23/92

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

CAS Number 100-41-4

References Consulted (circle):

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

Toxic and Hazardous Safety Manual Other:

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

Chemical Properties: (Synonyms: Ethylbonzol, Phenylethane)

Chemical Formula $CH_3CH_2C_6H_5$ Molecular Weight 106.2

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

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

Specific Gravity 0.87 Odor Characteristic 0.1 ppm Flammable Limits

Incompatabilities Strong oxidizers

Biological Properties:

TLV-TWA 100 ppm PEL 100 ppm Odor/Odor Threshold aromatic. oily

IDLH 2000 ppm Human Aquatic Rat/Mouse

Route of Exposure Inhalation, Ingestion

Carcinogen Teratogen Mutagen

Radiological Properties:

Handling Recommendations: (Personal protective measures)

Tyvek or saranex coveralls; APR in dusty/ windy condition8 or known high concentrations.

Monitoring Recommendations:

OVA or 10.2 ev probe on HNu.

Disposal/Waste Treatment:

Health Hazards and First Aid:

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

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

Chronic: skin rash, inflammation, dermatitis

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# HAZARD EVALUATION OF CHEMICALS

Chemical Name Gasoline Date 3/23/92

DOT Name/U.N. No. 1203 Job No. UH8000

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

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

Chemical Proportios: (Synonyms: Petrol, Motor spirits )

Chemical Formula CHx( Mixture of Hydrocarbons) Molecular Weight

Physical State liquid Solubility (H2O) insoluble Boiling Point 39°F- 204°F

Flash Point -50°F Vapor Pressure/Density Freezing Point N/A

Specific Gravity <1 odor Charactoristic 5 ppn Flammable Limits 1.3-6.0%

Incompatabilities Strong oxidizers

Biological Proportios:

TLV-TWA 300 ppm PEL 300 ppm Odor/Odor Threshold aromatic

IDLU Human Aquatic Rat/Mouse

Route of Exposure Inhalation, Ingostion, Dermal

Carcinogen X Toratogen Mutagen

Radiological Proportios:

Handling Recommendations: (Personal protoctivo measures)

Monitoring Recommendations:

Combustible gas/$O_2$ motor- lined filter to prevent leaded gasoline freom contaminating tho elements, and OVA/ HNu.

Disposal/Waste Treatment:

Health Hasards and First Aid:

INH: remove to fresh air, administer $O_2$ it needed. ING: seek nodical attontion.

Symptoms: Acute: dizziness, unconsciousnoss, hyperemia

Chronic: CNS depression, dermatitis

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# HAZARD EVALUATION OF CHEMICALS

Chomical Name: Load  Date: 3/23/92

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

CAS Number: 7439-92-1

References Consulted (circle):

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

Toxic and Hazardous Safety Manual  ACGIH  Other:

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

Chemical Proportios: (Synonyms: Plumbum)

Chemical Formula: Pb  Molecular Weight: 201.2

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

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

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

Incompatabilities: Strong oxidizers, hydrogon peroxide, acids

Biological Proportios:

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

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

Route of Exposure: Inhalation, Ingostion, Dermal

Carcinogon: ---  Teratogen: ---  Mutagen: ---

Radiological Proportios:

Handling Recommendations: (Personal protoctivo measures)

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

Monitoring Recommendations:

Disposal/Waste Treatment:

Health Hazards and First Aid:

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

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

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

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# HAZARD EVALUATION Or CHEMICALS

Chemical Name Methylene Chloride Date 3/23/92

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

CAS Number 75-09-2

References Consulted (circle):

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

Toxic and Hazardous Safety Manual ACGIH Other:

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

Chemical Properties: (Synonyms: Dichloromethane, Methylene Dichloride)

Chemical Formula $CH_2Cl_2$ Molecular Weight

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

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

Specific Gravity 1.33 Odor Characteristic Like chloroform Flammable Limits

Incompatabilities

Biological Properties:

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

IDLH 5,000 ppm Human Aquatic Rat/Mouse

Route of Exposure Oral, inh, ing, dorm

Carcinogen Human/animal Teratogen Mutagen Experimental

Radiological Proportios:

N/A

Handling Recommendations: (Personal protective measures)

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

Monitoring Recommendations:

OVA continuously

Disposal/Waste Treatment:

Health Hazards and First Aid:

Inh: move to fresh air, APR if necessary; Eye/skin: flush with water for 15 minutes, wash skin with soap/water; Ing: seek medical attontion

Symptoms: Acute: Mental confuaion, light-headedness, nausea/vomiting, headache, staggering, unconsciousness, irritation of eyes/resp/skin, skin burns

Chronic: Heart palpitations, malaise, death

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# HAZARD EVALUATION Or CHEMICALS

Chemical Name Phenol  Date 3/23/92

DOT Name/U.N. No. 1671  Job No. UH8000

CAS Number 108-95-2

References Consulted (circle):

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

Toxic and Hazardous Safety Manual  ACGIH  Other:

Chemical Properties: (Synonyms: Carbolic Acid, Phonic Acid, Phenyl Hydroxide)

Chemical Formula $C_6H_5OH$  Molecular Weight 94.11

Physical State Solid/Liquid  Solubility (H2O) 9%  Boiling Point 359°F

Flash Point 175°F  Vapor Pressure/Density 40 mm  Freezing Point

Specific Gravity 1.06  Odor Characteristic .OS ppm  Flammable Limits

Incompatabilities Strong oxidizers, calcium hypochloritm, aluminum chloride acid

Biological Properties:

TLV-TWA 5 ppm  PEL 5 ppm  Odor/Odor Threshold Sweet, pungent, aromatic

IDLH 250 ppm  Human  Aquatic  Rat/Mouse

Route of Exposure Inh, eye, derm, inq,

Carcinogen Suspect  Teratogen Experimental  Mutagen Experimental

Handling Recommendations: (Personal protective measures)

Apr: Dusty/windy condition or known high conentration of >1 but <5 ppm; SCBA >5 ppm Tyvek and gloves (Neoprene - 10 hours, Butyl - 8 hours)

Monitoring Recommendations:

Disposal/Waste Troatmont:

Health Hazards and First Aid:

Inh: move to fresh air, APR if necessary; Eye/skin: flush with wator for 15 minutes/wash skin with soap and water; Ing: do not induce vomiting; instead, give milk, egg white, or wator, and seek medical attention.

symptom.: Acute: Vomiting, difficulty swallowing, diarrhea, loss of appetite, headache, fainting, dizziness, dark urine, skin rash/whitening of color

Chronic: Liver or kidney damage, eye damage/blindness, circulatory collapse, paralysis, convulsions, coma



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# HAZARD EVALUATION OF CHEMICALS

Chemical Name Toluene  Date 3/23/92

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

CAS Number 108-88-3

References Consulted (circle):

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

Toxic and Hazardous Safety Manual  ACGIH  Other:

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

Chemical Properties: (Synonyms: Methyl benzene, Toluol, Phenyl methane)

