

M00146.AR.005735  
MCAS CHERRY POINT  
5090.3a

DRAFT WORK PLAN ADDITIONAL UNDERGROUND STORAGE TANK INVESTIGATION AT  
VARIOUS SITES WITH TRANSMITTAL MCAS CHERRY POINT NC  
9/21/2000  
CATLIN ENGINEERS AND SCIENTISTS

**DRAFT**

**WORKPLAN  
ADDITIONAL UST INVESTIGATION  
VARIOUS SITES MCAS AND MCOLF**

**SITE 1 - ATLANTIC FIELD HYDRANT SITE**

**SITE 2 - CHERRY POINT HYDRANT SITE**

**SITE 3 - MWSS 274 OLD REFUELERS**

**MARINE CORPS AIR STATION  
CHERRY POINT, NORTH CAROLINA  
MARINE CORPS OUTLYING LANDING FIELD  
ATLANTIC, NORTH CAROLINA**

**ISSUED SEPTEMBER 21, 2000**

**Contract No. N62470-95-D-6009**

**Delivery Order No. 0104**

**CATLIN Engineers and Scientists Project No. 200-163-20**



**Prepared By:**

**CATLIN Engineers and Scientists  
220 Old Dairy Road  
Wilmington, North Carolina 28405  
(910) 452-5861**



220 Old Dairy Road • P.O. Box 10279  
Wilmington, North Carolina 28405  
Telephone: (910) 452-5861  
Fax: (910) 452-7563

September 25, 2000

Commander  
LANTNAVFACENGCOM  
Attn: John Kresky, P.E.  
Code 18213  
1510 Gilbert Street  
Norfolk, Virginia 23511-2699

RE: Contract No. N62470-95-D-6009  
Delivery Order No. 0104  
CATLIN Project No. 200-163-16, 19, 20

Dear Mr. Kresky:

Please find enclosed the DRAFT report, "Workplan, Additional UST Investigation, Various Sites, Marine Corps Air Station and MCOLF, MCAS, Cherry Point and MCOLF Atlantic, North Carolina."

If you have any questions or require any additional information, please do not hesitate to contact us at (910) 452-5861. CATLIN appreciates the opportunity to provide you with environmental services.

Sincerely,

A handwritten signature in black ink, appearing to read "Thomas W. Landis".

Thomas W. Landis  
Project Geologist

A handwritten signature in black ink, appearing to read "Teri M. Piver".

Teri M. Piver  
Project Manager

TWL/TMP/hab

Enclosures

cc: John Myers, MCAS EAD (w/1 encl.)  
Christine Foskey, LANTNAVFACENGCOM, Code 02134 (letter only)

0163TWL01.ltr

**DRAFT**

**WORKPLAN  
ADDITIONAL UST INVESTIGATION  
VARIOUS SITES MCAS AND MCOLF**

**SITE 1 - ATLANTIC FIELD HYDRANT SITE**

**SITE 2 - CHERRY POINT HYDRANT SITE**

**SITE 3 - MWSS 274 OLD REFUELERS**

**MARINE CORPS AIR STATION  
CHERRY POINT, NORTH CAROLINA  
MARINE CORPS OUTLYING LANDING FIELD  
ATLANTIC, NORTH CAROLINA**

**ISSUED SEPTEMBER 21, 2000**

**Contract No. N62470-95-D-6009**

**Delivery Order No. 0104**

**CATLIN Engineers and Scientists Project No. 200-163-20**

**Prepared by:**

**CATLIN Engineers and Scientists  
220 Old Dairy Road  
Wilmington, North Carolina 28405  
(910) 452-5861**

**WORKPLAN  
ADDITIONAL UST INVESTIGATION –  
VARIOUS SITES – MCAS**

**TABLE OF CONTENTS**

**1.0 INTRODUCTION**

**1.1 *Purpose and Scope of Investigation***

**2.0 PREVIOUS INVESTIGATIONS, REMEDIATION AND/OR CLOSURES**

**2.1 *Atlantic Field Former Hydrant Site – (Site 1)***

**2.2 *Cherry Point Hydrant Site – (Site 2)***

2.2.1 Petroleum Fractions Exceeding State Soil Guidelines

2.2.2 Petroleum-Derived Compounds Exceeding Groundwater Quality Standards

2.2.3 Free Product

2.2.4 Initial Remedial Actions

2.2.4.1 Primary Source Abatement

2.2.4.2 Secondary Source Abatement

**2.3 *MWSS 274 Old Refuelers Site – (Site 3)***

**3.0 SITE DESCRIPTION**

**3.1 *Area of Investigation***

3.1.1 Atlantic Field Hydrant Site

3.1.2 Cherry Point Hydrant Site

3.1.3 MWSS 274 Old Refuelers Site

**3.1 *Site History and Operation***

3.2.1 Atlantic Field Hydrant Site

3.2.2 Cherry Point Hydrant Site

3.2.3 MWSS 274 Old Refuelers Site

**3.2 *Contaminant Source Inventory***

3.3.1 Atlantic Field Hydrant Site

3.3.2 Cherry Point Hydrant Site

3.3.3 MWSS 274 Old Refuelers Site

**3.3 *Water Well Inventory/Water Supply***

3.4.1 Atlantic Field Hydrant Site

3.4.2 Cherry Point Hydrant Site

3.4.3 MWSS 274 Old Refuelers Site

**3.5 *Utility Survey***

## TABLE OF CONTENTS (continued)

### 4.0 SITE CHARACTERIZATION

#### 4.1 *Regional Geology/Hydrogeology*

4.1.1 Regional Geology

4.1.2 Regional Hydrogeology

#### 4.2 *Site Geology/Hydrogeology and Soils*

4.2.1 Atlantic Field Hydrant Site

4.2.2 Cherry Point Hydrant Site

4.2.3 MWSS 274 Old Refuelers Site

#### 4.3 *Site Topography and Other Surface Characteristics*

4.3.1 Atlantic Field Hydrant Site

4.3.2 Cherry Point Hydrant Site

4.3.3 MWSS 274 Old Refuelers Site

### 5.0 POTENTIAL RECEPTORS

### 6.0 SUBSURFACE INVESTIGATION METHODOLOGY

#### 6.1 *Temporary Observation Well Design and Construction*

#### 6.2 *DPT Soil and Ground Water Sampling*

6.2.1 Temporary DPT Probe Locations

6.2.2 DPT Ground Water Sampling

6.2.3 Ground Water Level and Free Product Thickness Measurement

#### 6.3 *Disposal of Borehole Cuttings and Wastewater*

#### 6.4 *Surveying*

### 7.0 SAMPLE COLLECTION METHODOLOGY

#### 7.1 *DPT Soil Probe Sample and DPT Ground Water Sample Collection*

7.1.1 DPT Soil Probe Sample Collection and Field Screening Methodology

7.1.2 DPT Ground Water Sample Collection

#### 7.2 *Sample Identification*

#### 7.3 *Chain of Custody and Transportation Procedures*

7.3.1 Off-Site Laboratory

#### 7.4 *Equipment Decontamination*

7.4.1 Direct Push Technology Site Assessment Vehicle and Drilling Rigs

7.4.2 Soil and Ground Water Sample Collection Equipment

7.4.3 Rinsate Sample Collection Methodology

### 8.0 SAMPLE ANALYSIS

#### 8.1 *Off-Site Laboratory*

### 9.0 EVALUATION OF ASSESSMENT DATA

## TABLE OF CONTENTS (continued)

### 10.0 PROJECT SCHEDULE

### 11.0 REFERENCES

### TABLES

Table 1	Water Table Elevations Summary
Table 2	Sample Analysis Summary Table/Off-Site Laboratory- Atlantic Field Hydrant Site
Table 3	Sample Analysis Summary Table/Off-Site Laboratory- Cherry Point Hydrant Site
Table 4	Sample Analysis Summary Table/Off-Site Laboratory- MWSS 274 Old Refuelers Site

### FIGURES

Figure 1	General Location – USGS Topographic Quadrangle - Atlantic Field Hydrant Site
Figure 1A	Site Plan - Atlantic Field Hydrant Site
Figure 1B	Proposed DPT Boring Locations - Atlantic Field Hydrant Site
Figure 2	General Location – USGS Topographic Quadrangle - Cherry Point Hydrant Site
Figure 2A	Site Plan – Cherry Point Hydrant Site
Figure 2B	Proposed DPT Boring Locations - Cherry Point Hydrant Site
Figure 3	General Location -USGS Topographic Quadrangle - MWSS 274 Old Refuelers Site
Figure 3A	Site Plan - MWSS 274 Old Refuelers Site
Figure 3B	Proposed DPT Boring Locations - MWSS 274 Old Refuelers Site

### APPENDICES

Appendix A	Site Specific Health and Safety Plan
Appendix B	Boring Log Well Sampling Worksheet Chain of Custody Record
Appendix C	Project Schedule

**WORKPLAN  
ADDITIONAL UST INVESTIGATION  
VARIOUS SITES  
MARINE CORPS AIR STATION  
CHERRY POINT, NORTH CAROLINA**

**CATLIN PROJECT NO. 200-163-20**

**SEPTEMBER 21, 2000**

**1.0 INTRODUCTION**

**1.1 *Purpose and Scope of Investigation***

The purpose of this Leaking Underground Storage Tank (LUST) Site Assessment Workplan (Workplan) is to serve as a guidance document and procedural manual for performing tasks to aid in preliminarily determining the presence/absence of soil and ground water contamination; identifying possible free product accumulation; and assessing potential exposure to possible subsurface petroleum-related contaminants in the vicinity of the Atlantic Former Hydrant Fueling System Site, aboard Marine Air Corps Outlying Landing Field (MCOFL), Atlantic, North Carolina, and the Cherry Point Hydrant Site and the MWSS 274 Old Refuelers Site aboard Marine Corps Air Station (MCAS), Cherry Point, North Carolina. Site locations are shown on Figures 1, 2 and 3.

This Workplan was prepared in general accordance with CATLIN proposal Numbers P20126, P20128, and P20129 and Naval Facilities Engineering Command Order for Supplies and Services Contract No. N62470-95-D-6009, Delivery Order No. 104. The objective of the preliminary assessments is to determine the presence/absence of soil and/or ground water contamination associated with the above-referenced petroleum sources.

The project will be conducted in one phase. The phase involves the advancement of Direct Push Technology (DPT) Probes for collection of site soils and collection of shallow ground water samples for off-site laboratory analysis. The laboratory results will provide data to assist in determining the impact to soil and/or ground water which may be present. If available, previously established information will be used to assist in the placement of the DPT locations.

## 2.0 PREVIOUS INVESTIGATIONS, REMEDIATION AND/OR CLOSURE

### 2.1 *Atlantic Field Former Hydrant Site – (Site 1)*

Past documents revealed that assessment activities were previously undertaken at Tank 7012 located approximately 2,000 feet south of Atlantic Field.

Following is a listing of previous investigative reports to date:

Report Title	Report Author	Report Date
UST 7012, Closure Report	GES Environmental, Inc.	February 8, 1994
Leaking Underground Storage Tank Site Assessment Report	Law Engineering and Environmental Services, Inc.	October 5, 1994
Remedial Strategy/Pilot Study Recommendation	Law Engineering and Environmental Services, Inc.	February 2, 1995
Corrective Action Plan, UST 7012	Law Engineering and Environmental Services, Inc.	August 22, 1995

The previous assessment work was confined to the area surrounding the former UST 7012 which supplied No. 2 fuel oil to the former location of Building 7012.

A cursory review of the previous reports indicates the 7012 site is located hydrologically downgradient from the former hydrant site. Therefore contamination associated with the former UST 7012 should not influence the findings of the upcoming former hydrant site investigation.

No other assessment work is known to have been completed in or around the area of the former hydrant fueling system.

### 2.2 *Cherry Point Hydrant Site – (Site 2)*

Past documents indicate multiple releases have occurred along the abandoned fuel hydrant pipeline system in the vicinity of Building 130, Building 3996 and Pit 4 Area, MCAS, Cherry Point. A number of previous investigations and remedial efforts have been performed at sites which overlap the current investigation area. A list of these available reports are as follows:

Report Title	Report Author	Report Date	Date Submitted to State
UST Closure Report, UST 3996-4 and UST 3996-6	Remediation Services, Inc.	November 1994	December 1994
UST Closure Report, UST 3996-6 and UST 3996-3	Froehling & Robertson, Inc.	September 14, 1995	October 24, 1995
Comprehensive Site Assessment Report, Building 130, Volumes I-II	Law Engineering and Environmental Services, Inc.	June 21, 1995	June 26, 1995
Leaking Underground Storage Tank Site Assessment Report, UST 3996-4, Volumes I-II	Law Engineering and Environmental Services, Inc.	October 5, 1995	October 19, 1995
Leaking Underground Storage Tank Site Assessment Report, UST 3996-4, Volumes I-II	Law Engineering and Environmental Services, Inc.	October 5, 1995	October 19, 1995
Addendum Comprehensive Site Assessment Report, Building 130, Volumes I-III	Law Engineering and Environmental Services, Inc.	March 15, 1996	April 19, 1996
Addendum Comprehensive Site Assessment Report, Building 3996, Volumes I-III	Law Engineering and Environmental Services, Inc.	March 28, 1996	April 19, 1996
Final Report, Engineering Evaluation, Aviation Fuel Distribution System Integrity Testing, MCAS, Cherry Point	Dames & Moore, Inc.	March 1, 1996	May 29, 1996
Draft Comprehensive Site Assessment Report, Pit 4 Area, Volumes I-II	Law Engineering and Environmental Services, Inc.	July 15, 1996	NA
Remedial Strategies/Pilot Study Recommendations Letter	Law Engineering and Environmental Services, Inc.	July 19, 1996	Submitted with CAP

NA = Not Available

Previous investigations at sites in close proximity to the hydrant site revealed contaminants exceeding Groundwater Quality Standards and State Soil Guidelines. The exceedences and initial remedial actions are summarized as follows.

#### 2.2.1 Petroleum Fractions Exceeding State Soil Guidelines:

- At Building 130, concentrations of volatile and semi-volatile total petroleum hydrocarbons (TPH) as measured by EPA Methods 3550/8015 and 5030/8015 were indicated in vadose zone soils as high as 49.4 mg/Kg and 1,330 mg/Kg, respectively.

- At Building 3996, concentrations of volatile and semi-volatile TPH, and oil and grease as measured by EPA Methods 3550/8015 and 9071 were indicated in vadose zone soils as high as 209 mg/Kg, 106 mg/Kg and 5,880 mg/Kg, respectively.
- At Pit 4 Area, concentrations of volatile and semi-volatile TPH as measured by EPA Methods 3550/8015 and 5030/8015 were indicated in vadose zone soils as high as 124 mg/Kg and 7418 mg/Kg respectively.

## 2.2.2 Petroleum-derived Compounds Exceeding Groundwater Quality Standards:

- At Building 130:
 

Benzene	Chrysene
Ethylbenzene	Flourene
Xylenes	Indeno(1,2,3-cd)pyrene
Acenaphthene	1-Methylnaphthalene
Acenaphthylene	2-Methylnaphthlene
Benzo(k)flouranthene	Naphthalene
- At Building 3996:
 

Benzene	Xylenes
Ethylbenzene	Naphthalene
Toluene	
- At Pit 4 Area:
 

1-Methylnaphthalene	2-Methylnaphthalene
Benzo(b)flouranthene	Naphthalene

An overview of previous information is summarized in the Corrective Action Plan for the Recovery of Free Product and the Restoration of Petroleum Contaminated Soil and Groundwater prepared by Law Engineering (LAW) and dated January 1997. Excerpts from this report indicate:

- “sources that have apparently released petroleum products in the vicinity of Building 130 include a portion of an abandoned underground pipeline system. The pipeline system was installed during the 1940’s with subsequent additions and modifications prior to being taken out of service in 1983. A release from the pipeline has occurred at Building 130 as evident by the plume of free product to the west of the building. Other likely releases from the abandoned pipeline system include two petroleum hydrocarbon dissolved-phase plumes to the northwest and north of Building 130. Two lubrication oil/waste oil underground storage tanks (USTs) may have contributed to the release near Building 130.
- “Sources that have apparently released petroleum products in the vicinity of Building 396 include the abandoned underground pipeline

system referenced above. The primary release most likely results from a fueling station that was formerly connected to the pipeline located adjacent to northwest side of Building 131. USTs 3996-1, 3996-2, and 3996-3 located on the north side of Building 395 and two hydraulic lift pits located inside Building 3996 have also contributed to the release in the vicinity of Building 3996. Vadose zone soil has been impacted by a suspected UST located inside the northeastern end of Building 131.

- “Sources that have apparently released petroleum products at the Pit 4 Area include two underground pipeline systems. The abandoned pipeline system was taken out of service in 1983 when the currently active pipeline system was installed. The active pipeline system is periodically checked for leaks using a Tracer Tight Leak Test in conjunction with the collection and analysis of soil gas samples. Results of the October 195 study detected a leak from the pipeline system at the junction (T connection) on the grass island adjacent to the northwest side of Pit 4. The lines were retested in February 1996 after repairs and no leaks were indicated.”

### 2.2.3 Free Product

At Building 130, free product has been measured at a thickness of 2.68 feet in monitoring well 72GW15 in front of Building 130.

At Building 3996, free product has been measured at a thickness of 0.12 feet in monitoring well GW10. Free product was not measured in this well until the removal of USTs 3996-1 through 3996-3 during July 1995.

At Pit 4 Area, free product thickness has been reported at 11.5 feet in the existing free product recovery well.

### 2.2.4 Initial Remedial Actions

#### 2.2.4.1 Primary Source Abatement:

At Building 130, the former aviation fuel pipeline system has been abandoned in-place.

At Building 3996 the former aviation fuel pipeline system has been abandoned. USTs 3996-1, 3996-2 and 3996-3 were removed July 1995. Contaminated soil around hydraulic lift Pit No. 1 and Pit No. 2 has been removed to the extent possible. Further excavation of contaminated soil in the vicinity of Pits No.1 and No.2 may threaten the stability of Building 3996. The suspected UST in the northeastern end of Building 131 is located beneath an office area and removal of soils would require demolition of that portion of the building.

At Pit 4 Area, the aviation fuel pipeline installed in the 1940's was abandoned in 1983. The leading pipeline junction for the active pipeline system located on the grass island adjacent to the northwest side of Pit 4 has been repaired by MCAS personnel.

#### 2.2.4.2 Secondary Source Abatement:

At Building 130, free product is recovered by hand bailing. The amount of free product recovered to date is not known.

At Pit 4 Area, free product is recovered by hand bailing. The amount of free product recovered to date is not known (LAW, 1997).

Additional established information which may be pertinent to this site will also be used to assist in boring placements associated with this investigation.

### 2.3 *MWSS 274 Old Refuelers Site – (Site 3)*

Review of the Cherry Point Long Term Monitoring Database revealed no information, indicating previous investigations, remediation and or closures have been performed at this site. An additional review of the MCAS Cherry Point archives will be performed prior to initiation of field activities. Any pertinent information which may be found will be used to assist in optimum boring placement.

## 3.0 **SITE DESCRIPTION**

The site description involves the collection of information regarding the history and physical characteristics of the site to identify and evaluate known and/or potential source(s) of contamination and conditions which will assist in determining sample locations. Potential contaminant migration pathways which may influence subsurface contaminant migration characteristics and limit intrusive subsurface investigation will also be identified. These typically include the presence of surface or near surface features, such as asphalt pavement, surface water impoundments, and buried utilities.

### 3.1 *Area of Investigation*

A generalized area description for each site is included in the following subsections.