Chemical Formula $C_7H_8$  Molecular Weight 92

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

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

Specific Gravity 0.8669  Odor Characteristic 0.2ppm  Flammable Limits 1.32 - 7.12

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

Biological Properties:

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

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

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

Carcinogen Experimental  Teratogen Experimental  Mutagen Experimental

Radiological Properties:

Handling Recommendations: (Personal protective measures)

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

Monitoring Recommendations:

Disposal/Waste Treatment:

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

Health Hazards and First Aid:

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

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

Chronic: Bone marrow, depression, defatting of skin, dermatitis, kidney and/or liver damage if ingested

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# HAZARD EVALUATION OF CHEMICALS

Chemical Name Xylene Date 3/23/92

DOT Name/U.N. no. 1307 Job lo. UH8000

CAS Number 1330-73-8

References Consulted (circle):

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

Toxic and Hazardous Safety Manual ACGIH Other:

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

Chemical Properties: (Synonyms: Dimethylbenzene, Xylol)

Chemical Formula $C_8H_{10}$ Molecular Weight 106

Physical State Colorless Liquid solubility (H2O) Boiling Point 292°F

Flash Point 77°F Vapor Pressure/Density 3.7 Freezing Point -12°F

Specific Gravity 0.86 Odor Characteristic 0.5 ppm Flammable Limits 1.0% - 7.0%

Incompatabilities Strong oxidizers, strong acid, heat, peroxide

Biological Properties:

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

IDLH 1,000 ppm Human IHL TCL 0-200 ppm Aquatic Rat/Mouse IHL $LD_{50}$ - 500 ppm/4HC

Route of Exposure Inhale, akin

Carcinogen Experimental Teratogen Mutagen

Radiological Properties:

Handling Recommendations: (Personal protective measures)

Impervious clothing, PVC gloves, faceshield, avoid prolonged contact. Respirator w/organic vapor cartridge up to 5,000 ppm: >10,000 ppm use SCBA

Monitoring Recommendations:

Disposal/Waste Treatment:

OSHA standard 29 CFR 1910. 106 applies

Health Hazards and First Aid:

Skin - wash w/soap and water: eyes - flush w/water; remove to fresh air if overcome

symptoms: Acute: Eye and mucous membrane irritant, CNS depressant, ingestion causes gastrointestinal upset

Chronic: More severe than above, hyperplasia of bono marrow

# APPENDIX B

## SITE-SPECIFIC QUALITY ASSURANCE PROJECT PIAN



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

Section 1.0 -- Title Page

Vork Plan Group: K
Site No.: 7
Site Name: Firefighting School

Prepared by: Dan Foss
Ecology and Environment, Inc.
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Prepared for: Department of the Navy
Southern Division
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Contract Number N62467-88-C-0200

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E & E ASC Director: _____
A. Clifton

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

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Section 3.0 -- Project Summary

Work Plan Group: K

Site No. : 7

Site Name: Firefighting School

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 OVA Surface Emission Survey
- ___ Radiation Survey
- X Habitat/Biota Survey
- X Hydrologic Assessment

Geophysical Survey (check all that apply):

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

Analytical Screening (check all that apply):

- ___ Field Analyses
- X Soil Headspace Analyses: Planned number of samples 110
- ___ Soil Gas Analyses
- X Laboratory Analyses:

| PLANNED NUMBER OF SAMPLES | |
|---|---|
| Surface Water | ___ |
| Sediment | ___ |
| Soil | 39 |
| Soil Gas | ___ |
| Groundwater | 3 |
| Duplicates | 3 |
| Soil Gas Duplicates | ___ |
| Trip Blanks | ___ |
| Field Blanks | |
| Preservative Blanks | ___ |

Rinsate Blanks ___

CATEGORIES OF ANALYSES

___ Purgeable Aromatics
___ Purgeable Halocarbons
___ Base/Neutral Extractables
___ Acid Extractables
_X_ Volatile Organic Compounds
_X_ Polynuclear Aromatic Hydrocarbons
_X_ Phenols
___ Dioxins
___ Organophosphorus Pesticides
___ Herbicides
_X_ Pesticides
_X_ Polychlorinated Biphenyls
_X_ Total Recoverable Petroleum Hydrocarbons
_X_ Metals
___ Cyanide

Phase 11--Characterization

**PLANNED NUMBER OF SAMPLES**

| | |
|---|---|
| Surface water | ___ |
| Sediment | ___ |
| Soil | 20 |
| Soil Gas | ___ |
| Groundwater | 5 |
| Duplicates | 3 |
| Soil Gas Duplicates | ___ |
| Trip Blanks | 2 |
| Field Blanks | 1 |
| Preservative Blanks | 1 |
| Rinsate Blanks | 2 |

## CATEGORIES OF ANALYSES

___ Purgeable Aromatics
___ Purgeable Halocarbons
_X_ Base/Neutral Extractables
_X_ Acid Extractables
_X_ Volatile Organic Compounds
___ Polynuclear Aromatic Hydrocarbons
___ Phenols
___ Dioxins
___ Organophosphorus Pesticides
___ Herbicides

X Pesticides
_X_ Polychlorinated Biphenyls
_X_ Total Recoverable Petroleum Hydrocarbons
_X_ Metals
_X_ Cyanide

Additional analytical categories are identified below:

_X_ Gross Alpha
_X_ Gross Beta
_X_ Gamma Scan
_X_ Total Organic Carbon
_X_ Grain Size
_X_ Alkalinity
_X_ Total Suspended Solids (water only)
_X_ Total Kjeldahl Nitrogen
_X_ Ammonia Nitrogen
_X_ Orthophosphate Phosphorus
_X_ Dissolved Oxygen (in field)
_X_ 5-day Biological Oxygen Demand
_X_ Chemical Oxygen Demand

_X_ pH
_X_ Percent Moisture
_X_ Hardness (water only)
_X_ BTU Content
_X_ Ash Content
_X_ Total Organic Halogens
_X_ Sulfur
_X_ Ignitability
_X_ Cation Exchange Capacity
___ Sulfide