#### 3.1.1 Atlantic Field Hydrant Site

Atlantic MCOLF is located off Highway 70 northwest of Atlantic, North Carolina. The site is located at Atlantic MCOLF immediately adjacent to and along the runway taxiway (see Figure 1). Formerly located along the taxiway was a fuel hydrant system comprised of four to six aboveground tanks and piping from which fuel trucks obtained aviation gas (AVGAS)

and/or jet fuel (JP-5) for aircraft refueling on the runway (Figure 1A). Tank saddles and abandoned piping components are all that remain of the fueling system. Wooded areas surround the subject area and numerous pieces of inactive military equipment are mothballed throughout the area.

### 3.1.2 Cherry Point Hydrant Site

The site is situated on the western edge of the flight line complex north of Sixth Avenue aboard MCAS, Cherry Point, North Carolina (see Figure 2). Buildings 1701, 130, 3745, 1700 and 131 are the primary structures located adjacent to and southwest of the site. Tank Farm A is located to the northwest, and the base flightline air control complex is located to the east. Numerous utility and storage facilities are located within the area. The area of investigation is limited to the abandoned underground aviation fuel hydrant system which runs generally in a west to east direction from Building 1701 east to Building 130 (see Figure 2A). The fuel system itself is located beneath a broad expanse of concrete tarmac which extends northward to aircraft taxiway and runway 14L.

### 3.1.3 MWSS 274 Old Refuelers Site

This site is a fenced parking area located off Sixth Avenue just north of Buildings 3680 and 1738, aboard MCAS Cherry Point, North Carolina. Building 1702 lies to the southwest and runway 14L is located northeast of the site. The site is comprised of numerous concrete pads within and asphalt parking area. Access to the area is restricted by a gated chain link fence. Formerly refueling vehicles utilized the site as a staging/storage area related to refueling of aircraft at the nearby tarmac. The area of investigation will be limited to the paved parking area.

## 3.2 *Site History and Operation*

All three sites were historically involved in refueling of aircraft on the ground by truck or through the utilization of a fuel hydrant system.

### 3.2.1 Atlantic Field Hydrant Site

The underground aviation pipeline system was reportedly built in approximately 1943-1944 during the construction of the Atlantic MCOLF. The former hydrant system was apparently comprised of four to six Aboveground Storage Tanks (ASTs) from which fuel was piped to a series of hydrants. The hydrants dispensed aviation fuel to fuel trucks which in turn refueled aircraft parked on the tarmac. The only surface features remaining are concrete tank saddles and what appear to be the remnants of the hydrant bases. Little additional information is currently available concerning the specific historical operation and use of the fuel system.

The airfield is currently utilized for various military training exercises. It is estimated that fifteen or less personnel are housed at Atlantic Field. A small contingent of personnel, 30 or less typically are at the base on a daily or weekly basis.

### 3.2.2 Cherry Point Hydrant Site

According to review of previous reports associated with assessment around Building 130 it appears the original fuel hydrant system was constructed in the early 1940's. The older portion of the pipeline is reported to have been abandoned in the 1960's. Currently, little additional information is available concerning specific historical use of the abandoned pipeline.

Currently, the site is used as a refueling area for aircraft. Immediately adjacent to the site are a number of aircraft hangars and maintenance facilities. The site is currently served by an active pipeline system which was installed after the former hydrant system was abandoned.

### 3.2.3 MWSS 274 Old Refuelers Site

The area that encompasses the MWSS 274 Old Refuelers Site was historically used as a staging area for fuel trucks. The refueling vehicles staged in this area were used to fuel aircraft on the nearby tarmac located to the northeast of the staging area. Currently, little additional historical information is available concerning use of the site. Prior to commencement of field activities an additional search of the MCAS Cherry Point archives will be performed. Any additional information obtained should be used to assist in boring placement. The site is currently inactive.

## 3.3 *Contaminant Source Inventory*

A visual survey of the various sites revealed the potential for subsurface impact by a variety of sources.

### 3.3.1 Atlantic Field Hydrant Site

1. The abandoned fuel hydrants and associated aviation fuel distribution piping that parallels the taxiway. The pipeline is currently inactive.
2. Four to six former ASTs which supplied the former hydrant systems. All that remains of the ASTs are the concrete saddles. Size and contents are currently unknown although the tanks are believed to have contained one or more of the following AVGAS, JP-4 or JP-5. Removal/abandonment dates are unknown.

3. Historical operation of the fuel hydrant system may have resulted in inadvertent spillage during aircraft refueling activities. Additional potential sources may exist, but were not observed during the initial site reconnaissance. Any releases that may have occurred from these potential sources may be encountered during this investigation.

#### 3.3.2 Cherry Point Hydrant Site

1. Former fuel hydrant system installed in the 1940's with upgrades until abandonment, pipes are believed to be 4- and 12- inch diameter. Currently inactive and abandoned.
2. Current fuel distribution system. Review of previous reports indicate spills and repairs have occurred from the distribution system. This system is currently active.
3. Pits 1, 2, 3, and 4 which were also former refueling areas.
4. Numerous maintenance and storage buildings along the flight line perimeter. These structures are currently active although use of facilities may have varied over time.

#### 3.3.3 MWSS 274 Old Refuelers Site

1. Historical inadvertent spillage from refueling vehicles formerly staged at the site.
2. USTs or former USTs associated with Buildings 4048, 1769, and 4067 which are in the general vicinity of the area of investigation. Additional potential sources may exist, but were not observed during the initial site reconnaissance. Any releases that may have occurred from these potential sources may be encountered during this investigation.

### 3.4 *Water Well Inventory/Water Supply*

#### 3.4.1 Atlantic Field Hydrant System

According to information presented in the LAW Report dated October 5, 1999; "Two base water supply wells are mapped within a ½-mile radius of the site and are located approximately 800 feet north of the former location of Tank 7012. The two wells are located adjacent to the Barrack Building 7019 and are installed in the Castle Hayne aquifer to a depth of 177 feet and are screened from a depth of 145 feet to 165 feet. No other known wells are located within 1,500 feet of the site."

### 3.4.2 Cherry Point Hydrant Site

No active water supply wells are located within 3,000 feet of the site. The closest wells are located in the vicinity of Roosevelt Boulevard which is west and north of the site.

### 3.4.3 MWSS 274 Old Refuelers Site

No active water supply wells are located within 3,000 feet of the site. The closest wells are located in the vicinity of Roosevelt Boulevard which is west and north of the site.

## 3.5 *Utility Survey*

Numerous underground utilities are located throughout the various sites including sewer, water, stormwater, steam, communication lines, fuel lines, and electrical lines. Caution will be exercised during subsurface investigations to prevent breaching any encountered utilities. In addition, utility clearances will be implemented prior to the commencement of subsurface investigation at the various sites.

## 4.0 **SITE CHARACTERIZATION**

The site characterization involves the collection of information to characterize the physical setting of the project areas. Information regarding the geology/hydrogeology, topography, and other physical characteristics of the site and vicinity will be evaluated to identify conditions that could potentially affect the migration of petroleum contaminants. The information available at this time has revealed the following:

### 4.1 *Regional Geology/Hydrogeology*

The Havelock and Atlantic areas lie within the Coastal Plain Physiographic Province of North Carolina. This province consists of Mesozoic to Cenozoic-aged sediment layers and rocks which begin as a thin edge along the fall line of North Carolina and thicken to the southeast or oceanward. The sedimentary deposits lie unconformably on oceanward dipping Pre-Cretaceous basement rocks which are similar to the metamorphic intrusive igneous rocks of the Piedmont Region (Harris, et al, 1979). In the Havelock area, the basement rocks lie under approximately 2,500 feet of sedimentary deposits.

The major aquifers in this region are within the wedge of sands, clays, limestone beds or combination of these which make up the sediment layers of this Coastal Plain. These are identified as follows:

<u>Geologic Series</u>	<u>Aquifers and Confining Units</u>
Quaternary	Surficial aquifer
Tertiary	Yorktown confining unit Yorktown aquifer Pungo River confining unit Pungo River aquifer Castle Hayne confining unit Castle Hayne aquifer Beaufort confining unit Beaufort aquifer
Upper Cretaceous	PeeDee confining unit PeeDee aquifer Black Creek confining unit Black Creek aquifer Upper Cape Fear confining unit Upper Cape Fear aquifer Lower Cape Fear confining unit Lower Cape Fear aquifer
Lower Cretaceous	Lower Cretaceous confining unit Lower Cretaceous aquifer
Pre-Cretaceous	Basement Rocks

(Lloyd and Daniel, 1988)

#### 4.1.2 Regional Hydrogeology

In the eastern part of the North Carolina Coastal Plain, ground water is obtained from the surficial, Yorktown, and Castle Hayne aquifers. The depth to ground water typically ranges from three to 12 feet below the surface. The surficial unconfined aquifer extends to depths ranging from 50 to 100 feet. This unit is not used as a source of water on MCAS or MCOLF. The Castle Hayne aquifer, the principle source of water for the MCAS or MCOLF consists of thick limestone, sand, and clay sequences. The general ground water flow is in the direction of lower hydraulic head to a discharge area like the Neuse River or its tributaries or the ocean.

#### 4.2 Site Geology/Hydrogeology and Soils

The following data was obtained from review of previous investigations in close proximity to the subject sites. Although subsurface soils may vary the following descriptions will provide a general overview of subsurface profiles.

#### 4.2.1 Atlantic Field Hydrant Site

The upper 10 feet of subsurface material is generally expected to be mixtures of fine to medium grained silty sandy ranging from gray to dark gray in coloration. Moderate amounts of peat are also common in this unit. Typically underlying this unit is very fine to fine grained sand containing varying degrees of shell fragments to a depth of approximately 18.5 feet below land surface (BLS). Ground water in the area is generally encountered between 2.5 to 5.0 feet BLS. It was reported ground water flows generally from the north to south-southeast direction.

#### 4.2.2 Cherry Point Hydrant Site

A previous investigation by LAW (1996) characterized soils as organic, black to gray clayey to silty fine sands which was generally encountered between 1 and 8 feet BLS. This surficial unit is underlain by yellowish-orange to light gray, fine grained, silty sand and medium grained sand. Within this unit a number of clay interbeds occurred to a depth of 36 to 50 BLS. Below this unit the Yorktown formation is typically encountered. Ground water table elevation data collected during the LAW investigation suggest a northwesterly to westerly direction of ground water flow. Although somewhat variable depth to ground water is in the range of 15 to 20 feet BLS.

#### 4.2.3 MWSS 274 Old Refuelers Site

Although somewhat variable, subsurface soils and hydrological conditions at this site are expected to be similar to those encountered at the Cherry Point Hydrant site due to the relatively close proximity of the sites.

### 4.3 *Site Topography and Other Surface Features*

The following information was obtained from review of previous assessment activities at sites in close proximity to the subject sites and initial site reconnaissance.

#### 4.3.1 Atlantic Field Hydrant Site

The project area occurs at an elevation of approximately 15 feet mean sea level (MSL). As would be expected the subject site is situated on a broad flat lying area which slopes slightly to the southeast. Regional surface water flow is to the southeast toward Core Sound which is located approximately 3,000 feet from the site (USGS, 1983). The immediate area adjacent to the subject site is overgrown with scrub pines with heavily wooded areas beyond. The taxiway immediately adjacent to the site is paved asphalt.

#### 4.3.2 Cherry Point Hydrant Site

This project area occurs at an elevation of approximately 25 feet above MSL and slopes slightly to the west and southwest toward Sandy Branch. Sandy Branch is a tributary of Slocum Creek. The site itself is a large expanse of asphalt and/or concrete tarmac. The impervious surface covering the site will effect surface water infiltration rates at the site.

#### 4.3.3 MWSS 274 Old Refuelers Site

This project area occurs at an elevation of approximately 25 feet MSL. The site is covered by asphaltic pavement and concrete. The cover of this impervious surface may affect surface water infiltration rates across the site.

### 5.0 POTENTIAL RECEPTORS

The information collected in Sections 2.0, 3.0 and 4.0 will be evaluated to provide a preliminary listing of potential receptors that could be affected by the known/suspected release of petroleum. Potential receptors of contamination, as defined by the NCDENR, include any human, plant, animal, or structure which is, or has the potential to be adversely effected by a release or migration of contaminants.

### 6.0 SUBSURFACE INVESTIGATION METHODOLOGY

The major objectives of the subsurface investigation are to: (1) begin defining the approximate lateral and vertical extent of free product accumulation and dissolved-phase ground water contamination resulting from possible discharge of petroleum fuels at the site; and (2) determine the approximate direction and rate of migration of ground water contaminant constituents at the project site including the identification of preferential pathways of contaminant migration. To accomplish this, a total of 75 DPT probes will be utilized for vadose zone delineation as follows:

- Site 1 – Atlantic Field Hydrant Site                      20 DPT Probes
- Site 2 – Cherry Point Hydrant Site                      40 DPT Probes
- Site 3 – MWSS 274 Old Refuelers Site                      15 DPT Probes

Field activities will be performed in adherence to procedures and guidelines contained in the project Health and Safety Plan (Appendix A). The specific methods to accomplish these objectives are listed in the following subsections.

#### 6.1 *Temporary Observation Well Design and Construction*

Three temporary Type II observation wells will be constructed at Site 1 – Atlantic Field Hydrant Site. The purpose of these wells is to provide data for ground water flow direction determination. The wells will be installed utilizing hand augered borings into which 2-inch PVC screen and riser will be inserted. Piping will be

flush jointed and threaded and wells will be constructed without the use of glue. Boring termination will occur at a depth which will allow the slotted PVC screen to intersect the shallow water table. Prior to completion of the project, the PVC wells will be removed and each borehole will be backfilled with Benseal™ for proper abandonment of boreholes. The assigned well identification numbers for these wells are AFMW-1, AFMW-2 and AFMW-3.

## 6.2 *DPT Soil and Ground Water Sampling*

A total of 88 temporary wells will be installed on the various sites. The information will be used to obtain data necessary to further define the lithology beneath the project site; develop a water table contour map and determine the direction of ground water flow across the project site; ascertain the lateral extent and horizontal extent of the dissolved-phase contaminant plume(s), and provide for reproducible sampling points in the upper portions of the surficial aquifer.

The assigned DPT identification numbers for this site are as follows:

Site 1	AFDP01 to AFDP20
Site 2	CPHSDP01 to CPHSDP40
Site 3	MWSSDP01 to MW55DP15

### 6.2.1 Temporary DPT Probe Locations

The locations of the temporary DPT Probes will be based on the information obtained from previous subsurface investigations, geologic and hydrologic information, site topography, and visual assessment of the site. Temporary DPT Probes will be located so as to provide upgradient, cross-gradient and downgradient delineation of the suspected contaminant plume. The proposed well locations are illustrated on Figures 1B, 2B and 3B. The final locations of the DPT Probes will be determined by the information obtained while probing and installing successive temporary DPT Probes.

### 6.2.2 DPT Soil Sampling

As specified in Delivery Order No. 0104, 75 soil probes will be advanced on the various sites for vadose zone delineation. A truck mounted high capacity hydraulic ram and hammer will push a small diameter probe into the subsurface for the continuous collection of soil samples at four foot intervals as described in Section 7.1. Proposed DPT probe locations, based on existing data, are shown on Figures 1B, 2B, and 3B. The exact DPT locations will be determined in the field. The locations of these sample points will be selected based on known/suspected contaminant source locations, and review of previous subsurface investigative results. The DPT sample locations are intended to provide preliminary data to confirm the presence of site contamination and begin delineation of the spatial extent of the dissolved plumes(s). The actual sample locations may

change slightly based upon data obtained during the field investigation, utility hinderance and/or subsurface obstruction.

Soils will be continuously collected in intervals (sleeves) of four-feet from each probe location for vapor screening and sample selection.

An on-site geologist/engineer will examine the soils from the probeholes to obtain lithological conditions and monitor soils for evidence of contamination using physical observation and field screening with a flame ionization detector (FID) or photoionization detector (PID). Special emphasis will be placed on physical evaluation of soils by field personnel for evidence of contamination since the presence of heavier hydrocarbons characteristically cannot be entirely detected by a FID or PID. The soil sample interval exhibiting the highest FID/PID reading and the soil sample interval above the water table will be collected and submitted for laboratory analysis. All data will be recorded in a project-specific field book.

#### 6.2.3 DPT Ground Water Sampling

The temporary DPT Probe sampling points will be constructed of one inch diameter PVC, machine slotted well screens and one inch diameter, Schedule 40 PVC riser pipe. Piping will be flush jointed and threaded, and wells will be constructed without the use of glue. Screen slot widths will be 0.010 or 0.020 inches.

The PVC screen and riser pipe used in DPT sampling point construction will be pre-cleaned and packaged by the manufacturer. All well casings and screens will be transported and stored at the site in original packaging. Personnel handling these items will not handle tools or drilling equipment while installing the well. Clean, new disposable latex rubber gloves will be worn when handling well screens or casings. Personnel who are handling the drilling equipment will not be allowed to handle the well screens or casings until a new "clean" pair of gloves are worn.

All DPT Probes will be installed by a qualified driller registered in the State of North Carolina and well installation will be supervised in the field by an experienced staff or project level geologist or engineer specializing in subsurface investigation. No petroleum lubricants will be used on drill pipe joints. However, Teflon® tape, vegetable oil, or phosphate-free laboratory detergent such as Liquinox® will be used for lubrication, if required.

#### 6.2.4 Ground Water Level and Free Product Thickness Measurement

These measurements will be used to determine direction of ground water flow at the site, and estimate thickness of free product (if present) in the subsurface beneath the site.

Water level and free product thickness measurements will be performed using an electronic interface probe or steel tape with water/product finding pastes. The liquid levels will be measured by slowly lowering the instrument or tape into the well. When the probe reaches the water or free product surface, the circuit is completed and a buzzer is activated. A constant buzzing indicates free product while an intermittent buzzing indicates water. When the tape is inserted into the well, the liquid-specific pastes react with different fluids. The distance from the surveyed marker on the top of the well casing to the free product and/or water level is then measured and recorded. If free product is present, the thickness will be measured to the nearest 0.01 foot. Depth to water will also be measured to the nearest 0.01 foot. The measuring device will be decontaminated between sampling points by detergent wash and distilled water rinse. A complete set of water level measurements taken on the same day will be tabulated as shown in Table 1.

### **6.3 *Disposal of DPT Probe Cuttings and Wastewater***

Excess probehole cuttings will be spread in close proximity to the probeholes. Purge water will be discharged in close proximity to the sampling points. If necessary, development and purge water will also be containerized and removed to an off-site permitted facility. All soil and ground water shall be placed in DOT-approved containers and properly labeled prior to any shipment. Manifests will be prepared for all wastes if shipped from the site. Wastes generated as part of this investigation will be removed within 48 hours of obtaining the necessary clearances.

### **6.4 *Surveying***

Horizontal and vertical locations of all top of temporary observation wells will be surveyed in reference to mean sea level. DPT Probe locations will be surveyed utilizing Global Positioning System (GPS) to horizontal datum North American Datum (NAD) 83. Surveys will be supervised by a registered land surveyor.

## **7.0 SAMPLE COLLECTION METHODOLOGY**

The following sections describe the methods that will be utilized to collect soil and ground water samples for this project. All samples will be collected by personnel who are trained and experienced in sample collection procedures.

### **7.1 *DPT Soil Probe Sample and DPT Ground Water Sample Collection***

#### **7.1.1 DPT Soil Probe Sample Collection and Field Screening Methodology**

Field screening will be conducted during DPT soil probing to determine if organic vapors are present in the unsaturated zone and to identify areas of suspected near-surface releases. Soil samples for general site characterization will be obtained continuously from the probeholes

starting at 0.0 to 1.5 feet. A truck mounted high capacity hydraulic ram and hammer will obtain soil samples from a dual tube sampler. Soil samples will be described in the field by an engineer or geologist trained in using visual/manual techniques as described in ASTM D-2488-84. The soils will be classified in accordance with the Unified Soils Classification System (USCS). A boring record of each probehole will be produced. A sample boring log used for final presentation is provided in Appendix B.

Each sample will be removed from the probe sampler, divided into two foot sections, and placed in a pre-labeled, airtight, plastic bag. The bag will be left undisturbed for several minutes to allow the organic vapors to reach equilibrium. The gas contained in the headspace of the bag will be tested with a PID or an OVA. Bags will be immediately placed on ice pending selection of the appropriate laboratory sample depth. The laboratory samples will be taken from the interval exhibiting the highest PID/FID reading and the interval immediately above the water table. All soil samples will be sent to the off-site laboratory. No change in screening or instrumentation will occur during the site investigation in order to enhance consistency of results unless the equipment is damaged and/or needs replacement.

All soil samples collected for laboratory analyses will be immediately placed on ice. Soil will be collected and placed into containers in accordance with the type of analyses scheduled for that sample as follows:

<b>Analytical Method</b>	<b>Bottle Type and Size</b>	<b>Total Number of Bottles per Sample, On-Site/Off-Site</b>	<b>Preservative</b>
Halogenated and Aromatic Volatiles – EPA 8021	Glass/4 oz.	NA/1	<4°C
Oil & Grease – EPA 9071	Glass/4 oz.	NA/1	<4°C
TPH – EPA 5030/3550/8015	Glass/4 oz.	NA/1	<4°C
SVOC EPA 8270	Glass/4 oz.	NA/1	<4°C

NA = Not Applicable

See Section 8.0 for the specific type and quantity of analyses that will be conducted for this project.

### 7.1.2 DPT Ground Water Sample Collection

Ground water samples will be collected from each DPT sample location. All ground water samples will be immediately placed on ice and submitted to the off-site laboratory as described in Section 7.5.

Once the target probehole depth ( $\pm$  two feet soil saturation zone) is achieved, the DPT double tubes will be extracted and a 1-inch diameter PVC temporary well (two feet of casing, five feet of screen) will be installed in the borehole in order to obtain surficial ground water samples. Utilizing a GeoPump™ peristaltic pump, two to three gallons of ground water will be pumped from each temporary well prior to obtaining a representative surficial ground water sample. Ground water samples will be placed in the appropriate preserved and unpreserved clean glassware, labeled, and then kept on ice ( $<4^{\circ}\text{C}$ ) during the transportation to the analytical laboratory. All ground water samples will be transported with the appropriate COC and analyzed at Paradigm Analytical Laboratory of Wilmington, North Carolina.

The PVC wells will then be removed and each borehole will be backfilled with Benseal™ for proper abandonment of boreholes. New disposable Latex gloves will be used at each sample location. Ground water samples will be collected through the use of dedicated plastic tubing. Pump and sampling equipment will be decontaminated between each sampling location in order to mitigate the possibility of cross contamination.

Samples will be collected immediately upon purging of the well in accordance with the following procedures:

- Chemical preservatives, if applicable, will be added to sample bottles by the laboratory
- Sample bottles will be labeled prior to sample collection
- Sample bottles will be filled directly from the sampling collection tubing
- Caps will be secured on bottles
- Sample containers will be placed in plastic bags and the bags sealed

All monitoring well ground water samples collected for laboratory analyses will be immediately placed on ice. Ground water will be collected and placed into containers in the following order based upon the type of laboratory analyses scheduled for that sample:

Analytical Method	Bottle Type and Size	Total Number of Bottles per Sample Off-Site Lab	Preservative
EPA 602	Clear Glass Vial/ 40 ml	20	HCl
EPA 601	Clear Glass Vial/ 40 ml	22	H <sub>2</sub> SO <sub>4</sub>
EPA 625 + 10 TICs	Amber Glass Jar/ 1 Liter	2	<4°C
EPA 239.2	Plastic/500 ml	1	HNO <sub>3</sub>
EPA 504.1	Clear Glass Vial/ 40 ml	2	NA <sub>2</sub> S <sub>2</sub> O <sub>3</sub>

See Section 8.0 for the specific type and quantity of analyses that will be conducted for this project.

### 7.2 *Sample Identification*

Prior to collecting each soil and ground water sample, sample bottles will be labeled with the following information:

- Date and time of sample collection
- Project identification number
- Sample location number
- Initials of person collecting sample
- Type of preservative added to sample
- Parameter(s) or parameter group to be analyzed

Additional specific information, such as sampling interval, may be added. The sample location number on the label will correspond to the sample location numbers assigned on the field site map.

### 7.3 *Chain of Custody and Transportation Procedures*

Chain of Custody (COC) procedures will be followed to establish documentation of sample possession from the time of collection until completion of analysis for the laboratory. As few people as possible will handle the sample(s). The sampler will be responsible for the care and custody of the samples until they are dispatched for shipment to the off-site laboratory. An accurate record of sample collection, transport, and analysis will be maintained and documented. A sample COC record is provided in Appendix B.

The COC Record will be used by personnel responsible for ensuring the integrity of samples from the time of collection to shipment to the off-site laboratory. The laboratory will not proceed with sample analysis without a correctly prepared COC Record and Analytical Request Form. The laboratory will be responsible for maintaining COC of the sample(s) from time of receipt to disposal. COC procedures will be instituted and followed throughout the investigation.

The COC Record will be signed by each individual who has maintained custody of the samples. General preparation of the COC Record for samples to be delivered to the off-site laboratory will be as follows:

- Samples will be accompanied by a COC Record at all times
- The COC Record will be initiated in the field by the person collecting the samples. Every sample will be assigned a unique identification number as described in Section 7.4 that is entered on the COC Record
- The Record will be completed in the field identifying the project, sampler, CATLIN assigned project number, etc.
- If the person collecting the sample does not transport the samples to the laboratory or deliver the sample containers for shipment, the first block for “Relinquished By \_\_\_\_\_” will be signed by the sampler.
- The person transporting the samples to the laboratory or delivering them for shipment will sign the Record as “Relinquished By \_\_\_\_\_.”

#### 7.3.1 Off-Site Laboratory

Collected soil and ground water samples will be transported within established holding times to Paradigm Analytical Laboratories, Inc. in Wilmington, North Carolina. Prior to the start of the field investigation, necessary arrangements will be made with the laboratory to assure proper and prompt delivery and log in of the collected samples. Shipment and COC procedures are as follows:

- Samples will be packed properly for shipment so that bottles will not dislodge and/or break. The samples will be kept cool using either ice packs or ice in zip-lock bags.
- The COC record will be sealed in a watertight container and placed in the shipping container.
- The courier will double check the contents of the shipping container to assure that the samples are properly packed and the COC inventory is correct.

## 7.4 *Equipment Decontamination*

Equipment decontamination sites will be established by the MCAS Environmental personnel prior to the initiation of assessment activities.

### 7.4.1 Direct Push Technology Site Assessment Vehicle (DPTSAV) and Drilling Rig

The DPTSAV and drilling rig will be cleaned in accordance with the following guidelines:

- DPTSAV, drilling rig, and all support equipment will be cleaned of excess grease, oils and caked-on soil prior to arrival at the site. Equipment which leaks fuel, coolant, or lubricants will not be used on site.
- Equipment such as pumps and pump lines will be flushed thoroughly with potable water prior to use.

### 7.4.2 Soil and Ground Water Sample Collection Equipment

Disposable pump tubing used for ground water sampling will be disposed of after the sampling of each well.

DPT equipment, sample probes, submersible well development pump equipment, and other sample collection equipment will be decontaminated between sample events as follows:

- Tap water rinse
- Wash with phosphate-free detergent and tap water using a brush to remove any particulate matter or surface film
- Tap water rinse
- Rinse thoroughly with distilled water
- Rinse with isopropanol
- Allow to air dry or rinse with distilled water
- Wrap completely with aluminum foil and seal in airtight plastic bags or place on clean plastic if planned for immediate reuse

Hollow stem augers, rods, and other drilling equipment if required will be decontaminated between borings as follows:

- High temperature and pressure water rinse

- If any noticeable petroleum hydrocarbon film is present, wash with phosphate-free detergent and tap water using a brush
- High temperature and pressure tap water rinse
- Allow to air dry
- Place on and cover with clean plastic until next use

#### 7.4.3 Rinsate Sample Collection Methodology

A rinsate water sample will be collected for QA/QC purposes. Water from the same brand or batch of distilled water that is used in the decontamination process outlined above will be used to pour over previously decontaminated sampling equipment. The rinsate water will be collected in the sample bottles. The collected samples will be analyzed in accordance with the parameters listed in Section 8.0 to confirm that equipment decontamination is being conducted adequately and that no cross contamination is occurring between sample locations. If the rinsate samples detect any contamination, a sample of the source rinsate water will be collected and analyzed for the same laboratory parameters.

## 8.0 SAMPLE ANALYSIS

All samples collected during the investigation will be analyzed by the off-site laboratory. The analytical methods for this project are outlined below and summarized in Table 2, 3, and 4 for the off-site laboratory.

### 8.1 *Off-Site Laboratory*

Samples will be analyzed at Paradigm Analytical Laboratories, Inc. in Wilmington, North Carolina. Analytical methods for soils include TPH (EPA Methods 5030/3550/8015), EPA Method 9071, EPA Method 8260, and EPA Method 8270. Ground water samples will be analyzed for purgeable halocarbons (EPA Method 601), purgeable aromatics (EPA Method 602), base/neutrals (EPA Method 625 + 10 TICs), and total lead (EPA Method 3030C/239.2). The number and type of samples to be analyzed and the types of analyses to be conducted are summarized in Tables 2, 3, and 4.

## 9.0 EVALUATION OF ASSESSMENT DATA

An evaluation of the assessment monitoring data will be performed to establish and map the spatial boundaries of contaminant plume(s). Accomplishment of this objective will aid in: (1) identifying contaminant source area(s), migration pathways, and potential receptors; and, if necessary, (2) establishing a basis for additional assessment if required.

The initial step in the evaluation process involves data reduction. Analytical results will be reviewed and mapped to their respective sample locations. The following data will be presented in tabular form:

- Sampling point identification number (or quality control designation)
- Sampling date
- Practical quantitation limit
- Reported concentration
- Reported approximate concentration, if below practical quantitation limit

A quantitative ranking of constituent concentration/sampling point combination will be performed to identify likely source areas, delineate the approximate boundaries of the contamination plume, and establish concentration gradients of detected contaminants within the plume. Based on these results, horizontal limits of the plume area(s) and contaminant isopleth contours will be calculated for the project area.

## **10.0 PROJECT SCHEDULE**

A schedule for implementation of the Assessment Workplan, along with appropriate milestones, is exhibited in Appendix C. Where possible, one drill rig and Site Manager will be dedicated to the site throughout all of its phases of investigation.

## 11.0 REFERENCES

- Federal Register Vol. 49, No. 209, 40 CFR Part 136, Test Procedures for the Analysis of Pollutants Under the Clean Water Act, October 26, 1984.
- Harris, W.B., Zullo, V.A. and Baum, G.R., 1979, Tectonic Effects on Cretaceous, Paleogene, and Early Neogene Sedimentation, North Carolina: Carolina Geological Society and Atlantic Coastal Plain Geological Association Field Trip Guidebook, October 19-21, p. 17-29.
- Law Engineering, October 5, 1994, Leaking Underground Storage Tank Site Assessment Report, Tank 7012 Marine Corps Outlying Landing Field, Atlantic, North Carolina.
- Law Engineering, June, 1995, Leaking Underground Pipeline Site Assessment Report, Building 130 Marine Corps Air Station, Cherry Point, North Carolina.
- Law Engineering, March, 1996, Addendum Comprehensive Site Assessment Report, Building 130, Marine Corps Air Station, Cherry Point, North Carolina.
- Law Engineering, January 1997, Corrective Action Plan For the Recovery of Free Product and the Restoration of Petroleum Contaminated Soil and Groundwater, Building 130, Building 3996 and Pit 4 Area, Marine Corps Air Station, Cherry Point, North Carolina.
- Solid Waste Section, North Carolina Department of Environmental, Health and Natural Resources, North Carolina Water Quality Monitoring Guidance Document for Solid Waste Facilities, Document No. SW-1001-87, 1987.
- Todd D.K., 1980, Groundwater Hydrology, John Wiley & Sons, New York, 535 pp.
- United States Environmental Protection Agency (USEPA), 1985. Water Quality Assessment: A Screening Procedure for Toxic and Conventional Pollutants in Surface and Groundwater - Parts I & II, Environmental Research Laboratory, Office of Research and Development, Athens, Georgia.
- United States Environmental Protection Agency, 1986. Test Methods for Evaluating Solid Wastes (SW-846), 3rd Edition, Vol. II, Office of Solid Waste, Washington, DC.

## TABLES



**TABLE 2**

**Sample Analysis Summary Table/Off-Site Laboratory – (Site 1) : *Atlantic Field Hydrant Site***

DATA POINTS	Total Analysis Quantity									
	Number of Sample Locations	Soil (EPA Method)				Water (EPA Method)				Total Lead 239.2
		TPH 5030/5330	TPH 9071	EPA 8260	EPA 8270	601	602	625	504.1	
Temporary Well	3	-	-	-	-	-	-	-	-	-
Hand Auger	3	-	-	-	-	-	-	-	-	-
DPT Probe	20	40	40	-	-	20	20	20	20	20
Duplicate	-	4	4	-	-	2	2	2	2	2
Trip Blank	-	-	-	-	-	-	-	1	-	-
Waste Soil	-	-	-	-	-	-	-	-	-	-
Waste Water	-	-	-	-	-	-	-	-	-	-
<b>Total Samples</b>	-	44	44	-	-	22	23	22	22	22

**TABLE 3**

**Sample Analysis Summary Table/Off-Site Laboratory – (Site 2): *Cherry Point Hydrant Site***

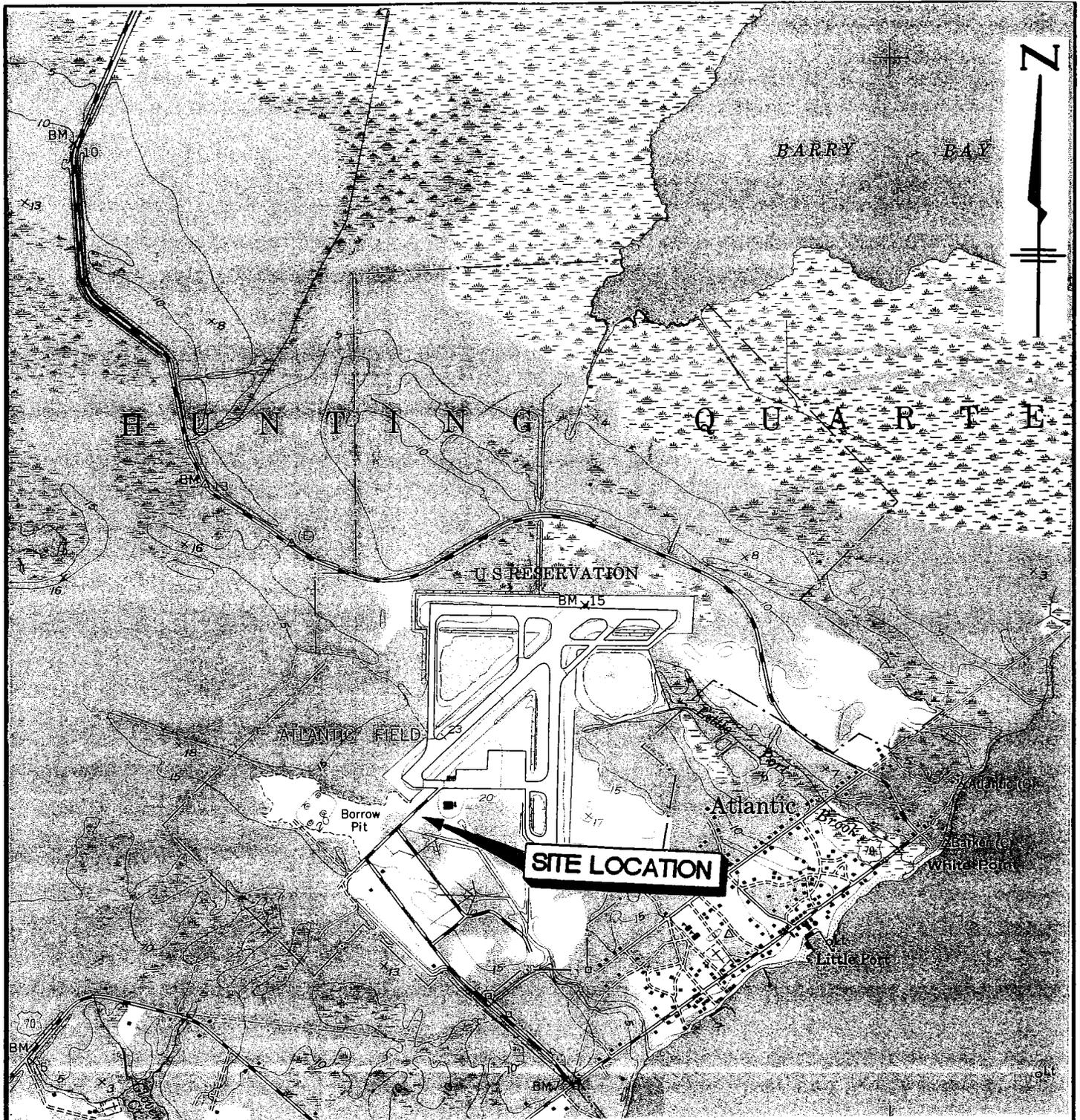
<b>DATA POINTS</b>	<b>Total Analysis Quantity</b>									
	<b>Number of Sample Locations</b>	<b>Soil (EPA Method)</b>				<b>Water (EPA Method)</b>				
		<b>TPH 5030/5330</b>	<b>TPH 9071</b>	<b>EPA 8260</b>	<b>EPA 8270</b>	<b>601</b>	<b>602</b>	<b>625</b>	<b>504.1</b>	<b>Total Lead 239.2</b>
DPT Probe	40	-	-	80	80	40	40	40	40	40
Duplicate	-	-	-	8	8	4	4	4	4	4
Trip Blank	-	-	-	1	-	-	1	-	-	-
Waste Soil	-	-	-	-	-	-	-	-	-	-
Waste Water	-	-	-	-	-	-	-	-	-	-
<b>Total Samples</b>	-	-	-	89	88	44	45	44	44	44

**TABLE 4**

**Sample Analysis Summary Table/Off-Site Laboratory – (Site 3): *MWSS Old Refuelers Site***

<b>DATA POINTS</b>	<b>Number of Sample Locations</b>	<b>Total Analysis Quantity</b>								
		<b>Soil (EPA Method)</b>				<b>Water (EPA Method)</b>				
		<b>TPH 5030/5330</b>	<b>TPH 9071</b>	<b>EPA 8260</b>	<b>EPA 8270</b>	<b>601</b>	<b>602</b>	<b>625</b>	<b>504.1</b>	<b>Total Lead 239.2</b>
DPT Probe	15	30	30	-	-	15	15	15	15	15
Duplicate	-	3	3	-	-	1	1	1	1	1
Trip Blank	-	-	-	-	-	-	1	-	-	-
Waste Soil	-	-	-	-	-	-	-	-	-	-
Waste Water	-	-	-	-	-	-	-	-	-	-
<b>Total Samples</b>	-	33	33	-	-	16	17	16	16	16