Section 4.0 -- Project Organization and Responsibility

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

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

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

Section 5.0 -- QA/QC Objectives for Measurement Data

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

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

| Analyte | Media | Method No. | A | P | C | DL |
|---|---|---|---|---|---|---|
| *<br>**aboratory** 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 Petroleum Hydrocarbons | S/W | EPA 418.1 | N/M | N/M | N/M | TBD |
| Phenols | S/W | -- | N/M | N/M | N/M | N/M |
| Arsenic | S/W | -- | N/M | N/M | N/M | N/M |
| Cadmium | S/W | -- | N/M | N/M | N/M | N/M |
| Chromium | S/W | -- | N/M | N/M | N/M | N/M |
| Copper | S/W | -- | N/M | N/M | N/M | N/M |
| Lead | S/W | -- | N/M | N/M | N/M | N/M |
| Nickel | S/W | -- | N/M | N/M | N/M | N/M |
| Silver | S/W | -- | N/M | N/M | N/M | N/M |
| Zinc | S/W | -- | N/M | N/M | N/M | N/M |
| **Laboratory Analyses** | | | | | | |
| Gross Alpha | S/W | EPA 900 | N/M | N/M | N/M | N/M |
| Gross Beta | S/W | EPA 900 | TBD | TBD | TBD | TBD |
| Gamma Scan | S/W | EPA 901.1 | TBD | TBD | TBD | TBD |
| TCL Purgeables + xylene | S/W | EPA 8240/624 | N/M | N/M | N/M | N/M |
| TCL BNAs | S/W | EPA 8270/625 | N/M | N/M | N/M | N/M |
| TCL Pesticides 6 PCBs | S/W | EPA 8080/608 | N/M | N/M | N/M | N/M |
| Total Recoverable Petroleum Hydrocarbons | S/W | EPA 418.1 | N/M | N/M | N/M | N/M |
| TAL Metals: | | | | | | |
| Aluminum | S/W | EPA 6010 | N/M | N/M | N/M | N/M |
| Antimony | S/W | EPA 6010 | N/M | N/M | N/M | N/M |
| Arsenic | S/W | EPA 7060 | N/M | N/M | N/M | N/M |
| Barium | S/W | EPA 6010 | N/M | N/M | N/M | N/M |
| Beryllium | S/W | EPA 6010 | N/M | N/M | N/M | N/M |
| Boron | S/W | EPA 6010 | N/M | N/M | N/M | N/M |
| Cadmium | S/W | EPA 6010 | N/M | N/M | N/M | N/M |
| Calcium | S/W | EPA 6010 | N/M | N/M | N/M | N/M |
| Chromium | S/W | EPA 6010 | N/M | N/M | N/M | N/M |

| Analyte | Hedia | Hethod No. | A | P | C | DL |
|---|---|---|---|---|---|---|
| Cobalt | S/W | EPA 6010 | N/M | N/M | N/M | N/M |
| Copper | S/W | EPA 6010 | N/M | N/M | N/M | N/M |
| Iron | S/W | EPA 6010 | N/M | N/M | N/M | N/M |
| Lead | S/W | EPA 7421 | N/M | N/M | N/M | N/M |
| Magnesium | S/W | EPA 6010 | N/M | N/M | N/M | N/M |
| Manganese | S/W | EPA 6010 | N/M | N/M | N/M | N/M |
| Mercury | S/W | EPA 747117470 | N/M | N/M | N/M | N/M |
| Nickel | S/W | EPA 6010 | N/M | N/M | N/M | N/M |
| Selenium | S/W | EPA 7740 | N/M | N/M | N/M | N/M |
| Silver | S/W | EPA 6010 | N/M | N/M | N/M | N/M |
| Sodium | S/W | EPA 6010 | N/M | N/M | N/M | N/M |
| Thallium | S/W | EPA 7841 | N/M | N/M | N/M | N/M |
| Tin | S/W | EPA 282.2 | N/M | N/M | N/M | N/M |
| Vanadium | S/W | EPA 6010 | N/M | N/M | N/M | N/M |
| Zinc | S/W | EPA 6010 | N/M | N/M | N/M | N/M |
| Cyanide | S/W | EPA 90101335.2 | N/M | N/M | N/M | N/M |
| TOC | S/W | EPA 415.1 | N/M | N/M | N/M | N/M |
| Hardness | W | EPA 130.2 | N/M | N/M | N/M | N/M |
| Alkalinity | W | EPA 310.1 | N/M | N/M | N/M | N/M |
| Total Suspended Solids | W | EPA 160.2 | N/M | N/M | N/M | N/M |
| Total Kjeldahl Nitrogen | S/W | EPA 351.3 | N/M | N/M | N/M | N/M |
| Nitrogen-Ammonia | S/W | EPA 350.2 | N/M | N/M | N/M | N/M |
| Orthophosphate Phosphorus | S/W | EPA 365.2 | N/M | N/M | N/M | N/M |
| 5-day Biological Oxygen Demand | W | SM 507 | N/M | N/M | N/M | N/M |
| Chemical Oxygen Demand | W | EPA 410.4 | N/M | N/M | N/M | N/M |
| pH | W | EPA 150.1 | N/M | N/M | N/M | N/M |
| Percent Moisture | S | ASTM D-2216-80 | N/M | N/M | N/M | N/M |
| Grain Size | S | ASTM D-422-63 | N/M | N/M | N/M | N/M |
| BTU Content | S | ASTM D-2015-77 | N/M | N/M | N/M | N/M |
| Ash Content | S | ASTM D-482 | N/M | N/M | N/M | N/M |
| Total Organic Halogens | S | ASTM D-808-81 | TBD | TBD | TBD | TBD |
| | | EPA 325.3 | TBD | TBD | TBD | TBD |
| Sulfur | S | ASTM D-129-64 | N/M | N/M | N/M | N/M |
| Ignitability | S/W | EPA 1010 | N/M | N/M | N/M | N/M |
| Cation Exchange Capacity | S | EPA 9081 | 75-125 | 35 | 95% | 100mg/kg |

| Analyte | Media | Method No. | A | P | C | DL |
|---|---|---|---|---|---|---|
| Field Parameters | | | | | | |
| pH | U | 150.1 | N/M | N/M | N/M | N/M |
| Specific Conductance | U | 120.1 | N/M | N/M | N/M | N/M |
| Temperature | W | 170.1 | N/M | N/M | N/M | N/M |
| Dissolved Oxygen | W | EPA 360.1 | N/M | N/M | N/M | N/M |

Notes: S = Soil and/or sediment
W = Groundwater and/or surface water
N/M = No modifications from GQAPP
TBD = To be determined.

*With the exception of total recoverable petroleum hydrocarbons, the laboratory screening analyses do not have EPA method numbers.

## 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. Modifications to these procedures are described below:

No Modifications

Section 12.0 -- Performance and System Audits

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

| Audit Type | Frequency/Date | Description |
|---|---|---|
| | To Be Determined | |

Section 13.0 -- Preventive Haintenance

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

No Modifications

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

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

No Modifications

Section 15.0 -- Corrective Action

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

No Modifications

Section 16.0 -- Quality Assurance Reports to Management

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

No Modifications

Appendix A -- Additional Personnel Biographies

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

To Be Determined

## Section 1.0 -- Title Page

Work Plan Group: K
Site No.: 21
Site Name: Sludge At Fuel Tanks Area

Prepared by : Dan Foss
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Prepared for : Department of the Navy
Southern Division
Naval Facilities Engineering Command
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Charleston, South Carolina 29411-0068
Contract Number N62467-88-C-0200

Signature Approvals:

E & E Project Manager: _____
J. Barksdale

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

E & E ASC Director: _____
A. Clifton

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

Section 2.0 Table of Contents


| | | Page | Date |
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| Section 9.0 | Analytical Procedures | 9 | 3/23/92 |
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Section 3.0 -- Project Summary

Work Plan Group: K

Site No.: 21

Site Name: Sludge at Fuel Tanks Area

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

Phase I--Field Screening

Physical Survey (check all that apply):

X Overall Physical Reconnaissance
X OVA Surface Emission Survey
___ Radiation Survey
X Habitat/Biota Survey
X Hydrologic Assessment