## **FIGURES**

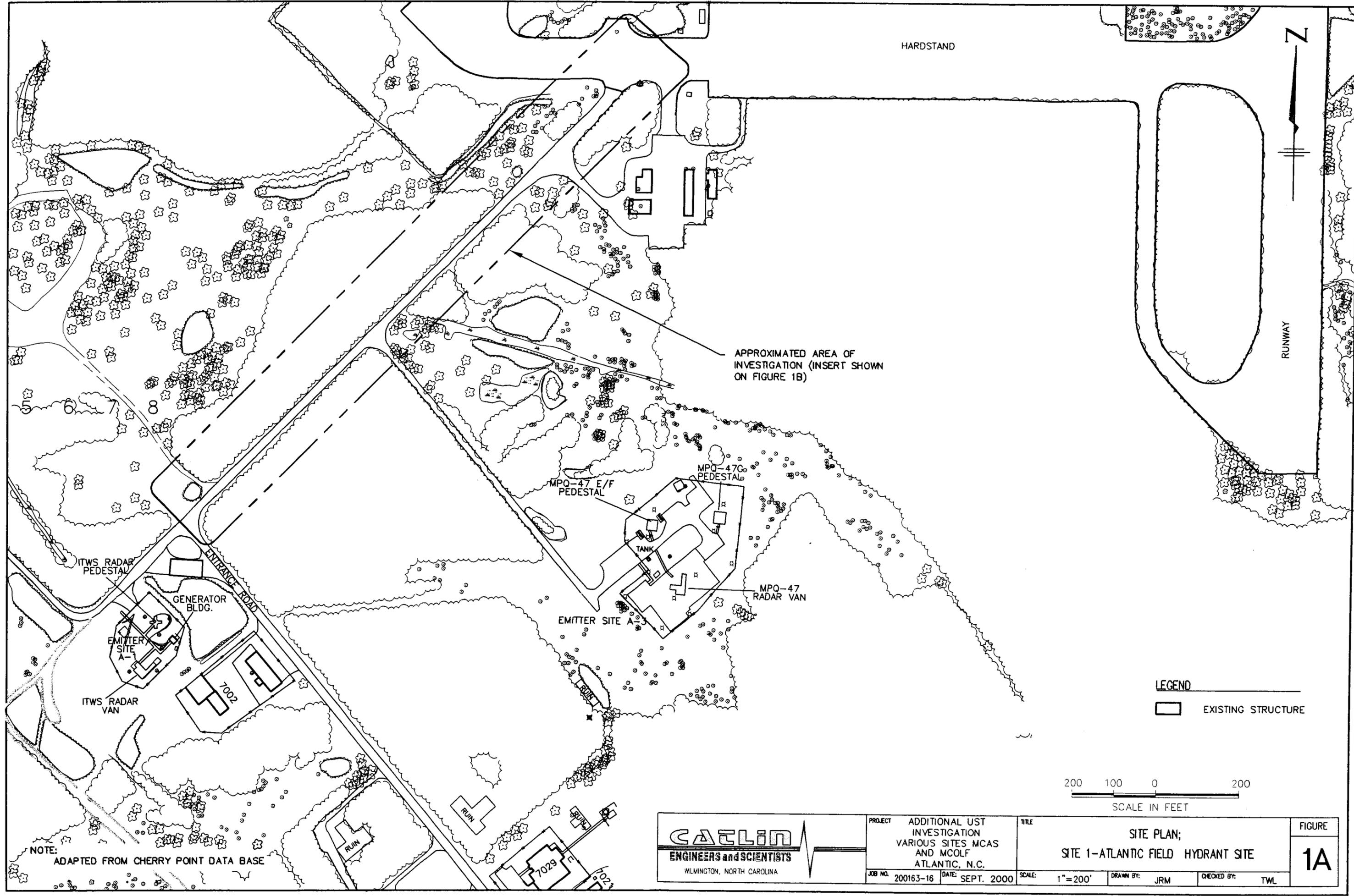


2000 1000 0 2000

SCALE IN FEET

FROM: USGS ATLANTIC, N.C. TOPOGRAPHIC QUADRANGLE DATED 1949

 WILMINGTON, NORTH CAROLINA	PROJECT ADDITIONAL UST INVESTIGATION VARIOUS SITES MCAS AND MCOLF ATLANTIC, N.C.	TITLE GENERAL LOCATION USGS TOPOGRAPHIC QUADRANGLE SITE 1 ATLANTIC FIELD HYDRANT SITE	FIGURE 1
	JOB NO: 200163-16    DATE: SEPT. 2000	SCALE: 1" = 2000'	DRAWN BY: CJ    CHECKED BY: TWL



HARDSTAND



RUNWAY

APPROXIMATED AREA OF INVESTIGATION (INSERT SHOWN ON FIGURE 1B)

MPQ-47 E/F PEDESTAL  
 MPQ-47C PEDESTAL  
 TANK  
 MPQ-47 RADAR VAN  
 EMITTER SITE A-3

ITWS RADAR PEDESTAL  
 GENERATOR BLDG.  
 EMITTER SITE A-1  
 ITWS RADAR VAN  
 7002

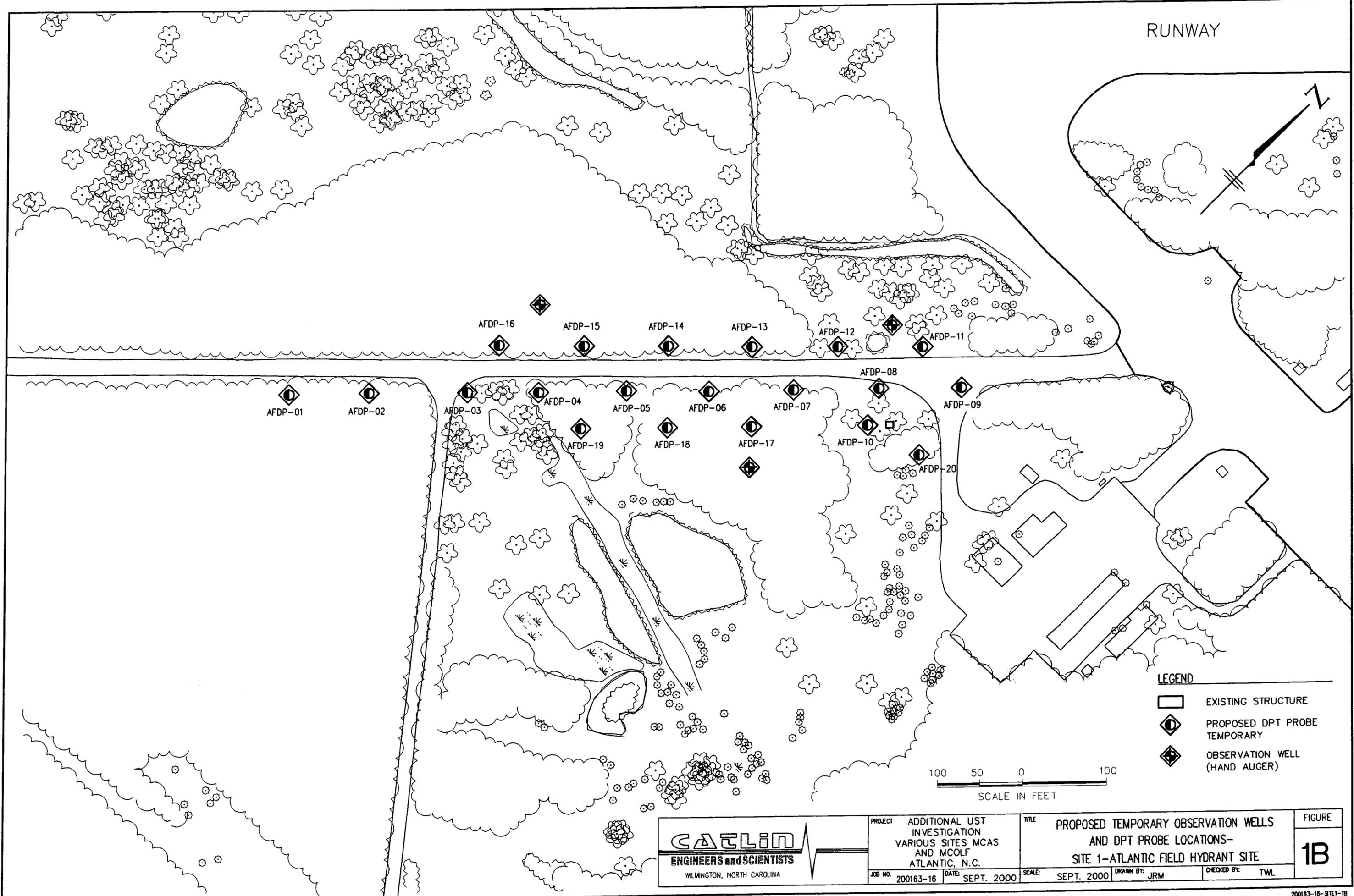
ENTRANCE ROAD

LEGEND  
 [Symbol: Rectangle] EXISTING STRUCTURE

200 100 0 200  
 SCALE IN FEET

NOTE:  
 ADAPTED FROM CHERRY POINT DATA BASE

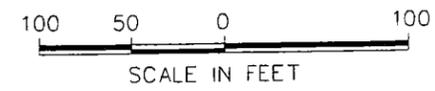
 <b>CAELIN</b> ENGINEERS and SCIENTISTS WILMINGTON, NORTH CAROLINA	PROJECT ADDITIONAL UST INVESTIGATION VARIOUS SITES MCAS AND MCOLF ATLANTIC, N.C.	TITLE SITE PLAN; SITE 1-ATLANTIC FIELD HYDRANT SITE		FIGURE <b>1A</b>
	JOB NO. 200163-16	DATE: SEPT. 2000	SCALE: 1"=200'	DRAWN BY: JRM CHECKED BY: TWL



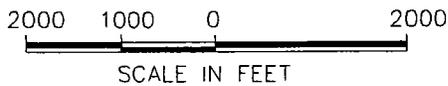
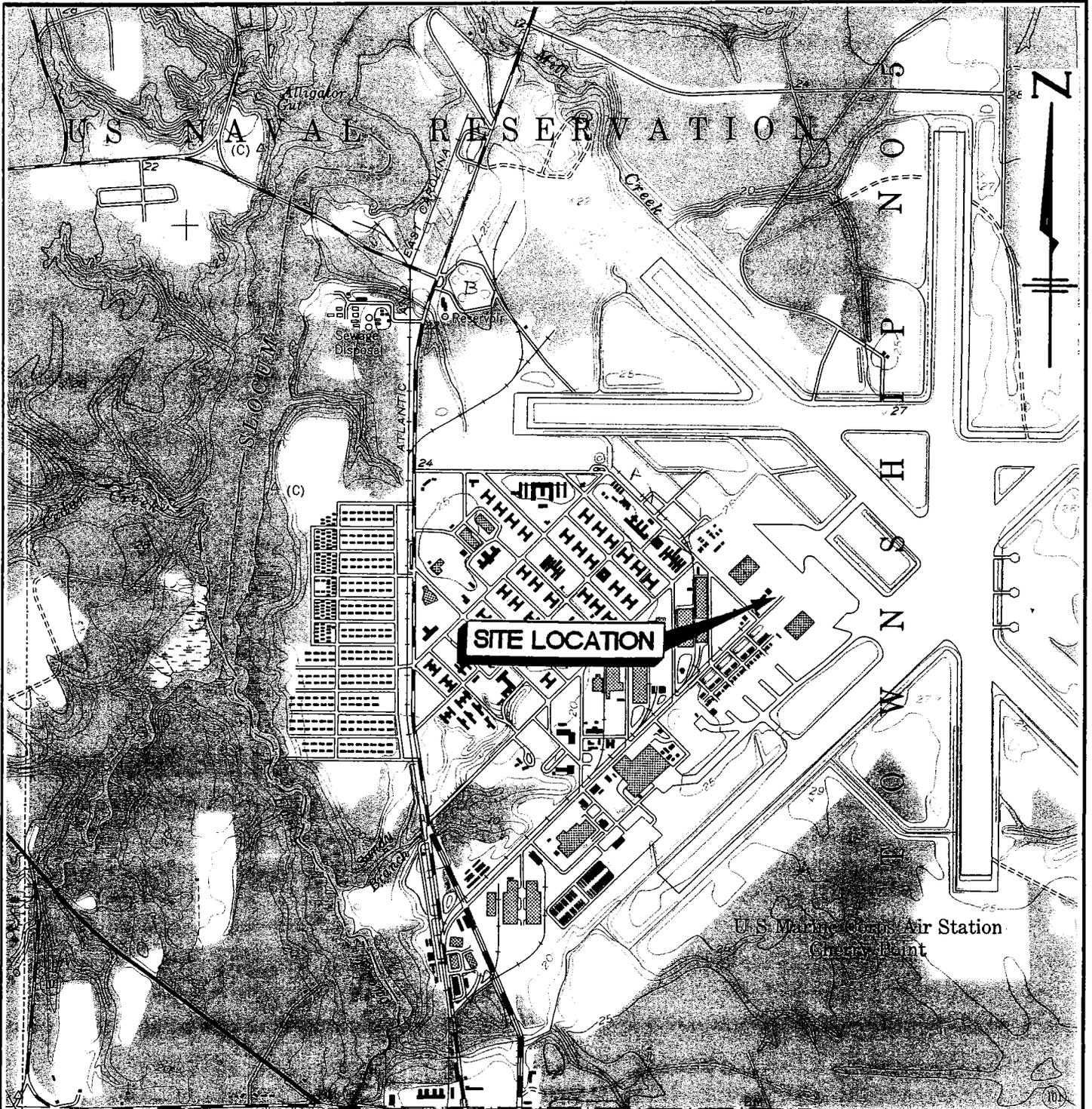
RUNWAY

**LEGEND**

-  EXISTING STRUCTURE
-  PROPOSED DPT PROBE TEMPORARY
-  OBSERVATION WELL (HAND AUGER)

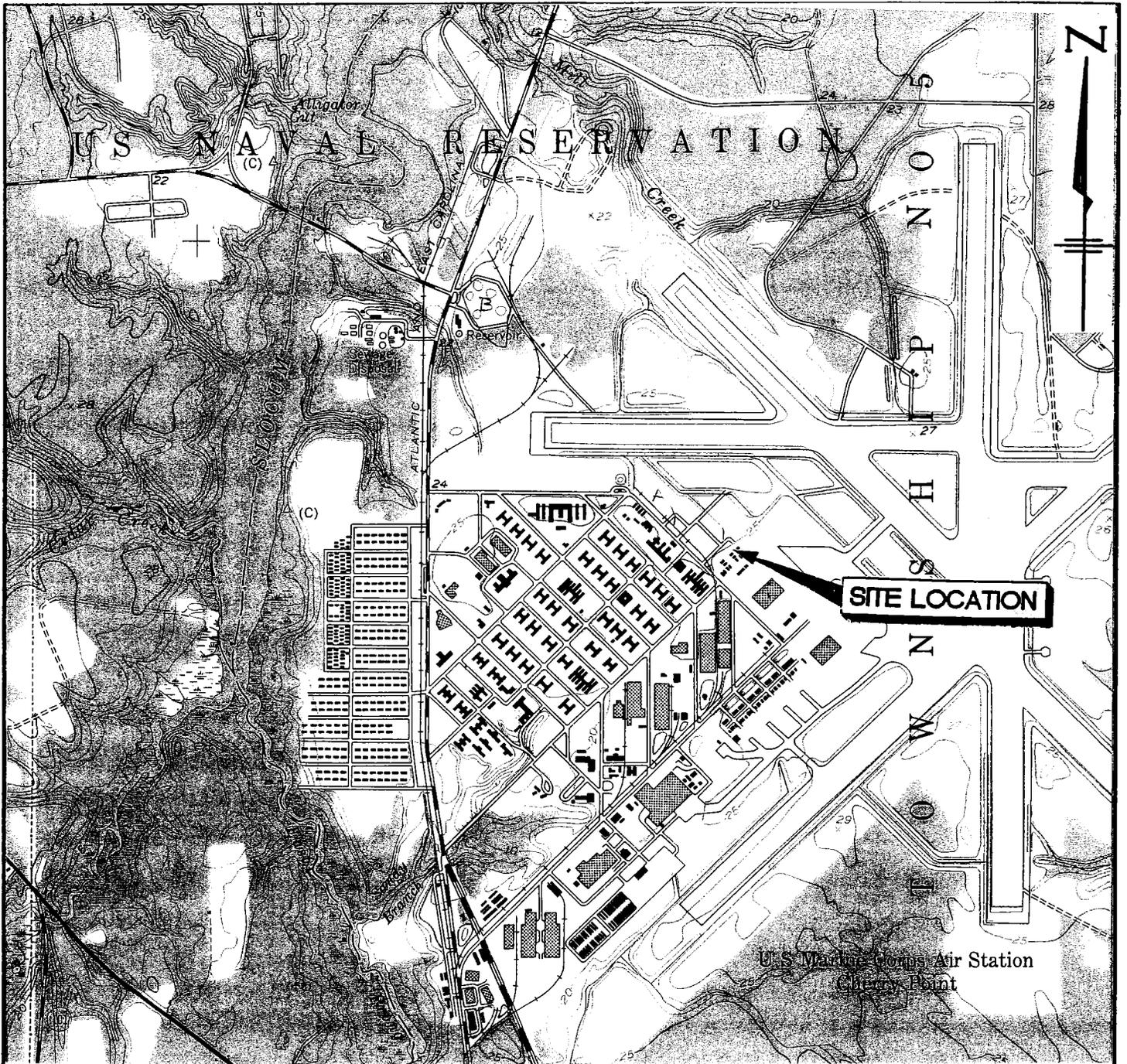


 <b>CAELIN</b> ENGINEERS and SCIENTISTS WILMINGTON, NORTH CAROLINA	PROJECT: ADDITIONAL UST INVESTIGATION VARIOUS SITES MCAS AND MCOLF ATLANTIC, N.C.	TITLE: PROPOSED TEMPORARY OBSERVATION WELLS AND DPT PROBE LOCATIONS- SITE 1-ATLANTIC FIELD HYDRANT SITE	FIGURE: 1B
	JOB NO.: 200163-16    DATE: SEPT. 2000	SCALE: SEPT. 2000    DRAWN BY: JRM    CHECKED BY: TWL	



FROM: USGS HAVELOCK, N.C. TOPOGRAPHIC QUADRANGLE DATED 1949

 WILMINGTON, NORTH CAROLINA	<b>PROJECT</b> ADDITIONAL UST INVESTIGATION VARIOUS SITES MCAS AND MCOLF CHERRY POINT, N.C.	<b>TITLE</b> GENERAL LOCATION USGS TOPOGRAPHIC QUADRANGLE SITE 1-CHERRY POINT HYDRANT SITE	<b>FIGURE</b> 2
	<b>JOB NO:</b> 200163-19 <b>DATE:</b> SEPT. 2000	<b>SCALE:</b> 1" = 2000'	<b>DRAWN BY:</b> CJ <b>CHECKED BY:</b> TWL

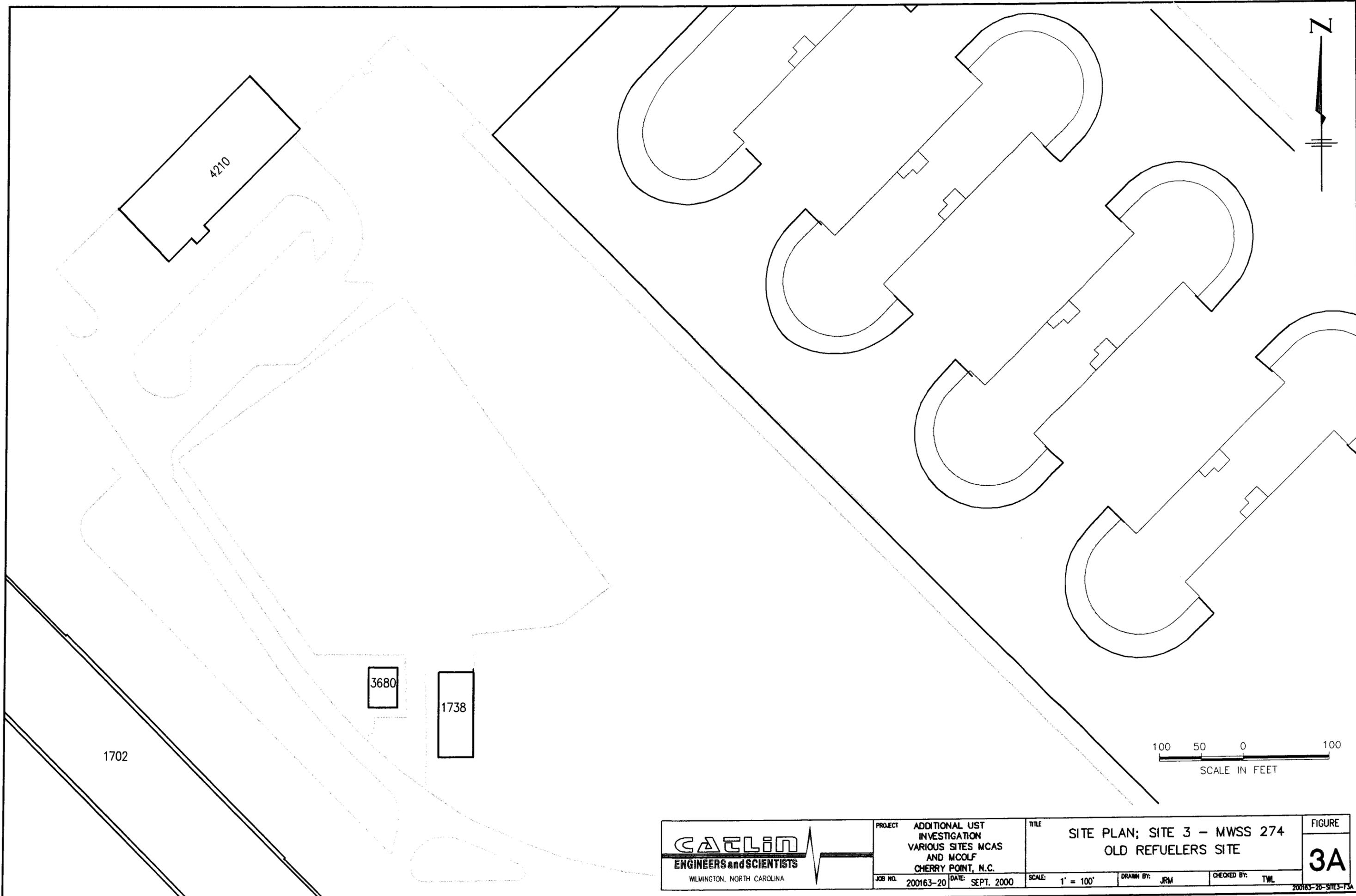


2000 1000 0 2000

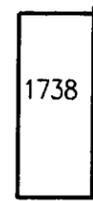
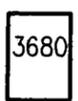
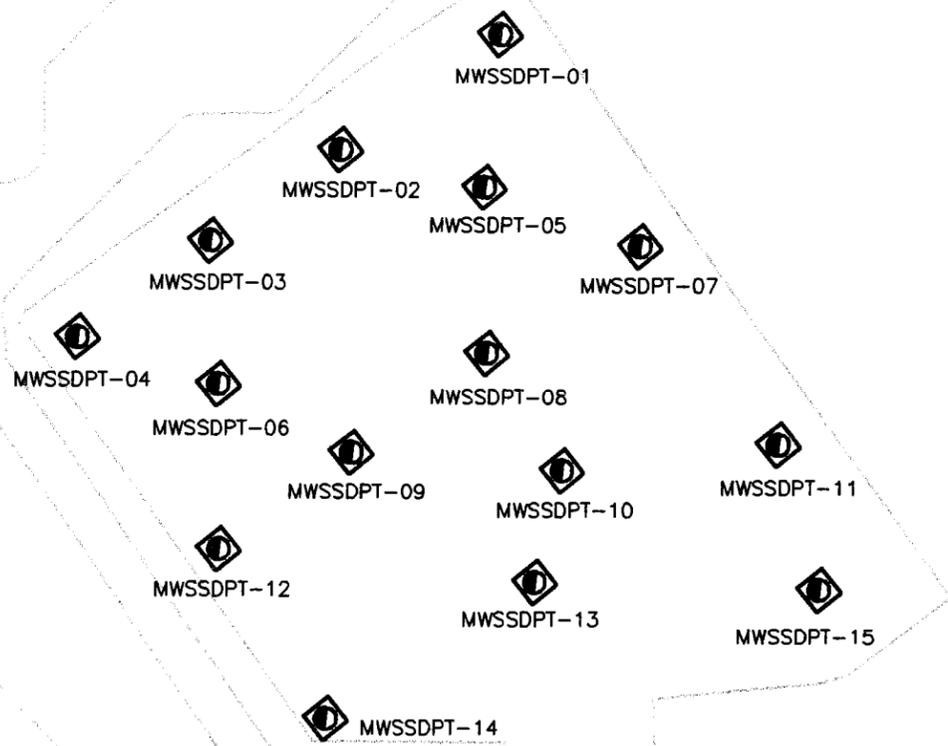
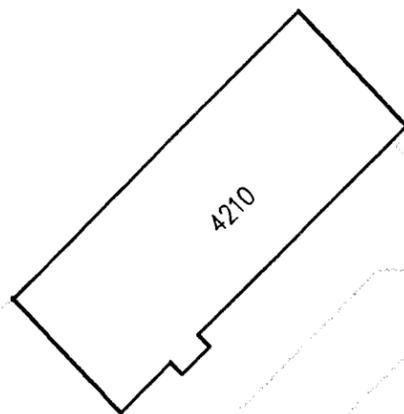
SCALE IN FEET

FROM: USGS HAVELOCK, N.C. TOPOGRAPHIC QUADRANGLE DATED 1949

 <b>ENGINEERS and SCIENTISTS</b> WILMINGTON, NORTH CAROLINA	<b>PROJECT</b> ADDITIONAL UST INVESTIGATION VARIOUS SITES MCAS AND MCLF CHERRY POINT, N.C.	<b>TITLE</b> GENERAL LOCATION USGS TOPOGRAPHIC QUADRANGLE SITE-3 MWSS 274 OLD REFUELERS SITE	<b>FIGURE</b> <div style="font-size: 2em; text-align: center;">3</div>	
	<b>JOB NO:</b> 200163-20	<b>DATE:</b> SEPT. 2000	<b>SCALE:</b> 1"=2000'	<b>DRAWN BY:</b> CJ



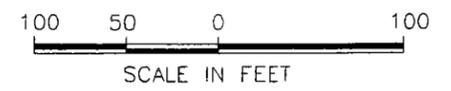
 <b>CAELIN</b> ENGINEERS and SCIENTISTS WILMINGTON, NORTH CAROLINA	PROJECT ADDITIONAL UST INVESTIGATION VARIOUS SITES MCAS AND MCOLF CHERRY POINT, N.C.	TITLE SITE PLAN; SITE 3 - MWSS 274 OLD REFUELERS SITE	FIGURE <b>3A</b>
	JOB NO. 200163-20    DATE: SEPT. 2000	SCALE: 1" = 100'	DRAWN BY: JRM    CHECKED BY: TWL



1702

LEGEND

-  EXISTING BUILDING
-  PROPOSED DPT LOCATION



NOTE: ADAPTED FROM CHERRY POINT DATA DASE

 ENGINEERS and SCIENTISTS WILMINGTON, NORTH CAROLINA	PROJECT	ADDITIONAL UST INVESTIGATION VARIOUS SITES MCAS AND MCOLF CHERRY POINT, N.C.	TITLE	PROPOSED DPT PROBE LOCATIONS; SITE-3 MWSS 274 OLD REFUELERS SITE	FIGURE	3B			
	JOB NO.	200163-20	DATE	SEPT. 2000	SCALE	1' = 100'	DRAWN BY	JRM	CHECKED BY

## **APPENDICES**

**APPENDIX A**

**SITE SPECIFIC HEALTH AND SAFETY PLAN**

**PETROLEUM HYDROCARBON  
SITE SPECIFIC HEALTH & SAFETY PLAN**

**PREPARED FOR:  
ADDITIONAL UST INVESTIGATION  
VARIOUS SITES  
MARINE CORPS AIR STATION  
SITE 1 – ATLANTIC FIELD HYDRANT SITE  
SITE 2 – CHERRY POINT HYDRANT SITE  
SITE 3 – MWSS 274 OLD REFUELERS SITE  
CHERRY POINT AND ATLANTIC, NORTH CAROLINA**

**PREPARED BY:  
CATLIN ENGINEERS AND SCIENTISTS**

**PREPARATION DATE:  
SEPTEMBER 21, 2000  
CATLIN PROJECT NO.: 200-163**

COPIES TO: _____	DATE: _____

The undersigned have read the Site Specific Health and Safety Plan and are familiar with its provisions:

<u>Signature</u>	<u>Date</u>	<u>Signature</u>	<u>Date</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

AMENDMENTS/REVISIONS MUST BE APPROVED BY PLAN AUTHOR PRIOR TO IMPLEMENTATION OF EACH AMENDMENT.

AMENDMENT NUMBER	EFFECTIVE DATE	SUBJECT
_____	_____	_____
_____	_____	_____

APPROVED: Teri M. Piver DATE: 09/21/2000  
**Health & Safety Manager**

PLAN AUTHOR: Tom Landis DATE: 09/21/2000

**PETROLEUM HYDROCARBON  
SITE SPECIFIC HEALTH & SAFETY PLAN  
ADDITIONAL UST INVESTIGATIONS**

**MARINE CORPS AIR STATIONS  
CHERRY POINT AND ATLANTIC, NORTH CAROLINA  
SEPTEMBER 21, 2000**

**1.0 INTRODUCTION**

This section of the Site Health and Safety Plan (HASP) document defines general applicability and general responsibilities with respect to compliance with Health and Safety programs.

**1.1 Scope and Applicability of the Site Health & Safety Plan**

The purpose of this Site Health and Safety Plan is to define the requirements and designate protocols to be followed at the Site during investigation and remediation activities. Applicability extends to all employees, contractors, and subcontractors.

All personnel on site, contractors and subcontractors included, shall be informed of the emergency response procedures and any potential fire, explosion, health, or safety hazards of the operation. This HASP summarizes these hazards and defines protective measures planned for the site.

This plan must be reviewed and an agreement to comply with the requirements must be signed by all personnel prior to entering the exclusion zone or contamination reduction zone.

During development of this plan consideration was given to current safety standards as defined by Environmental Protection Agency/Occupational Safety and Health Administration/National Institute of Occupational Safety and Health (EPA/OSHA/NIOSH), health effects and standards for known contaminants, and procedures designed to account for the potential for exposure to unknown substances. Specifically, the following reference sources have been consulted:

- OSHA 29 CFR 1910.120 and EPA 40 CFR 311
- U.S. EPA, Office of Emergency and Remedial Response, Environmental Response Team (OERR ERT) Standard Operating Safety Guidelines
- NIOSH/OSHA/USCG/EPA Occupational Health and Safety Guidelines
- American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values
- U. S. EPA OERR ERT, Health and Safety Plan (HASP), version 3.0

## 2.0 PROJECT ORGANIZATION/KEY PERSONNEL:

The following personnel are designated to carry out the stated job functions. (Note: One person may carry out more than one job function.)

CATLIN Program Manager: Michael E. Mason  
CATLIN Safety Manager: Teri Piver  
CATLIN Field Team Leader: Tom Landis  
CATLIN Field Team Members: Ben Ashba, Shawn Carroll, Johli Carscallen, Rick Catlin, Shane Chasteen, Bobbie Fowler, Steve Hudson, Chris Jolly, Tom Landis, Mike E. Mason, Mike D. Mason, Bill Miller, Teri Piver, Steve Tyler, Jake Wessel, Keith Yeoman.

CATLIN Public Information Manager: Rick Catlin/Mike E. Mason  
Security Officer: Not applicable  
Subcontractors: Waste Industries, Riggs Surveyors, McGill Environmental Systems of NC, Mid Atlantic Drilling, and Paradigm Laboratories.

## 3.0 SITE CHARACTERIZATION:

3.1 Location:  
(Refer to Figures 1, 2 and 3)

Site 1: Atlantic Field Hydrant Site  
Marine Corps Outlying Landing Field  
Atlantic, North Carolina

Site 2: Cherry Point Hydrant Site  
Marine Corps Air Station  
Cherry Point, North Carolina

Site 3: MWSS 274 Old Refuelers Site  
Marine Corps Air Station  
Cherry Point, North Carolina

3.2 Type/Description of Site:  
(Refer to Figure 1A, 2A and 3A)

The focus of the investigation is to begin assessing potential impact to soil and ground water related to historical refueling activities. The sites are located in close proximity to active Marine Corps flightlines.

3.3 Activities Performed on Site Prior to Investigation/Cleanup:

Previous investigations have been conducted by others at sites in the general vicinity of the current planned assessment activities. The previously investigated sites in the vicinity of the project area indicates impacts to both soil and groundwater have been documented and corrective action plans submitted.

3.4 Unusual Features (Containers, Buildings, Dikes, Power Lines, Terrain, Bodies of Water, etc.):

Above and below ground utilities may be present, work is primarily at active flightlines.

3.5 Results of Previous Surveys:

Results of the subsurface investigations at sites in the vicinity of the project area revealed petroleum hydrocarbon concentrations in excess of State ground water standards and soil action levels. Free product was detected in a number of monitoring wells in the general vicinity of the project area.

3.6 Waste Types (Liquid, Solid, Gas Vapor):

Potential for petroleum impacted soil, ground water, and/or vapors.

3.7 Characteristics:

Toxic X Flammable/Volatile X Reactive \_\_\_\_  
Radioactive \_\_\_\_ Corrosive \_\_\_\_ Ignitable X  
Biological Agent \_\_\_\_ Combustible X

3.8 Hazard Evaluation:

3.8.1 *Chemicals (known or suspected):*  
*(Refer to Appendix I)*

CHEMICAL	PEL	STEL	IDLH
Benzene	1 ppm	5 ppm	CARC
Toluene	200 ppm	150 ppm	2000 ppm
Ethylbenzene	100 ppm	125 ppm	2000 ppm
Xylenes	100 ppm	150 ppm	1000 ppm
Naphthalene	10 ppm	15 ppm	500 ppm
JP-5	NE	NE	NE
TPH	NE	NE	NE

Notes: PEL- Permissible Exposure Limit, STEL- Short Term Exposure Limit, IDLH-Immediately Dangerous to Life and Health  
NE- No evidence a standard has been established, ppm- parts per million, CARC-Carcinogen

### 3.8.2 Task Specific Physical Hazards

Hazards at the site may be associated with several job tasks detailed in the site workplan. Listed below are summaries for the hazards associated with each of the tasks.

#### Task Site Reconnaissance/Surveying

##### *Chemical*

- Ingestion of contaminated material from hand to mouth contact.

##### *Physical/Environmental*

- Slips/trips/falls-sloped, uneven terrain.
- Skin irritation from contact with insects and vegetation.
- Interaction with native and potentially hostile animal life.
- Thermal stress.
- Vehicular traffic.

#### Task DPT Probes/Temporary Monitoring Well Installation

##### *Chemical*

- Potentially-contaminated mud, etc. in eyes and on skin.
- Contact with potentially contaminated material.
- Ingestion of potentially contaminated material from hand to mouth contact.
- Inhalation of volatile or semivolatile contaminants.
- Inhalation of fumes (carbon monoxide) from DPT rig.

##### *Physical/Environmental*

- Heavy objects landing on foot/toe or head.
- Elevated noise levels from heavy equipment operation.
- Slips/trips/falls-sloped, uneven terrain.
- Skin irritation from contact with insects and vegetation.
- Overhead hazards, moving parts, and high pressure hydraulic lines from DPT rig operations.
- Underground/above ground utilities.
- Lifting hazards.
- Thermal stress.
- Vehicular traffic.

#### Task DPT/Monitoring Well Sampling/Monitoring

##### *Chemical*

- Skin contact with potentially contaminated water.
- Eye contact from splashing water.
- Ingestion of potentially contaminated materials from hand to mouth contact.
- Inhalation of volatile compounds emitting from the well opening.

#### *Physical/Environmental*

- Skin irritation from contact with insects and vegetation.
- Lifting hazards (bailers, pumps, generators).
- Cuts from using knives to cut bailer rope.
- Slips/trips/falls-sloped, uneven terrain.
- Thermal stress.
- Vehicular traffic.
- Electrical hazards associated with use of electrical equipment around water or wet surfaces.

### 3.8.3 *General Physical Hazards*

#### Confined Space Entry

It is not anticipated that there will be a need for a confined space entry procedure during the site activities. However, confined space entry procedures may have to be implemented if a "permit required confined space" (as defined by OSHA) has the following characteristics:

- Contains or has known potential to contain a hazardous atmosphere.
- Has limited or restricted means of entry.
- Is large enough that an employee can bodily enter and perform work,
- Contains material with potential for engulfment.
- Contains any other recognized serious safety or health hazard.

Before any operation is to be performed in a confined space, the Safety Manager must be contacted. Procedures are detailed in Appendix II.

#### Thermal Stress/Cold Stress

Provisions for monitoring heat stress and/or cold stress are detailed in Appendix III.

#### Explosion and Fire

In general, the following items present potential physical hazards and will be monitored closely.

- Explosion and fire resulting from:
  - Heavy equipment malfunction
  - Penetration into underground utilities
  - Ignition of trapped flammable vapors
  - Vehicular accidents

### Noise

Excessive noise levels may be produced during equipment operation or as a result of air traffic. Depending on the length and duration of these activities, hearing protective devices may be required.

### Radiation Hazards

Radiation hazards are not anticipated during site activities; therefore, radiation monitoring is not required.

### Hazardous Flora

Contact by individuals with poisonous/thorny plants is possible. Bare skin should be covered as much as is practical when working in forested areas. Rashes and other injuries should be reported to the Safety Manager as soon as they are known.

### Hazardous Fauna

All animal life should be treated with respect. Without proper training, individuals may not be able to differentiate between dangerous and non-dangerous species.

Insects such as mosquitoes and gnats pose a nuisance and physical hazard to field personnel. As a nuisance, they distract workers, leading to accidents. Perfumes and scented deodorants should be avoided. Donning light colored clothing is preferable.

There is potential to come into contact with other dangerous insects, such as, fire ants, chiggers, bees, wasps, hornets, mites, fleas, spiders, and ticks. All personnel should perform checks, periodically during and at the end of each work shift, to inspect for the presence of insects or insect bites.