Geophysical Survey (check all that apply):

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

Analytical Screening (check all that apply):

___ Field Analyses
X Soil Headspace Analyses: Planned number of samples 100
___ Soil Gas Analyses
X Laboratory Analyses:

PLANNED NUMBER OF SAMPLES

| | |
|---|---|
| Surface Water | ___ |
| Sediment | ___ |
| Soil | 37 |
| Soil Gas | ___ |
| Groundwater | 11 |
| Duplicates | 3 |
| Soil Gas Duplicates | ___ |
| Trip Blanks | ___ |
| Field Blanks | ___ |
| Preservative Blanks | ___ |

Rinsate Blanks ___

CATEGORIES OF ANALYSES

___ Purgeable Aromatics
___ Purgeable Halocarbons
___ Base/Neutral Extractables
___ Acid Extractables
X Volatile Organic Compounds
X Polynuclear Aromatic Hydrocarbons
X Phenols
___ Dioxins
___ Organophosphorus Pesticides
___ Herbicides

X Pesticides
X Polychlorinated Biphenyls
X Total Recoverable Petroleum Hydrocarbons
X Metals
___ Cyanide

Phase 11--Characterization

PLANNED NUMBER OF SAMPLES

| | |
|---|---|
| Surface Water | 3 |
| Sediment | 3 |
| Soil | 81 |
| Soil Gas | |
| Groundwater | 21 |
| Duplicates | 12 |
| Soil Gas Duplicates | ___ |
| Trip Blanks | 8 |
| Field Blanks | 1 |
| Preservative Blanks | 1 |
| Rinsate Blanks | 8 |

## CATEGORIES OF ANALYSES

___ Purgeable Aromatics
___ Purgeable Halocarbons
X Base/Neutral Extractables
X Acid Extractables
X Volatile Organic Compounds
___ Polynuclear Aromatic Hydrocarbons
___ Phenols
___ Dioxins
___ Organophosphorus Pesticides
___ Herbicides

X Pesticides
X Polychlorinated Biphenyls
X Total Recoverable Petroleum Hydrocarbons

X Metals
X Cyanide

Additional analytical categories are identified below:

X Gross Alpha
X Gross Beta
X Gamma Scan
X Total Organic Carbon
X Grain Size
X Alkalinity
X Total Suspended Solids (water only)
X Total Kjeldahl Nitrogen
X Ammonia Nitrogen
X Orthophosphate Phosphorus
X Dissolved Oxygen (in field)
X 5-day Biological Oxygen Demand
X Chemical Oxygen Demand

X pH
X Percent Moisture
X Hardness (water only)
X BTU Content
X Ash Content
X Total Organic Halogens
X Sulfur

X Ignitability
X Cation Exchange Capacity
___ Sulfide

Section 4.0 -- Project Organization and Responsibility

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

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

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

Section 5.0 -- QA/QC Objectives for Measurement Data

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

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

| Analyte | Media | Xethod 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 Petroleum Hydrocarbons | S/W | EPA 418.1 | N/M | N/M | N/M | TBD |
| Phenols | S/W | -- | N/M | N/M | N/M | N/M |
| Arsenic | S/W | -- | N/M | N/M | N/M | N/M |
| Cadmium | S/W | -- | N/M | N/M | N/M | N/M |
| Chromium | S/W | -- | N/M | N/M | N/M | N/M |
| Copper | S/W | -- | N/M | N/M | N/M | N/M |
| Lead | S/W | -- | N/M | N/M | N/M | N/M |
| Nickel | S/W | -- | N/M | N/M | N/M | N/M |
| Silver | S/W | -- | N/M | N/M | N/M | N/M |
| Zinc | S/W | -- | N/M | N/M | N/M | N/M |
| **Laboratory Analyses** | | | | | | |
| Gross Alpha | S/W | EPA 900 | N/M | N/M | N/M | N/M |
| Gross Beta | S/W | EPA 900 | TBD | TBD | TBD | TBD |
| Gamma Scan | S/W | EPA 901.1 | TBD | TBD | TBD | TBD |
| TCL Purgeables + xylene | S/W | EPA 8240/624 | N/M | N/M | N/M | N/M |
| TCL BNAs | S/W | EPA 8270/625 | N/M | N/M | N/M | N/M |
| TCL Pesticides & PCBs | S/W | EPA 8080/608 | N/M | N/M | N/M | N/M |
| Total Recoverable Petroleum Hydrocarbons | S/W | EPA 418.1 | N/M | N/M | N/M | N/M |
| TAL Metals: | | | | | | |
| Aluminum | S/W | EPA 6010 | N/M | N/M | N/M | N/M |
| Antimony | S/W | EPA 6010 | N/M | N/M | N/M | N/M |
| Arsenic | S/W | EPA 7060 | N/M | N/M | N/M | N/M |
| Barium | S/W | EPA 6010 | N/M | N/M | N/M | N/M |
| Beryllium | S/W | EPA 6010 | N/M | N/M | N/M | N/M |
| Boron | S/W | EPA 6010 | N/M | N/M | N/M | N/M |
| Cadmium | S/W | EPA 6010 | N/M | N/M | N/M | N/M |
| Calcium | S/W | EPA 6010 | N/M | N/M | N/M | N/M |
| Chromium | S/W | EPA 6010 | N/M | N/M | N/M | N/M |

| Analyte | Media | Method No. | A | P | C | DL |
|---|---|---|---|---|---|---|
| Cobalt | S/W | EPA 6010 | N/M | N/M | N/M | N/M |
| Copper | S/W | EPA 6010 | N/M | N/M | N/M | N/M |
| Iron | S/W | EPA 6010 | N/M | N/M | N/M | N/M |
| Lead | S/W | EPA 7421 | N/M | N/M | N/H | N/M |
| Hagnesium | S/W | EPA 6010 | N/M | N/H | N/H | N/M |
| Hanganese | S/W | EPA 6010 | N/M | N/M | N/H | N/M |
| Hercury | S/W | EPA 7471/7470 | N/M | N/M | N/M | N/M |
| Nickel | S/W | EPA 6010 | N/M | N/M | N/M | N/M |
| Selenium | S/W | EPA 7740 | N/M | N/M | N/M | N/M |
| Silver | S/W | EPA 6010 | N/M | N/M | N/M | N/M |
| Sodium | S/W | EPA 6010 | N/M | N/M | N/M | N/M |
| Thallium | S/W | EPA 7841 | N/M | N/M | N/M | N/M |
| Tin | S/W | EPA 282.2 | N/M | N/M | N/M | N/M |
| Vanadium | S/W | EPA 6010 | N/M | N/M | N/M | N/M |
| Zinc | S/W | EPA 6010 | N/M | N/M | N/M | N/M |
| Cyanide | S/W | EPA 90101335.2 | N/M | N/M | N/M | N/M |
| TOC | S/W | EPA 415.1 | N/M | N/M | N/M | N/M |
| Hardness | W | EPA 130.2 | N/M | N/M | N/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/M | N/H |
| Total Kjeldahl Nitrogen | S/W | EPA 351.3 | N/M | N/M | N/M | N/M |
| Nitrogen-Ammonia | S/W | EPA 350.2 | N/M | N/M | N/M | N/M |
| Orthophosphate Phosphorus | S/W | EPA 365.2 | N/M | N/M | N/M | N/H |
| 5-day Biological Oxygen Demand | W | SM 507 | N/M | N/M | N/M | N/M |
| Chemical Oxygen Demand | W | EPA 410.4 | N/M | N/M | N/M | N/M |
| pH | W | EPA 150.1 | N/M | N/M | N/M | N/M |
| Percent Moisture | S | ASTM D-2216-80 | N/M | N/M | N/M | N/M |
| Grain Size | S | ASTM D-422-63 | N/M | N/M | N/M | N/M |
| BTU Content | S | ASTM D-2015-77 | N/M | N/M | N/M | N/M |
| Ash Content | S | ASTM D-482 | N/M | N/M | N/M | N/M |
| Total Organic Halogens | S | ASTM D-808-81 | TBD | TBD | TBD | TBD |
| | | EPA 325.3 | TBD | TBD | TBD | TBD |
| Sulfur | S | ASTM D-129-64 | N/M | N/M | N/M | N/M |
| Ignitability | S/W | EPA 1010 | N/M | N/M | N/M | N/M |
| Cation Exchange Capacity | S | EPA 9081 | 75-125 | 35 | 95% | 100mg/kg |