Poisonous snakes such as copperheads, rattlesnakes, and water moccasin (pit vipers), are common to the southeast United States. When encountering a snake, avoid quick/jerky motions, loud noises, and retreat slowly. Do not provoke the snake.

#### **4.0 SITE ORGANIZATION AND CONTROL: Refer to Appendix II**

##### **4.1 Work Zones**

###### Work Areas Identified

*(Refer to Figures 1A, 2A and 3A)*

Areas identified in and around the various sites. Figures 1A, 2A and 3A illustrate proposed areas of investigation. Investigative perimeters will be established during initial site walk-over, prior to commencement of field activities.

###### Decontamination Areas Identified

Temporary decontamination area to be established prior to initiation of field activities. The decontamination area will be set up in an area mutually agreed upon by CATLIN and MCAS personnel.

###### Support Areas Established

Support areas will be located upwind from the work zone.

##### **4.2 Site Access**

Access areas will be established following the initial site walk-over, but prior to commencement of field activities.

##### **4.3 Site Conditions**

Anticipated weather conditions include moderate temperatures and rain.

#### **5.0 JOB ACTIVITIES/WORK PLANS:**

Types of Activities to be Performed:

Install 75 DPT soil borings, 3 temporary Type II wells, develop monitoring wells, collect soil and ground water samples, and survey.

#### **6.0 EDUCATION AND TRAINING:**

Training Requirements:

40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) and 8-hour HAZWOPER refresher in accordance with 29 CFR 1910.120 where required.

## 7.0 MEDICAL SURVEILLANCE:

Medical Monitoring Requirements:

CATLIN medical monitoring program in accordance with 29 CFR 1910.120.

Avoid frequent or prolonged skin contact with petrochemicals. Monitor skin and eyes for dermatitis, allergic reaction, and eye irritation. If these or other symptoms develop, seek qualified medical attention. Workers with histories of liver, kidney, or nervous system disorders should be advised as to possible increased risk.

Symptoms of Acute Exposure to Volatile Organics: High vapor levels can cause irritation of the respiratory tract, headaches, nausea and mental confusion. Loss of consciousness occurs with very high concentrations. Liquid contact with skin may cause defatting, drying and irritation. Both vapor and liquid phases are irritating to the eyes.

Heat stress will be monitored in accordance with the contingency plan provided in Appendix III.

## 8.0 AMBIENT FIELD MONITORING:

8.1 Field Monitoring Equipment Needed for this Site:

Photoionization detector (PID) or flame ionization detector (FID).

8.2 Monitoring Protocol:

*Breathing Zone:* Ambient air monitoring for the presence of volatile organic compounds (VOCs) will be performed using a PID or FID. Testing will be conducted initially (at the start of job task) and periodically (when site conditions or set-up changes warrant). The following guidelines should be consulted to determine protection levels.

- Background to 1 ppm above background = Level D
- > 1 ppm to 5 ppm above background for greater than five continuous minutes = Level C
- > 5 ppm above background for up to 15 continuous minutes = Stop work and consult the Safety Manager
- Instantaneous peak concentrations > 50 ppm = Stop work and consult the Safety Manager

## 9.0 CLOTHING AND PROTECTIVE GEAR

In general, most work will be performed in Level D protective gear unless conditions warrant more protective attire. Level D is the minimum protection clothing as established by OSHA. Typically Level D consists of steel-toe protective work boots, protective eyewear (goggles or glasses), hard hats, nitrile outer gloves, vinyl or latex inner gloves, and hearing protection.

Should conditions warrant, full face respirators with proper cartridges, chemical-resistant coveralls (Tyvek), and splash suits shall be available.

- **Job Activity:** Site reconnaissance/Surveying

**Level:** D

**Monitoring Protocol:** None required

**List of PPE:** Steel toe impermeable safety boots, safety goggles, gloves, hard hat, and hearing protection.

- **Job Activity:** Drilling/Well Installation/Hydropunch

**Level:** D unless conditions warrant, then Level C

**Monitoring Protocol:** Monitor breathing zone with PID/FID

**List of PPE:** Steel toe impermeable safety boots, hard hat with face shield or safety goggles, hearing protection, splash suit, outer gloves, inner gloves, Tyvek coveralls, hearing protection, full face respirator with proper cartridges.

- **Job Activity:** Monitoring Well Development/Sampling/Monitoring

**Level:** D unless conditions warrant, then Level C.

**Monitoring Protocol:** Monitor breathing zone with PID/FID

**List of PPE:** Steel toe impermeable safety boots, hearing protection, hard hat with face shield or safety goggles, splash suit (optional), outer gloves, inner gloves, Tyvek coveralls, hearing protection. Tyveks may be optional depending on the potential for skin contact with free product and/or contaminated soil, full-face respirator with proper cartridges.

## 10.0 SAFETY EQUIPMENT LIST:

First Aid: Small - medium industrial First Aid Kit

Fire Fighting: "No Smoking" signs, ABC type Fire Extinguisher

Communications (Radios/Signs): Barricade tape/traffic cones to keep people out of work area, if necessary.

Personal Protective Equipment: MSHA/NIOSH approved full face air purifying respirator with organic vapor cartridges, hard hats, face shields or safety goggles gloves, hearing protection, steel toe impermeable boots, hearing protection, splash suit (optional), tyvek (optional).

Decontamination Equipment: Potable water, non-phosphate soap, alcohol rinse, steam cleaner.

## 11.0 DECONTAMINATION PROCEDURES:

- **Work Activities:** Drilling/Hydropunch equipment

**Level of Protection:** D (tyvek and/or splash suit)

**Decontamination Solutions:** Steam cleaner or high pressure wash

**Procedures (By Station):** Steam wash or pressure wash off dirt and product residue from equipment. May require soapy water wash.

- **Work Activities:** Personal Decontamination

**Level of Protection:** D

**Decontamination Solutions:** Non-phosphate soap, potable water

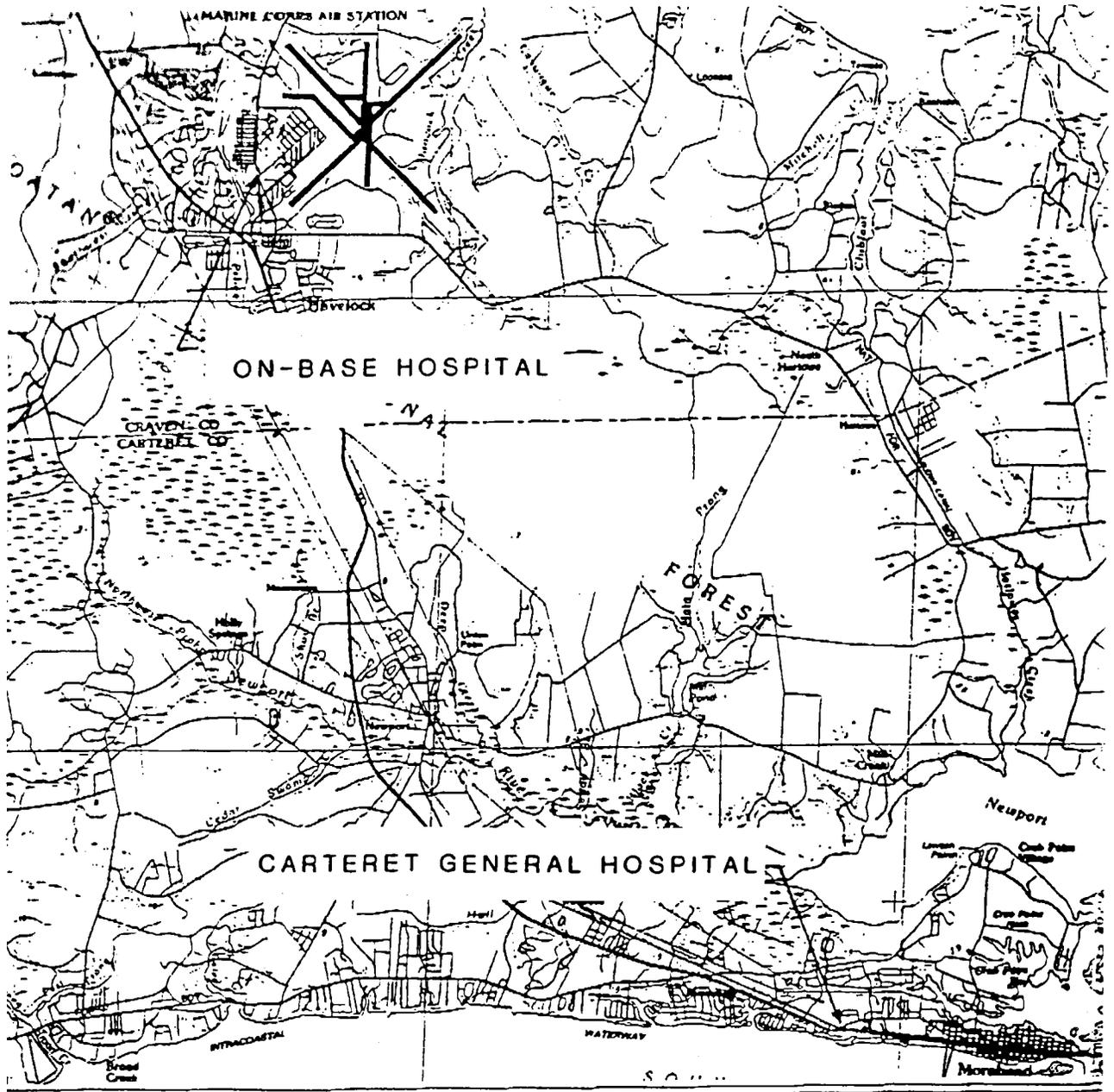
**Procedures (By Station):** Wash boots and outer gloves; change product contaminated clothing immediately. Wash contaminated skin surfaces.

## 12.0 CONTINGENCY PLANS:

(Refer to Appendix III)

### 12.1 Local Sources of Assistance:

<u>FACILITY</u>	<u>PHONE NUMBER</u>	<u>CONTACT</u>
Police	(919) 393-2183	Cape Carteret Police
Fire	911	Cape Carteret Fire & Rescue Sea Level Fire & Rescue
EMS	911	Cape Carteret Fire & Rescue Sea Level Fire & Rescue
Hospital (Off-Base)	(919) 247-1616	Carteret General Hospital
MCAS Cherry Point EAD	(919) 466-4903	John Myers
CATLIN Engineers & Scientists	1-800-346-7360 (910) 452-5861	Mike E. Mason/Teri Piver



ORTH



After Law Engineering  
**MOREHEAD CITY**  
 NORTH CAROLINA

<p>WILMINGTON, NORTH CAROLINA</p>	PROJECT ADDITIONAL UST INVESTIGATION VARIOUS SITES MCAS-CHERRY POINT, N. C. MCOLF-ATLANTIC, N. C.	TITLE <b>HOSPITAL AND EVACUATION ROUTES</b>	PLATE <b>1</b>
	JOB NO: 200163-20 DATE: SEPT. 2000	SCALE: AS SHOWN	DRAWN BY: JRM CHECKED BY: TWL

## 12.2 Special First Aid or Evacuation Procedures:

Provide basic first aid procedures as required and note time and circumstances of injuries. In the event of serious injury or emergency, the on-site hospital will be used. Minor injuries and non-emergency cases should be treated off-base at Carteret General Hospital located on Arendall Street in Morehead City, North Carolina (Figure 4).

In the event of potential or actual fire or explosion, evacuate the area immediately. Notify Mr. John Myers and CATLIN project manager immediately.

### **EMERGENCY PROCEDURES (Petroleum Products):**

<i>Skin-</i>	Wash with soap and water, rinse well
<i>Inhalation-</i>	Move to fresh air at least 50 feet upwind from vapor source. Seek qualified medical attention
<i>Eyes-</i>	Flush for a minimum of ten minutes with clean water while holding eye open. Seek qualified medical attention.
<i>Ingestion-</i>	Do not induce vomiting. If conscious, give water or milk to drink. Seek qualified medical attention.

## 12.3 National or Regional Sources of Assistance:

- CATLIN Engineers and Scientists 1-910-452-5861  
1-800-346-7360
- *EPA RCRA/Superfund Hotline* 1-800-424-9346
- *Chemtrec (24 Hours)* 1-800-424-9300
- *Bureau of Explosives (24 Hours)* 1-202-293-4048  
(Association of American Railroads)
- *Communicative Disease Center* 1-404-633-5313  
(Biological Agents)
- *National Response Center, NRC* 1-800-424-8802  
(Oil/Hazardous Substances)
- US DOT, *Office of Hazardous Operations* 1-202-426-0656  
US DOT, (Regulatory Matters) 1-202-426-9280
- *US Coast Guard (Major Incidents)* 1-800-424-8802
- *Poison Control Center* 1-800-672-1697
- *National Agricultural Chemical Association* 1-513-961-4300

### 13.0 AMENDMENTS TO SITE SPECIFIC HEALTH & SAFETY PLAN

13.1 This Site Specific Health & Safety Plan is based on information available at the time of preparation. Unexpected conditions may arise. It is important that personnel protective measures be thoroughly assessed by the RC&A Field Team Leader prior to and during the planned activities. Unplanned activities and/or changes in the hazard status should initiate a review of and may initiate changes in this plan.

13.2 Changes in the hazard status or unplanned activities are to be submitted on "Amendments to Site Specific Health and Safety Plan" which is included.

13.3 Amendments must be approved by the Safety Manager prior to implementation of amendment.

#### AMENDMENTS TO SITE SPECIFIC HEALTH AND SAFETY PLAN

Changes in field activities of hazards:

Proposed Amendment:

Proposed By: T. Piver

Date:

Approved By: T. Piver

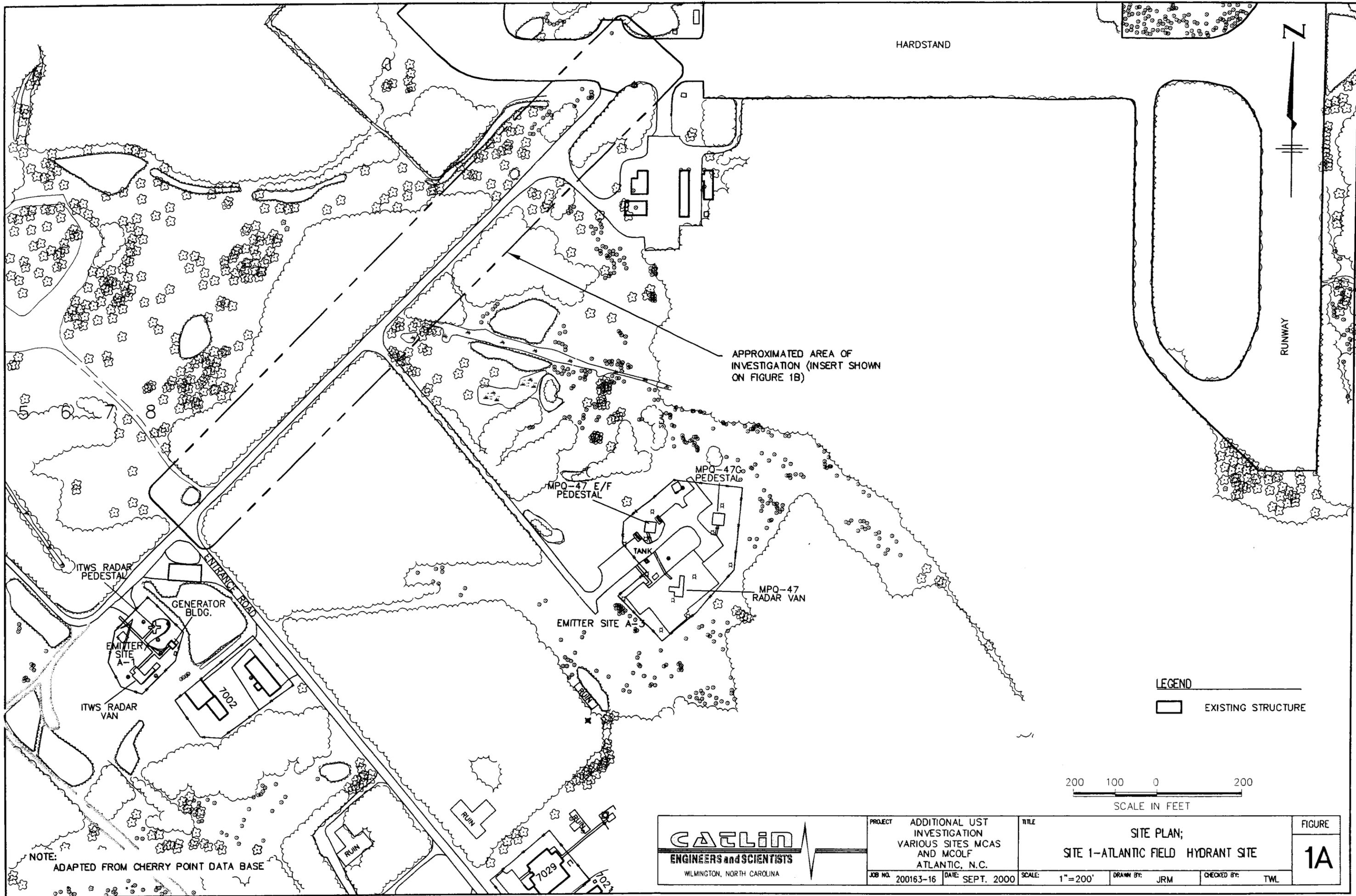
Accepted:

Declined:

Amendment Effective Date:

## FIGURES





HARDSTAND

N

RUNWAY

APPROXIMATED AREA OF INVESTIGATION (INSERT SHOWN ON FIGURE 1B)

MPQ-47 E/F PEDESTAL

MPQ-47C PEDESTAL

TANK

MPQ-47 RADAR VAN

EMITTER SITE A

ITWS RADAR PEDESTAL

GENERATOR BLDG.

EMITTER SITE A

ITWS RADAR VAN

7002

RUIN

7029

7020

LEGEND

EXISTING STRUCTURE

200 100 0 200

SCALE IN FEET

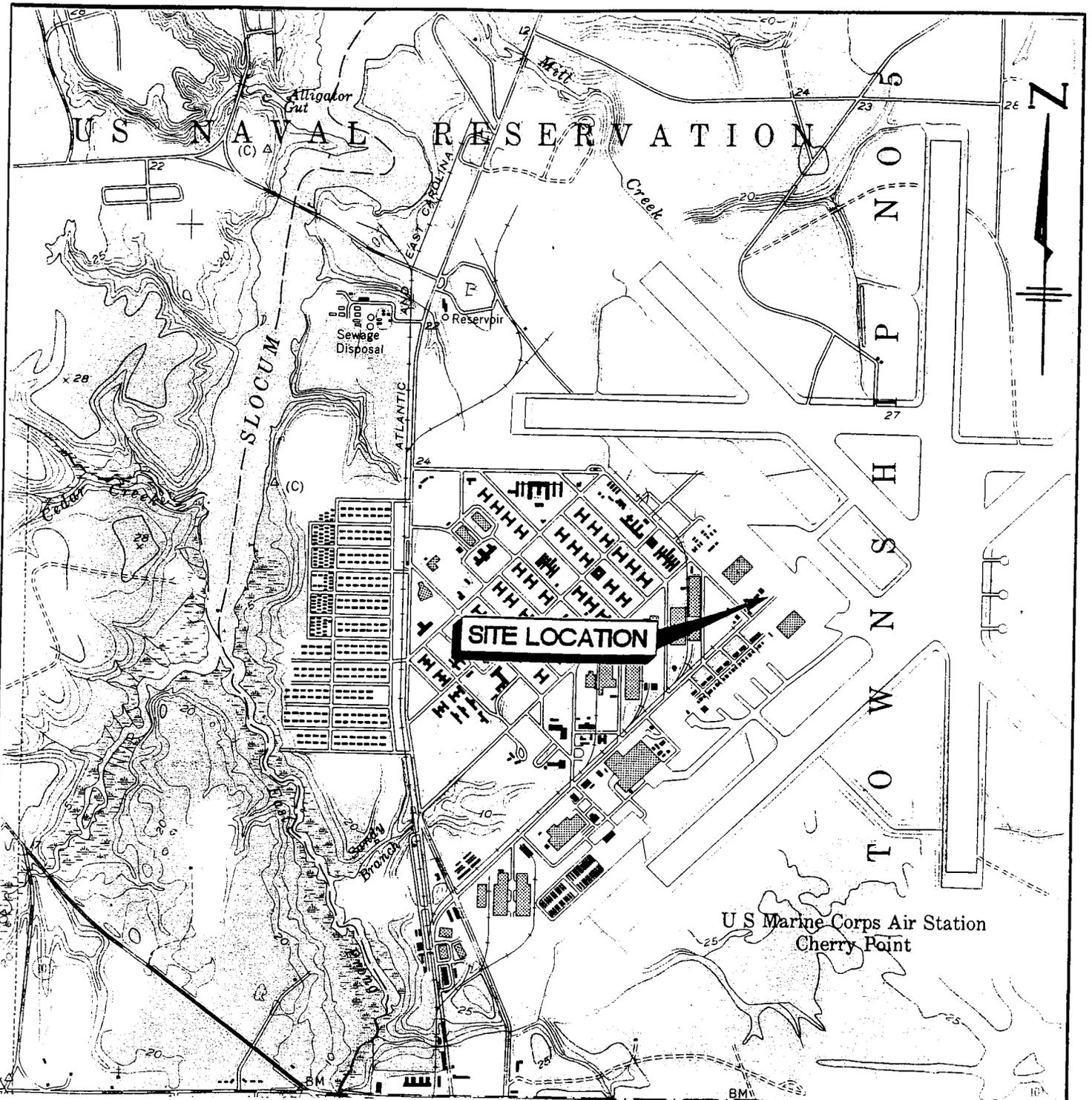
**CALIN**  
ENGINEERS and SCIENTISTS  
WILMINGTON, NORTH CAROLINA

PROJECT: ADDITIONAL UST INVESTIGATION VARIOUS SITES MCAS AND MCOLF ATLANTIC, N.C.  
JOB NO. 200163-16 DATE: SEPT. 2000

TITLE: SITE PLAN; SITE 1-ATLANTIC FIELD HYDRANT SITE  
SCALE: 1"=200' DRAWN BY: JRM CHECKED BY: TWL

FIGURE  
**1A**

NOTE: ADAPTED FROM CHERRY POINT DATA BASE

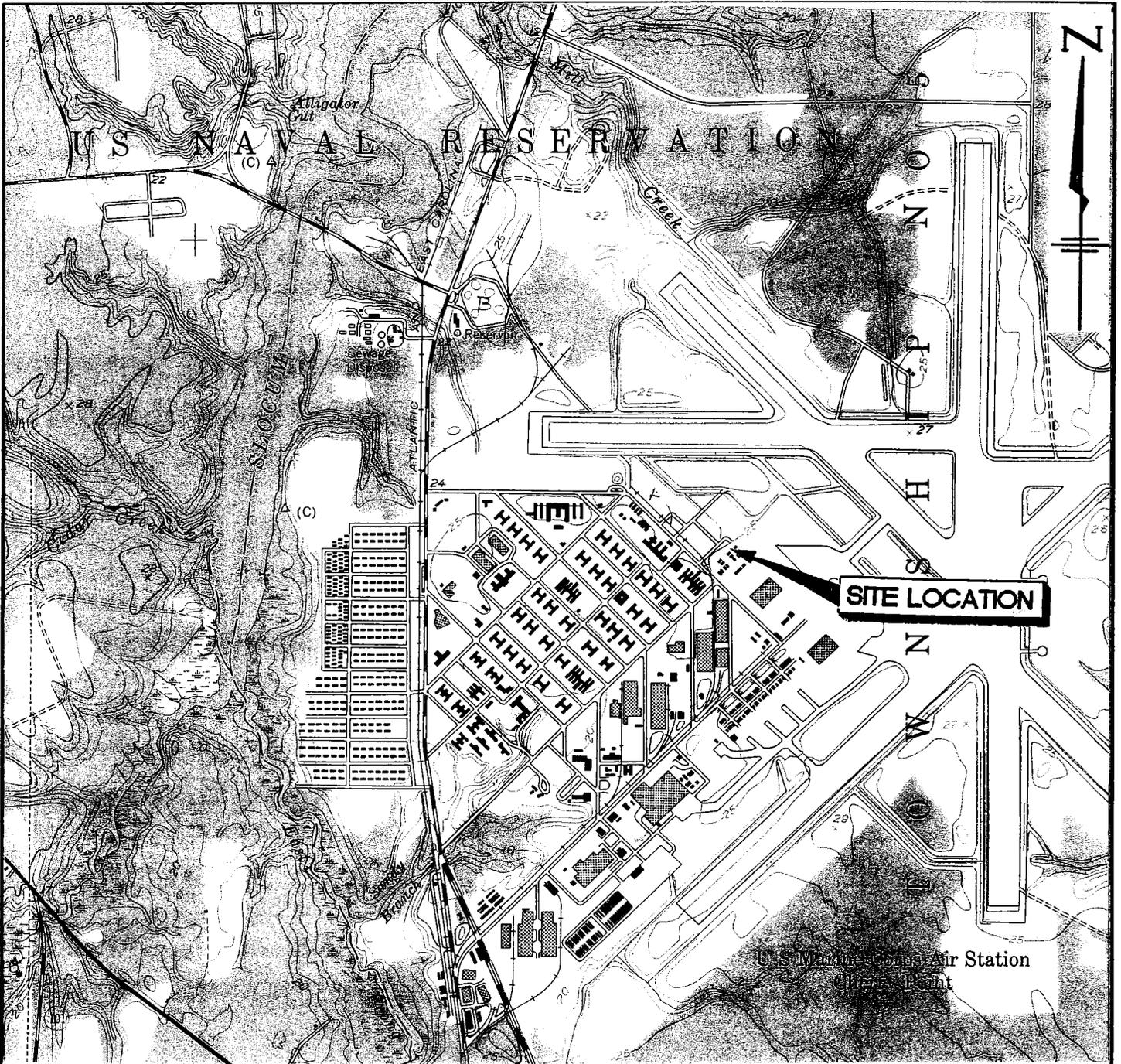


2000 1000 0 2000

SCALE IN FEET

FROM: USGS HAVELOCK, N.C. TOPOGRAPHIC QUADRANGLE DATED 1949

 WILMINGTON, NORTH CAROLINA	<b>PROJECT</b> ADDITIONAL UST INVESTIGATION VARIOUS SITES MCAS AND MCOLF CHERRY POINT, N.C.	<b>TITLE</b> GENERAL LOCATION USGS TOPOGRAPHIC QUADRANGLE SITE 1-CHERRY POINT HYDRANT SITE	<b>FIGURE</b> <div style="font-size: 2em; text-align: center;">2</div>
	<b>JOB NO:</b> 200163-19	<b>DATE:</b> SEPT. 2000	<b>SCALE:</b> 1"=2000'

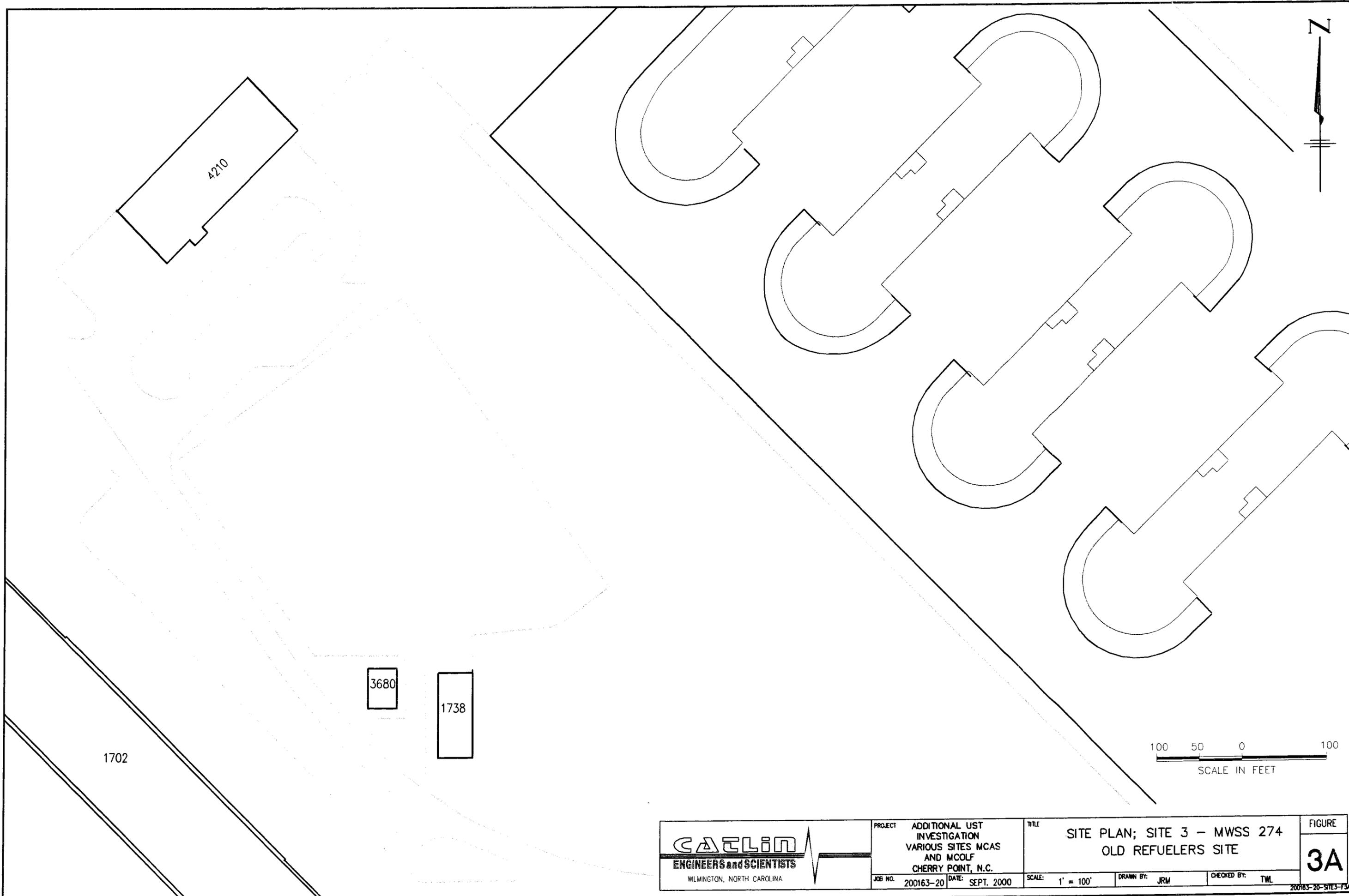


2000 1000 0 2000

SCALE IN FEET

FROM: USGS HAVELOCK, N.C. TOPOGRAPHIC QUADRANGLE DATED 1949

 <b>ENGINEERS and SCIENTISTS</b> WILMINGTON, NORTH CAROLINA	<b>PROJECT</b> ADDITIONAL UST INVESTIGATION VARIOUS SITES MCAS AND MCLF CHERRY POINT, N.C.	<b>TITLE</b> GENERAL LOCATION USGS TOPOGRAPHIC QUADRANGLE SITE-3 MWSS 274 OLD REFUELERS SITE	<b>FIGURE</b> <div style="text-align: center; font-size: 2em; font-weight: bold;">3</div>	
	<b>JOB NO:</b> 200163-20	<b>DATE:</b> SEPT. 2000	<b>SCALE:</b> 1"=2000'	<b>DRAWN BY:</b> CJ



4210

1702

3680

1738



 <p>WILMINGTON, NORTH CAROLINA</p>	PROJECT: ADDITIONAL UST INVESTIGATION VARIOUS SITES MCAS AND MCOLF CHERRY POINT, N.C.	TITLE: SITE PLAN; SITE 3 - MWSS 274 OLD REFUELERS SITE	FIGURE: 3A
	JOB NO.: 200163-20    DATE: SEPT. 2000	SCALE: 1" = 100'	DRAWN BY: JRM    CHECKED BY: TWL

**APPENDIX I**

**PETROLEUM SUBSTANCES  
SUBSTANCE INFORMATION FORMS  
MATERIAL SAFETY DATA SHEETS**

# PETROLEUM SUBSTANCES

## INTRODUCTION

During work involving petroleum products, workers may be exposed to petroleum hydrocarbon liquids, vapors or wastes. Petroleum substances in liquid or vapor form are a highly complex mixture of hydrocarbons and additives in varying concentrations. Gasoline for instance, is comprised of over 200 components. Due to the complexity of gasoline and diesel fuel, no firm standards for recommended occupational health and safety have been established. Never the less, health precautions should be taken to minimize exposure to the various petroleum forms.

## TOXICITY CONSIDERATIONS

Tests have shown that prolonged or repeated exposures to petroleum substances, in liquid or vapor form, may cause serious illness including cancer in laboratory test animals. High concentrations of inhaled petroleum product components may cause a variety of symptoms including dizziness, intoxication, excitement or unconsciousness (API, 1987). Some petroleum product components may be toxic and care should be exercised to minimize exposure to these substances. When working with or around petroleum substances the ambient air quality should be monitored in the breathing zone by means of an organic vapor detector, oxygen meter, explosimeter and/or colorimetric tubes. However, other aromatic hydrocarbons may become contaminated with benzene during the distillation process and benzene-related health effects should be considered when exposure to any of these agents is suspected (NIOSH, 1985).

The following general health precautions are recommended:

1. Minimize skin contact and breathing of vapors;
2. Keep petroleum projects away from eyes, skin and mouth; and
3. Keep work areas well ventilated.

# MATERIAL SAFETY DATA SHEET

BENZENE (AMOCO/TOTAL)

MSDS No. 11697000 ANSI/ENGLISH

## 1.0 CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: BENZENE (AMOCO/TOTAL)

MANUFACTURER/SUPPLIER: EMERGENCY HEALTH INFORMATION:

1 (800) 447-8735

Amoco Oil Company

200 East Randolph Drive

Chicago, Illinois 60601 U.S.A.

EMERGENCY SPILL INFORMATION:

1 (800) 424-9300 CHEMTREC (USA)

OTHER PRODUCT SAFETY INFORMATION:

(312) 856-3907

## 2.0 COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS#	Range % by Wt.
Benzene	71-43-2	99.80
Toluene	108-88-3	0.20

(See Section 8.0, "Exposure Controls/Personal Protection", for exposure guidelines)

## 3.0 HAZARDS IDENTIFICATION

**EMERGENCY OVERVIEW:** Danger! Extremely flammable. Causes eye and skin irritation. Inhalation causes headaches, dizziness, drowsiness, and nausea, and may lead to unconsciousness. Harmful or fatal if liquid is aspirated into lungs. Danger! Contains Benzene. Cancer hazard. Can cause blood disorders. Harmful when absorbed through the skin.

**POTENTIAL HEALTH EFFECTS:**

**EYE CONTACT:** Causes mild eye irritation.

**SKIN CONTACT:** Causes mild skin irritation. Causes skin irritation on prolonged or repeated contact. Harmful when absorbed through the skin.

**INHALATION:** Cancer hazard. Can cause blood disorders. Inhalation causes headaches, dizziness,

drowsiness, and nausea, and may lead to unconsciousness. See "Toxicological Information" section (Section 11.0).

**INGESTION:** Harmful or fatal if liquid is aspirated into lungs. See "Toxicological Information" section (Section 11.0).

**HMIS CODE:** (Health:2) (Flammability:3) (Reactivity:0)

**NFPA CODE:** (Health:2) (Flammability:3) (Reactivity:0)

#### 4.0 FIRST AID MEASURES

**EYE:** Flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation persists.

**SKIN:** Wash exposed skin with soap and water. Remove contaminated clothing, including shoes, and thoroughly clean and dry before reuse. Get medical attention if irritation develops.

**INHALATION:** If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. Get immediate medical attention.

**INGESTION:** If swallowed, drink plenty of water, do NOT induce vomiting. Get immediate medical attention.

#### 5.0 FIRE FIGHTING MEASURES

**FLASHPOINT:** 12°F(-11°C)

**UEL:** 8.0%

**LEL:** 1.5%

**AUTOIGNITION TEMPERATURE:** 928°F (498°C)

**FLAMMABILITY CLASSIFICATION:** Extremely Flammable Liquid.

**EXTINGUISHING MEDIA:** Agents approved for Class B hazards (e.g., dry chemical, carbon dioxide, foam, steam) or water fog.

**UNUSUAL FIRE AND EXPLOSION HAZARDS:** Extremely flammable liquid. Vapor may explode if ignited in enclosed area.

**FIRE-FIGHTING EQUIPMENT:** Firefighters should wear full bunker gear, including a positive pressure self-contained breathing apparatus.

**PRECAUTIONS:** Keep away from sources of ignition (e.g., heat and open flames). Keep container closed. Use with adequate ventilation.

**HAZARDOUS COMBUSTION PRODUCTS:** Incomplete burning can produce carbon monoxide

and/or carbon dioxide and other harmful products.

## 6.0 ACCIDENTAL RELEASE MEASURES

Remove or shut off all sources of ignition. Remove mechanically or contain on an absorbent material such as dry sand or earth. Increase ventilation if possible. Wear respirator and spray with water to disperse vapors. Keep out of sewers and waterways.

## 7.0 HANDLING AND STORAGE

**HANDLING:** Use with adequate ventilation. Do not breathe vapors. Keep away from ignition sources (e.g., heat, sparks, or open flames). Ground and bond containers when transferring materials. Wash thoroughly after handling. After this container has been emptied, it may contain flammable vapors; observe all warnings and precautions listed for this product.

**STORAGE:** Store in flammable liquids storage area. Store away from heat, ignition sources, and open flame in accordance with applicable regulations. Keep container closed. Outside storage is recommended.

## 8.0 EXPOSURE CONTROLS / PERSONAL PROTECTION

**EYE:** Do not get in eyes. Wear eye protection.

**SKIN:** Do not get on skin or clothing. Wear protective clothing and gloves.

**INHALATION:** Do not breathe mist or vapor. If heated and ventilation is inadequate, use supplied-air respirator approved by NIOSH/MSHA.