| Analyte | Hedia | Hethod No. | A | P | C | DL |
|---|---|---|---|---|---|---|
| Field Parameters | | | | | | |
| pH | W | 150.1 | N/M | N/M | N/M | N/M |
| Specific Conductance | W | 120.1 | N/M | N/M | N/M | N/M |
| Temperature | W | 170.1 | N/M | N/M | N/M | N/M |
| Dissolved Oxygen | W | EPA 360.1 | N/M | N/M | N/M | N/M |

Notes: S = Soil and/or sediment
W = Groundwater and/or surface water
N/M = No modifications from GQAPP
TBD = To be determined.

*With the exception of total recoverable petroleum hydrocarbons, the laboratory screening analyses do not have EPA method numbers.

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. Modifications to these procedures are described below:

No Modifications

Section 12.0 -- Performance and System Audits

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

| Audit Type | Frequency/Date | Description |
|---|---|---|
| | To Be Determined | |

Section 13.0 -- Preventive Maintenance

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

No Modifications

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

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

No Modifications

Section 15.0 -- Corrective Action

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

No Modifications

Section 16.0 -- Quality Assurance Reports to Management

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

No Modifications

Appendix A -- Additional Personnel Biographies

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

To Be Determined

# APPENDIX C

## THREATENED AND ENDANGERED FLORA AND FAUNA ASSOCIATED WITH NAS PENSACOLA



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

## APPENDIX C

## THREATENED AND ENDANGERED FLORA AND FAUNA OBSERVED OR LIKELY TO OCCUR WITHIN THE NAS PENSACOLA FACILITY OR NEARBY

| Scientific Name | Common Name | Base * Status | Status FGFWFC(or FDA) | Status USFWS | Habitat |
|---|---|---|---|---|---|
| FISHES | | | | | |
| Acipenser oxyrhynchus | Atlantic sturgoon | M | SSC | UR 2 | Gulf coast, estuarine |
| Ammocrypta asprella | Crystal darter | U | T | UR 2 | Fresh wator |
| Etheostoma histrio | Harelquin darter | U | SSC | | Fresh wator |
| Fundulus jenkinsi | Salt marsh topminnow | P | SSC | | Salt, fresh, brackish waters |
| Lepisosteus spatula | Alligator gar | U | SSC | | Brackish, fresh, salt water |
| Moxostoma carinatum | River redhorse | U | SSC | | Fresh wator |
| AMPHIBIANS AND REPTILES | | | | | |
| Alligator mississippiensis | American Alligator | R | SSC | T(S/A) | Swamps, marshes, ponds |
| ~~Caretta~~ ~~caretta~~ ~~carotta~~ | Loggerhead turtlo | M ? | T | T | Marina, coastal |
| Chelonia mydas mydas | Green turtlo | M ? | E | E | Harino, coastal |
| Dermochelys coriacea | Leatherback turtlo | M | E | E | Marine, coastal |
| Drymarchon corais couperi | Eastern indigo snake | P | T | T | Open areas near water |
| Eretmochelys imbricata | Hawksbill turtlo | M ? | E | E | Marine, coastal |
| Gopherus polyphemus | Gopher tortoise | P | SSC | UR 1 | Sandy coastal plains |
| Gcaptemys pu1chra | Alabama map turtlo | U | SSC | | Swamps, streams, marshes, ponds |
| Lepidochelys kempi | Atlantic ridley | M ? | E | E | Harino, coastal |
| Rana areolata aesopus | Florida gopher frog | P | SSC | UR 2 | Sand hill communities |
| Macroc1emys temmincki | Alliqator snapping turtle | SR | SSC | UR 2 | Swamps. marshes, ponds |
| MAMMALS | | | | | |
| Mustela vison lutensis | Florida mink | U | | UR 2 | Terrestrial habitats |
| Peromyscus polionotus trissyllepsis | Perdido Kay beach mouse | N/A | T | E | Beach dunes |
| Trichochur manatus latirostris | West Indian manatee | M | E | E | Atlantic and Gulf coasts |
| Ursus americanus floridanus | Florida black boar | N/A | T | UR 2 | Titi swamps |

Appendix C (Cont).

| scientific Name | Common Name | Base * status | status FGFWFC(or FDA) | USFWS | Habitat |
|---|---|---|---|---|---|
| BIRDS | | | | | |
| Charadrius melodus | Piping Plover | P | T | T | Open dry, sandy beaches |
| Charadrius alexandrinus | Snowy plover | P | T | UR 2 | Open dry, sandy beaches |
| Dendroida dominica stoddardi | Stoddard's yellow-throated warbler | P-u | | UR 2 | Wooded habitats |
| Dendroica kirtlandii | Kirtland's warbler | U | E | E | Wooded habitats |
| Haematopus palliatus | American oystercatcher | U | SSC | | Coastal habitats |
| Egretta rufescens | Reddish egret | P-u | SSC | UR 2 | Freshwater/coastal wetlands |
| Egretta caerulea | Little blue heron | P-u | SSC | | Freshwater/coastal wetlands |
| Egretta thula | Snowy egret | P-u | SSC | | Freshwater/coastal 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 leucoccphalus | Bald eagle | P-u | T | E | Pine forests/coastal habitat |
| Pandion haliaetus | osprey | R | SSC | | Near water |
| Pclecanus occidentalis | Brown pelican | R | SSC | AC | flangrove trees, coasts |
| Picoides borealis | Red-cockaded woodpecker | P-u | T | E | Cavity nests/old pine stands |
| Vermivora bachmanii | Bachmann's warbler | U | E | E | Woodod habitats |
| Canpephilus principalis | Ivory-billed woodpecker | U | E | E | Wooded habitats |
| Sterna antillarum | Least torn | U | T | | Coastal habitats |
| Mycteria americana | Wood stork | U | E | E | Freshwater/coastal wetlands |
| Rostrhaaus 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 | statu. FGFWFC(or FDA) | USFWS | Habitat |
|---|---|---|---|---|---|
| PLANTS | | | | | |
| Chrysopsis gossypina cruiseana | Cruise's golden-aster | P | E | UR 1 | Coastal dunes |
| Drosera intermedia | Spoon-leaved sundew | R | T | | Aquatic habitats |
| Epigaea repens | Trailing arbutus | U | E | | Dry, acid, sandy soil |
| Kalmia latifolia | Hountain laurel | U | T | | Rich, moist, shady woods |
| Lilaeopsis carolinensis | Carolina lilaeopsis | R | | UR 2 | |
| Lilium iridollae | Panhandle lily | U | E | UR 2 | Black, mucky soils |
| Pinguicula planifolia | Chapman's butterwort | U | RE | UR 2 | |
| Polygonella macrophy11a | Larqe-leaved jointweed | R | T | UR 1 | Sand pine-oak scrub |
| Rhododendron austrinum | Orange azalea | U | E | UR 5 | Hoist, woody habitats |
| Sarracenia leucophylla | White-top pitcherplant | R | E | | Open acid bogs |
| Sarracenia rubra | sweet pitcherplant | U | E | UR 2 | Acid bogs/slash pine woods |
| Stewartia malacodnedron | Silky camellia | U | E | | Slopes of wooded ravines |

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

Appendix C (Cont.)

| | | |
|---|---|---|
| Base * | = | Status of species on tho NAS Pensacola facility. |
| R | = | Roridont. |
| M | = | Migrant. |
| SR | = | Suspected rosidont. |
| P | = | Possible resident duo to available habitat; survey roquirod. |
| U | = | Unknown, survey required. |
| N/A | = | Not expected to occur on tho NAS Pensacola facility. |

[APPENDIX D

**JUNE 1990** SECTION **14.2--CHARACTERIZATION]**



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

## 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;

Phase II characterization will consist of limited soil sampling, and the installation, development, and sampling of shallow monitoring wells. In addition, limited aquifer testing will be performed. This phase of the investigation is intended to characterize the concentrations of individual contaminant constituents within the most highly contaminated areas, as determined from the Phase I results.

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

During the Phase II investigation of Site 21, which is covered by RCRA requirements, at least one sample per contaminated medium will also be analyzed for Appendix IX parameters (40 CFR, Part 264). These samples will be collected from the area of highest 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.



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

TABLE 14-2

**PHASE II SAMPLING AND ANALYTICAL REQUIREMENTS—GROUP K**

SITE 7

| Medium | No. of Samples | Dupli-catos | Trip Blanks[a] | Field Blanks | Rinsate Blanks | [Preservative Blanks[b]] | Total[•] | Analytical suit.[c,d] |
|---|---|---|---|---|---|---|---|---|
| soil | 30 | 3 | 2 | [1] | 2 | [1] | 39 (10) | A C |
| Groundwator | 3 | 1 | 1 | [NR] | 1 | [NR] | [6] (2) | A B |
| TOTAL | 33 | 4 | 3 | [1] | 3 | [1] | [45](12) | |

SITE 20

| Medium | lo. of Samples | Dupli-catos | Trip Blanks[a] | Field Blanks | Rinsate Blanks | [Preservative Blanks[b]] | Total[•] | Analytical suit.[c,d] |
|---|---|---|---|---|---|---|---|---|
| soil | 15 | 2 | [1] | [1] | [1] | [1] | [21] (6) | A C |
| Groundwater | 3 | 1 | [1] | [NR] | [1] | [NR] | [6] (2) | A B |
| TOTAL | 18 | 3 | [2] | [1] | [2] | [1] | [27](8) | |

SITE 21

| Medium | No. of Samples | Dupli-catos | Trip Blanks[a] | Field Blanks | Rinsate Blanks | [Preservative Blanks[b]] | Total[•] | Analytical suit.[c,d] |
|---|---|---|---|---|---|---|---|---|
| soil | 27 | 3 | [2] | [1] | [2] | 111 | [36] (6) | A C |
| Groundwator | 9 | 1 | [1] | [NR] | [1] | [NR] | [12] [(2)] | A B |
| TOTAL | 36 | 4 | [3] | [1] | [3] | [1] | [48(8)] | |

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

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

[c]Analytical suit. dosignations 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. total organic carbon. hardness (water only), and alkalinity (water only).

B = total suspended solids, total Kjoldahl nitrogen, ammonia nitrogen, 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 conrtituonts encompassed by the various chemical groups included within the above-listed analytical suites are identified in Tables 9-5 through 9-13 of tho Generic Quality Assurance Project Plan.

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

[Sa = lot required.]

### 14.2.2 Soil Sampling

Soil samples will be collected as part of the shallow monitoring well installation (described below in Section 4.2.2), and from shallow soil borings at each of sites 7, 20 and 21.

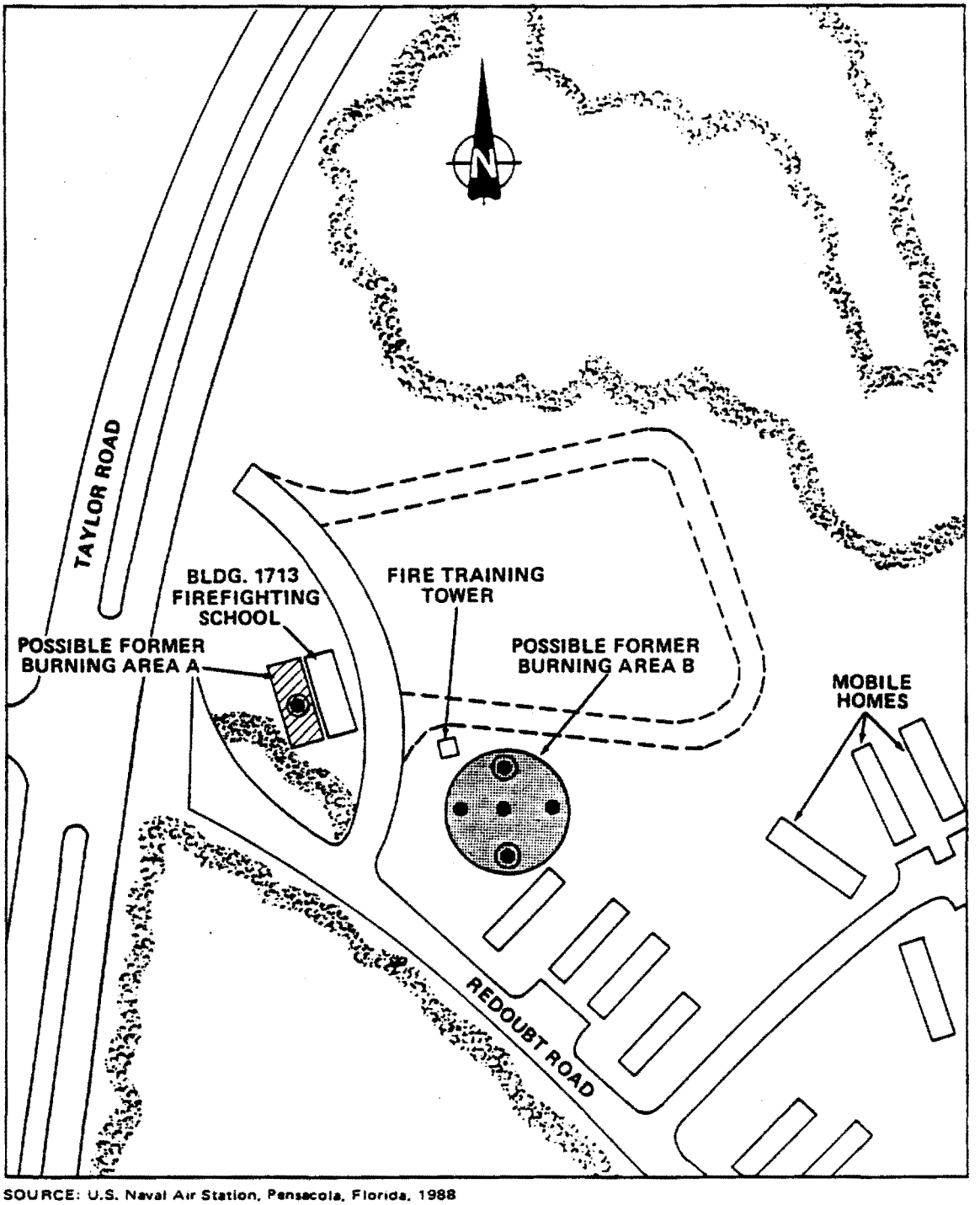
At Site 7, it is tentatively planned that soil samples will be collected during the installation of three wells, and during three shallow borings for a total of six locations (shown on Figure 14-4).

At Site 20, it is tentatively planned that soil samples will be collected during the installation of three shallow wells and two soil borings, for a total of five locations (shown on Figure 14-5).

At Site 21, it is tentatively planned that soil samples will be collected from nine soil borings (shown on Figure 14-6).

Soil samples will be collected using split-spoon samplers, when the effort is in conjunction with well drilling. All other soil borings which are made separate from the well installation activity, will be conducted using either the solid-stem auger extraction technique, or by manual hand auger techniques, as practical. The soil samples will be collected as composites from depth intervals of surface to 0.5 feet, 0.5 to 2.5 feet, and every 2.5-foot interval thereafter to a maximum depth of 10 feet or where water table conditions are encountered, whichever is less. Based on an assumption that water table occurs at a depth of 15 feet at Site 7, it is planned that 30 soil samples will be collected. Based on an assumption that water table occurs at a depth of 5 feet at Site 20, it is planned that 15 soil samples will be collected. Based on an assumption that water table occurs at a depth of 5 feet at Site 21, it is planned that 27 soil samples will be collected.

Each soil sample will be collected as a composite of the material retrieved from a depth interval. All sampling, compositing, and lithologic logging will be conducted in accordance with Section 6.6 of the GOAPP. Equipment decontamination will be conducted in accordance with GOAPP Section 6.10.

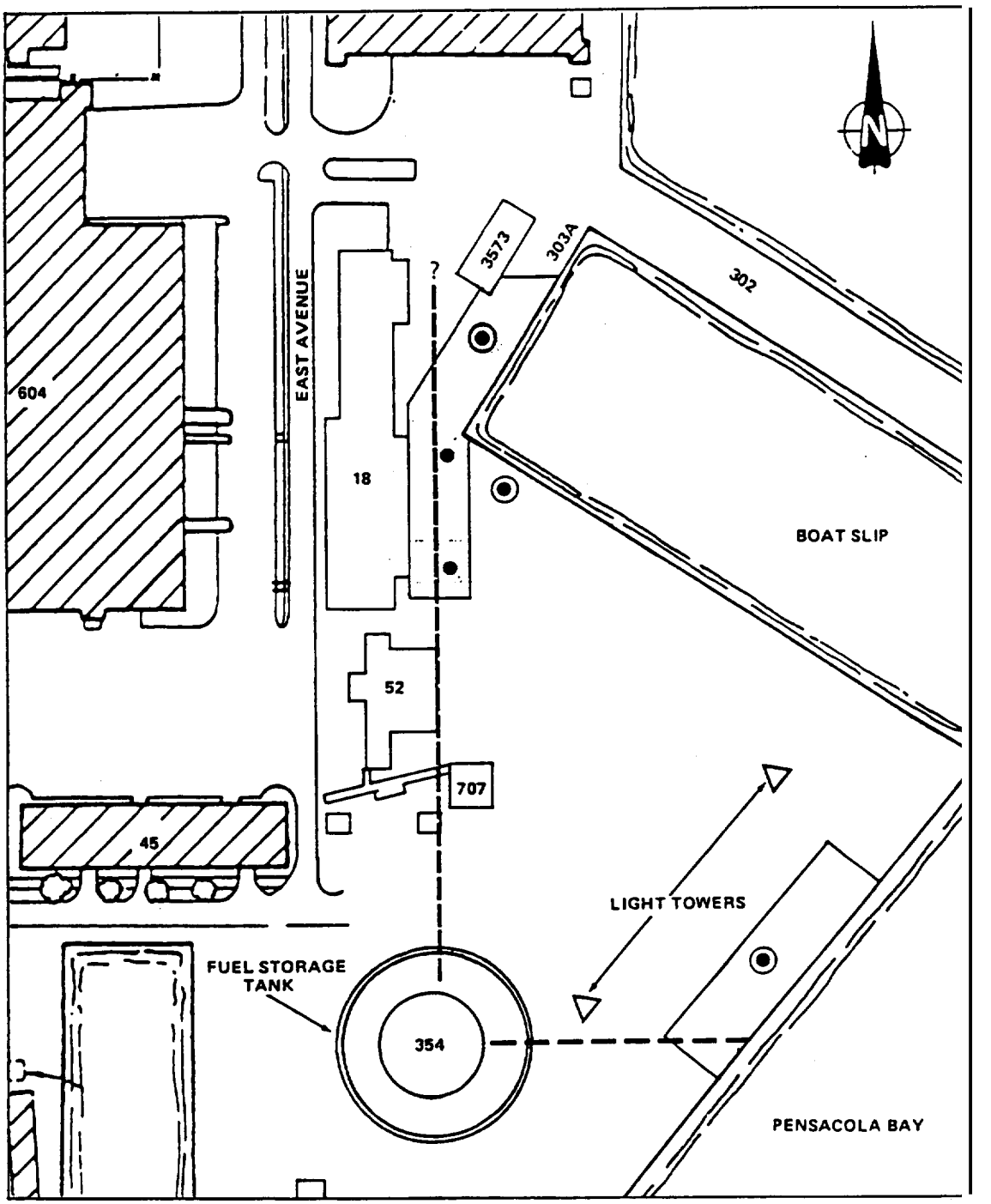



SOURCE: U.S. Naval Air Station, Pensacola, Florida, 1988

SCALE
0 50 100 150 200 FEET

KEY:
● Tentative Soil Boring
○ Tentative Shallow Monitoring Well

Figure 14–4 TENTATIVE SOIL BORING AND SHALLOW MONITORING WELL LOCATIONS, SITE 7 – PHASE II



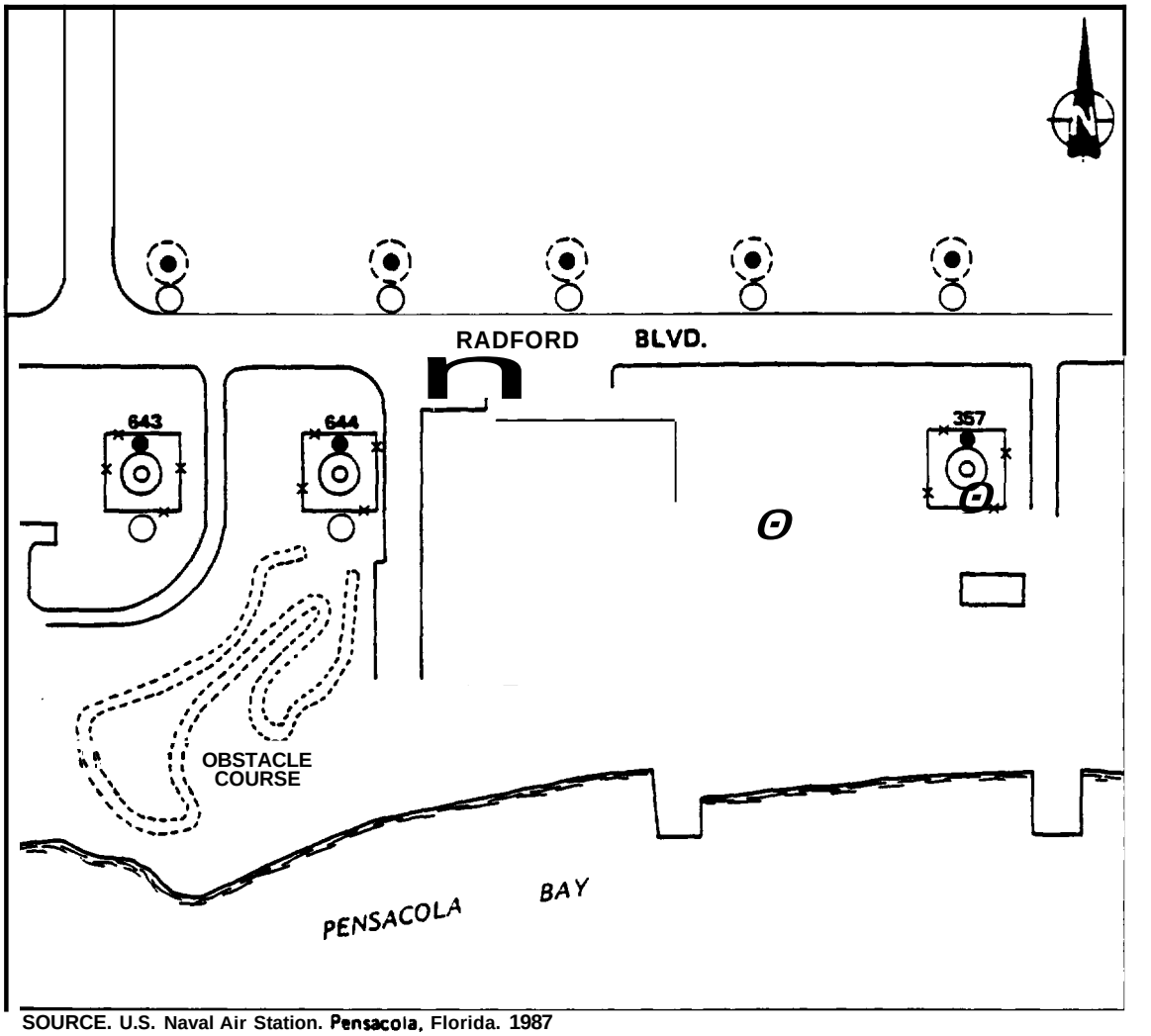

SOURCE: U.S. Naval Air Station, Pensacola, Florida, 1986

SCALE
0 100 200 400 FEET

KEY:

- Possible Fuel Pipeline
- Approximate Areas Of Previously Identified Potential Contamination
- Building
- Tentative Soil Boring
- Tentative Shallow Monitoring Well

Figure 14–5 TENTATIVE SOIL BORING AND SHALLOW MONITORING WELL LOCATIONS, SITE 20 – PHASE II




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

SCALE

0 100 200 300 400 500 FEET

KEY:

- Aboveground Fuel Storage Tank and Containment Wall
- Former Aboveground Fuel Storage Tank and Containment Wall
- Tentative Soil Boring
- Tentative Shallow Monitoring Well

**Figure 14–6 TENTATIVE SOIL BORING AND SHALLOW MONITORING WELL LOCATIONS, SITE 21 – PHASE II**

It is not anticipated that the above Phase II soil sampling plan will change appreciably, however, the findings of Phase I will ultimately determine Phase II information requirements and sampling strategies.

### 14.2.3 Shallow Monitoring Well Installation and Development

The actual number and locations of monitoring wells to be installed in Phase II will be based on Phase I findings. For planning purposes, the number of permanent shallow monitoring wells to be installed at sites 7 and 20 is three for each site. For Site 21, it is estimated that nine permanent shallow wells will be installed in Phase 11. All shallow wells will be of two-inch diameter PVC construction, and bracket the water table with 10 feet of .010-inch screen. Anticipated well depths at sites 20 and 21 are 15 feet, and at Site 7 are 25 feet. The wells will be installed utilizing hollow-stem auger techniques, constructed, and developed in accordance with Section 6.7 of the GQAPP. Drilling equipment will be decontaminated in accordance with 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 new shallow monitoring wells at both sites 7 and 20, and at the nine new shallow wells at Site 21. The purging and sampling of these wells will be in accordance with the GQAPP Section 6.8. Equipment decontamination will be in accordance with Section 6.10 of the GOAPP.

### 14.2.S Eydrologic Assessment

Well head elevations will be surveyed for all newly installed monitoring wells and water levels will be measured in all wells. At sites 20 and

21 surface water staff gauges will be installed and monitored during the investigation and the elevations will be recorded.

Limited aquifer testing will be conducted on all newly installed and any existing monitoring wells. These will consist primarily of performing short-duration specific capacity test during development of newly installed monitoring wells. Specific capacity tests are particularly useful for deriving first estimates of aquifer hydraulic properties (i.e., hydraulic conductivity, transmissivity).

The advantages of conducting specific capacity test in conjunction with well development is that the test itself does not generate additional potentially contaminated water which requires disposal.

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

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