**ENGINEERING CONTROLS:** Control airborne concentrations below the exposure guidelines.

### EXPOSURE GUIDELINES:

Component	CAS#	Exposure Limits
Benzene	71-43-2	OSHA PEL: 1 ppm OSHA STEL: 5 ppm ACGIH TLV-TWA: 10 ppm
Toluene	108-88-3	OSHA PEL: 100 ppm (1989); 200 ppm (1971) OSHA STEL: 150 ppm (1989); Not established. (1971) OSHA Ceiling: 300 ppm (1971) ACGIH TLV-TWA: 50 ppm (skin)

## 9.0 CHEMICAL AND PHYSICAL PROPERTIES

**APPEARANCE AND ODOR:** Liquid. Colorless. Sweet odor.

**pH:** Not determined.

**VAPOR PRESSURE:** 74.6 mm Hg at 20 °C

**VAPOR DENSITY:** Not determined.

**BOILING POINT:** 176°F(80°C)

**MELTING POINT:** 42°F(6°C)

**SOLUBILITY IN WATER:** Slight, 0.1 to 1.0%.

**SPECIFIC GRAVITY (WATER=1):** 0.88

## 10.0 STABILITY AND REACTIVITY

**STABILITY:** Stable.

**CONDITIONS TO AVOID:** Keep away from ignition sources (e.g. heat, sparks, and open flames).

**MATERIALS TO AVOID:** Avoid chlorine, fluorine, and other strong oxidizers.

**HAZARDOUS DECOMPOSITION:** None identified.

**HAZARDOUS POLYMERIZATION:** Will not occur.

## 11.0 TOXICOLOGICAL INFORMATION

### ACUTE TOXICITY DATA:

**EYE IRRITATION:** Testing not conducted. See Other Toxicity Data.

**SKIN IRRITATION:** Testing not conducted. See Other Toxicity Data.

**DERMAL LD50:** Testing not conducted. See Other Toxicity Data.

**ORAL LD50:** 3.8 g/kg (rat).

**INHALATION LC50:** 10000 ppm (rat)

**OTHER TOXICITY DATA:** Acute toxicity of benzene results primarily from depression of the central nervous system (CNS). Inhalation of concentrations over 50 ppm can produce headache, lassitude, weariness, dizziness, drowsiness, or excitation. Exposure to very high levels can result in unconsciousness and death.

Long-term overexposure to benzene has been associated with certain types of leukemia in humans. In

In addition, the International Agency for Research on Cancer (IARC) and OSHA consider benzene to be a human carcinogen. Chronic exposures to benzene at levels of 100 ppm and below have been reported to cause adverse blood effects including anemia. Benzene exposure can occur by inhalation and absorption through the skin.

Inhalation and forced feeding studies of benzene in laboratory animals have produced a carcinogenic response in a variety of organs, including possibly leukemia, other adverse effects on the blood, chromosomal changes and some effects on the immune system. Exposure to benzene at levels up to 300 ppm did not produce birth defects in animal studies; however, exposure to the higher dosage levels (greater than 100 ppm) resulted in a reduction of body weight of the rat pups (fetotoxicity). Changes in the testes have been observed in mice exposed to benzene at 300 ppm, but reproductive performance was not altered in rats exposed to benzene at the same level.

Aspiration of this product into the lungs can cause chemical pneumonia and can be fatal. Aspiration into the lungs can occur while vomiting after ingestion of this product. Do not siphon by mouth.

## 12.0 ECOLOGICAL INFORMATION

Ecological testing has not been conducted on this product.

## 13.0 DISPOSAL INFORMATION

Disposal must be in accordance with applicable federal, state, or local regulations. Enclosed-controlled incineration is recommended unless directed otherwise by applicable ordinances. Residues and spilled material are hazardous waste due to ignitability.

## 14.0 TRANSPORTATION INFORMATION

### U.S. DEPT OF TRANSPORTATION

Shipping Name	Benzene
Hazard Class	3
Identification Number	UN1114
Packing Group	II
RQ	RQ

### INTERNATIONAL INFORMATION:

#### Sea (IMO/IMDG)

Shipping Name Not determined.

#### Air (ICAO/IATA)

Shipping Name Not determined.

#### European Road/Rail (ADR/RID)

Shipping Name Not determined.

**Canadian Transportation of Dangerous Goods**

Shipping Name Not determined.

**15.0 REGULATORY INFORMATION**

**CERCLA SECTIONS 102a/103 HAZARDOUS SUBSTANCES (40 CFR Part 302.4):** This product is reportable under 40 CFR Part 302.4 because it contains the following substance(s):

Component/CAS Number	Weight %	Component Reportable Quantity (RQ)
Benzene 71-43-2	99.80	10 lbs.

**SARA TITLE III SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR Part 355):** This product is not regulated under Section 302 of SARA and 40 CFR Part 355.

**SARA TITLE III SECTIONS 311/312 HAZARDOUS CATEGORIZATION (40 CFR Part 370):** This product is defined as hazardous by OSHA under 29 CFR Part 1910.1200(d).

**SARA TITLE III SECTION 313 (40 CFR Part 372):** This product contains the following substance(s), which is on the Toxic Chemicals List in 40 CFR Part 372:

Component/CAS Number	Weight Percent
Benzene 71-43-2	99.80

**U.S. INVENTORY (TSCA):** Listed on inventory.

**OSHA HAZARD COMMUNICATION STANDARD:** Flammable liquid. Carcinogen. Irritant. CNS Effects. Target organ effects.

**EC INVENTORY (EINECS/ELINCS):** In compliance.

**JAPAN INVENTORY (MITI):** Not determined.

**AUSTRALIA INVENTORY (AICS):** Not determined.

**KOREA INVENTORY (ECL):** Not determined.

**CANADA INVENTORY (DSL):** Not determined.

**PHILIPPINE INVENTORY (PICCS):** Not determined.

**16.0 OTHER INFORMATION**

Prepared by:

Environment, Health and Safety Department

**Issued:** November 14, 1995

---

*This material Safety Data Sheet conforms to the requirements of ANSI Z400.1.*

*This material safety data sheet and the information it contains is offered to you in good faith as accurate. We have reviewed any information contained in this data sheet which we received from sources outside our company. We believe that information to be correct but cannot guarantee its accuracy or completeness. Health and safety precautions in this data sheet may not be adequate for all individuals and/or situations. It is the user's obligation to evaluate and use this product safely and to comply with all applicable laws and regulations. No statement made in this data sheet shall be construed as a permission or recommendation for the use of any product in a manner that might infringe existing patents. No warranty is made, either express or implied.*

---

# TOLUENE

MSDS Number: T3913 --- *Effective Date: 11/17/99*

---

## 1. Product Identification

**Synonyms:** Methylbenzene; Toluol; Phenylmethane

**CAS No.:** 108-88-3

**Molecular Weight:** 92.14

**Chemical Formula:** C<sub>6</sub>H<sub>5</sub>-CH<sub>3</sub>

**Product Codes:**

J.T. Baker: 5375, 5584, 5809, 5812, 9336, 9351, 9364, 9456, 9457, 9459, 9460, 9462, 9466, 9472, 9476

Mallinckrodt: 4483, 8091, 8092, 8604, 8605, 8608, 8610, 8611, V560

---

## 2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Toluene	108-88-3	100%	Yes

---

## 3. Hazards Identification

### Emergency Overview

---

**POISON! DANGER! HARMFUL OR FATAL IF SWALLOWED. HARMFUL IF INHALED OR ABSORBED THROUGH SKIN. VAPOR HARMFUL. FLAMMABLE LIQUID AND VAPOR. MAY AFFECT LIVER, KIDNEYS, BLOOD SYSTEM, OR CENTRAL NERVOUS SYSTEM. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT.**

**J.T. Baker SAF-T-DATA<sup>(tm)</sup> Ratings (Provided here for your convenience)**

---

Health Rating: 2 - Moderate

Flammability Rating: 3 - Severe (Flammable)

Reactivity Rating: 0 - None

Contact Rating: 1 - Slight

Lab Protective Equip: GOGGLES; LAB COAT; VENT HOOD; PROPER GLOVES;  
CLASS B EXTINGUISHER

Storage Color Code: Red (Flammable)

---

## Potential Health Effects

---

**Inhalation:**

Inhalation may cause irritation of the upper respiratory tract. Symptoms of overexposure may include fatigue, confusion, headache, dizziness and drowsiness. Peculiar skin sensations (e. g. pins and needles) or numbness may be produced. Very high concentrations may cause unconsciousness and death.

**Ingestion:**

Swallowing may cause abdominal spasms and other symptoms that parallel over-exposure from inhalation. Aspiration of material into the lungs can cause chemical pneumonitis, which may be fatal.

**Skin Contact:**

Causes irritation. May be absorbed through skin.

**Eye Contact:**

Causes severe eye irritation with redness and pain.

**Chronic Exposure:**

Reports of chronic poisoning describe anemia, decreased blood cell count and bone marrow hypoplasia. Liver and kidney damage may occur. Repeated or prolonged contact has a defatting action, causing drying, redness, dermatitis. Exposure to toluene may affect the developing fetus.

**Aggravation of Pre-existing Conditions:**

Persons with pre-existing skin disorders or impaired liver or kidney function may be more susceptible to the effects of this substance. Alcoholic beverage consumption can enhance the toxic effects of this substance.

---

## 4. First Aid Measures

**Inhalation:**

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. CALL A PHYSICIAN IMMEDIATELY.

**Ingestion:**

Aspiration hazard. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately. If vomiting occurs, keep head below hips to prevent aspiration into lungs.

**Skin Contact:**

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

**Eye Contact:**

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

---

## 5. Fire Fighting Measures

**Fire:**

Flash point: 7C (45F) CC

Autoignition temperature: 422C (792F)

Flammable limits in air % by volume:

lel: 3.3; uel: 19

Flammable liquid and vapor!

Dangerous fire hazard when exposed to heat or flame. Vapors can flow along surfaces to distant ignition source and flash back.

**Explosion:**

Above flash point, vapor-air mixtures are explosive within flammable limits noted above.

Contact with strong oxidizers may cause fire or explosion. Sensitive to static discharge.

**Fire Extinguishing Media:**

Dry chemical, foam or carbon dioxide. Water may be used to flush spills away from exposures and to dilute spills to non-flammable mixtures.

**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 spray may be used to keep fire exposed containers cool.

---

## 6. Accidental Release Measures

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! If a leak or spill has not ignited, use water spray to disperse the vapors, to protect personnel attempting to stop leak, and to flush spills away from exposures. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker SOLUSORB(R) solvent adsorbent is recommended for spills of this product.

---

## 7. Handling and Storage

Protect against physical damage. Store in a cool, dry well-ventilated location, away from any area where the fire hazard may be acute. Outside or detached storage is preferred. Separate from incompatibles. Containers should be bonded and grounded for transfers to avoid static sparks. Storage and use areas should be No Smoking areas. Use non-sparking type tools and equipment, including explosion proof ventilation. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

---

## 8. Exposure Controls/Personal Protection

**Airborne Exposure Limits:**

Toluene:

- OSHA Permissible Exposure Limit (PEL):

200 ppm (TWA); 300 ppm (acceptable ceiling conc.); 500 ppm (maximum conc.).

- ACGIH Threshold Limit Value (TLV):

50 ppm (TWA) skin, A4 - Not Classifiable as a Human Carcinogen.

**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 exposure limit is exceeded, a half-face organic vapor respirator may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece organic vapor respirator may be worn up to 50 times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-face piece positive-pressure, air-supplied respirator.

**WARNING:** Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

**Skin Protection:**

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

**Eye Protection:**

Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

---

## 9. Physical and Chemical Properties

**Appearance:**

Clear, colorless liquid.

**Odor:**

Aromatic benzene-like.

**Solubility:**

0.05 gm/100gm water @ 20C (68F).

**Specific Gravity:**

0.86 @ 20C / 4 C

**pH:**

No information found.

**% Volatiles by volume @ 21C (70F):**

100

**Boiling Point:**

111C (232F)

**Melting Point:**

-95C (-139F)

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

3.14

**Vapor Pressure (mm Hg):**

22 @ 20C (68F)

**Evaporation Rate (BuAc=1):**

2.24

## 10. Stability and Reactivity

### Stability:

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

### Hazardous Decomposition Products:

Carbon dioxide and carbon monoxide may form when heated to decomposition.

### Hazardous Polymerization:

Will not occur.

### Incompatibilities:

Heat, flame, strong oxidizers, nitric and sulfuric acids, chlorine, nitrogen tetraoxide; will attack some forms of plastics, rubber, coatings.

### Conditions to Avoid:

Heat, flames, ignition sources and incompatibles.

## 11. Toxicological Information

### Toxicological Data:

Oral rat LD50: 636 mg/kg; skin rabbit LD50: 14100 uL/kg; inhalation rat LC50: 49 gm/m<sup>3</sup>/4H; Irritation data: skin rabbit, 500 mg, Moderate; eye rabbit, 2 mg/24H, Severe.

Investigated as a tumorigen, mutagen, reproductive effector.

### Reproductive Toxicity:

Has shown some evidence of reproductive effects in laboratory animals.

-----\Cancer Lists\-----			
Ingredient	---NTP Carcinogen---		IARC Category
	Known	Anticipated	
Toluene (108-88-3)	No	No	3

## 12. Ecological Information

### Environmental Fate:

When released into the soil, this material may evaporate to a moderate extent. When released into the soil, this material is expected to leach into groundwater. When released into the soil, this material may biodegrade to a moderate extent. When released into water, this material may evaporate to a moderate extent. When released into water, this material may biodegrade to a moderate extent. When released into the air, this material may be moderately degraded by reaction with photochemically produced hydroxyl radicals. When released into the air, this material is expected to have a half-life of less

than 1 day. This material is not expected to significantly bioaccumulate. This material has a log octanol-water partition coefficient of less than 3.0. Bioconcentration factor = 13.2 (eels).

**Environmental Toxicity:**

This material is expected to be toxic to aquatic life. The LC50/96-hour values for fish are between 10 and 100 mg/l.

### 13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved incinerator or disposed in a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

### 14. Transport Information

**Domestic (Land, D.O.T.)**

-----  
**Proper Shipping Name:** TOLUENE  
**Hazard Class:** 3  
**UN/NA:** UN1294  
**Packing Group:** II  
**Information reported for product/size:** 390LB

**International (Water, I.M.O.)**

-----  
**Proper Shipping Name:** TOLUENE  
**Hazard Class:** 3.2  
**UN/NA:** UN1294  
**Packing Group:** II  
**Information reported for product/size:** 390LB

### 15. Regulatory Information

-----\Chemical Inventory Status - Part 1\-----				
Ingredient	TSCA	EC	Japan	Australia
Toluene (108-88-3)	Yes	Yes	Yes	Yes

-----\Chemical Inventory Status - Part 2\-----				
Ingredient	Korea	DSL	--Canada-- NDSL	Phil.
Toluene (108-88-3)	Yes	Yes	No	Yes

-----\Federal, State & International Regulations - Part 1\-----  
 -SARA 302-                      -----SARA 313-----

Ingredient	RQ	TPQ	List	Chemical Catg.
Toluene (108-88-3)	No	No	Yes	No
-----\Federal, State & International Regulations - Part 2\-----				
Ingredient	CERCLA	-RCRA-	-TSCA-	
		261.33	8 (d)	
Toluene (108-88-3)	1000	U220	No	

Chemical Weapons Convention: No      TSCA 12(b): No      CDTA: Yes  
SARA 311/312: Acute: Yes      Chronic: Yes      Fire: Yes      Pressure: No  
Reactivity: No      (Pure / Liquid)

**WARNING:**

THIS PRODUCT CONTAINS A CHEMICAL(S) KNOWN TO THE STATE OF CALIFORNIA TO CAUSE BIRTH DEFECTS OR OTHER REPRODUCTIVE HARM.

**Australian Hazchem Code:** 3[Y]E

**Poison Schedule:** S6

**WHMIS:**

This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

**16. Other Information**

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

**Label Hazard Warning:**

POISON! DANGER! HARMFUL OR FATAL IF SWALLOWED. HARMFUL IF INHALED OR ABSORBED THROUGH SKIN. VAPOR HARMFUL. FLAMMABLE LIQUID AND VAPOR. MAY AFFECT LIVER, KIDNEYS, BLOOD SYSTEM, OR CENTRAL NERVOUS SYSTEM. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT.

**Label Precautions:**

Keep away from heat, sparks and flame.

Keep container closed.

Use only with adequate ventilation.

Wash thoroughly after handling.

Avoid breathing vapor.

Avoid contact with eyes, skin and clothing.

**Label First Aid:**

Aspiration hazard. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If vomiting occurs, keep head below hips to prevent aspiration into lungs. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes.

Remove contaminated clothing and shoes. Wash clothing before reuse. In all cases call a physician immediately.

**Product Use:**

Laboratory Reagent.

**Revision Information:**

No changes.

**Disclaimer:**

\*\*\*\*\*

**Mallinckrodt Baker, Inc. provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product. Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose. MALLINCKRODT BAKER, INC. MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE INFORMATION SET FORTH HEREIN OR THE PRODUCT TO WHICH THE INFORMATION REFERS. ACCORDINGLY, MALLINCKRODT BAKER, INC. WILL NOT BE RESPONSIBLE FOR DAMAGES RESULTING FROM USE OF OR RELIANCE UPON THIS INFORMATION.**

\*\*\*\*\*

**Prepared by:** Strategic Services Division  
Phone Number: (314) 539-1600 (U.S.A.)

---

**HEXANES**MSDS Number: H2379 --- *Effective Date: 04/15/99*

---

**1. Product Identification**

**Synonyms:** Normal Hexane; Hexyl Hydride  
**CAS No.:** 110-54-3 (n-hexane)  
**Molecular Weight:** 86.18  
**Chemical Formula:** CH<sub>3</sub>(CH<sub>2</sub>)<sub>4</sub>CH<sub>3</sub> n-hexane  
**Product Codes:** 9277, 9306, 9309, N169

---

**2. Composition/Information on Ingredients**

Ingredient	CAS No	Percent	Hazardous
Hexane	110-54-3	> 95%	Yes
Methylcyclopentane	96-37-7	1 - 2%	Yes
2-Methylpentane	107-83-5	1 - 2%	No
3-Methylpentane	96-14-0	1 - 2%	No
Pentane	109-66-0	0 - 2%	No

---

**3. Hazards Identification****Emergency Overview**

---

**DANGER! EXTREMELY FLAMMABLE LIQUID AND VAPOR. VAPOR MAY CAUSE FLASH FIRE. HARMFUL OR FATAL IF SWALLOWED. HARMFUL IF INHALED. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. AFFECTS THE CENTRAL AND PERIPHERAL NERVOUS SYSTEMS.**

**J.T. Baker SAF-T-DATA<sup>(tm)</sup> Ratings (Provided here for your convenience)**

---

Health Rating: 3 - Severe (Life)

Flammability Rating: 4 - Extreme (Flammable)

Reactivity Rating: 2 - Moderate

Contact Rating: 2 - Moderate

Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD;  
 PROPER GLOVES; CLASS B EXTINGUISHER

Storage Color Code: Red (Flammable)

---

### Potential Health Effects

---

The health hazards addressed are for the major component: n-hexane.

**Inhalation:**

Inhalation of vapors irritates the respiratory tract. Overexposure may cause lightheadedness, nausea, headache, and blurred vision. Greater exposure may cause muscle weakness, numbness of the extremities, unconsciousness and death.

**Ingestion:**

May produce abdominal pain, nausea. Aspiration into lungs can produce severe lung damage and is a medical emergency. Other symptoms expected to parallel inhalation.

**Skin Contact:**

May cause redness, irritation, with dryness, cracking.

**Eye Contact:**

Vapors may cause irritation. Splashes may cause redness and pain.

**Chronic Exposure:**

Repeated or prolonged skin contact may defat the skin and produce irritation and dermatitis. Chronic inhalation may cause peripheral nerve disorders and central nervous system effects.

**Aggravation of Pre-existing Conditions:**

Persons with pre-existing skin disorders or eye problems or impaired respiratory function may be more susceptible to the effects of the substance. May affect the developing fetus.

---

## 4. First Aid Measures

**Inhalation:**

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

**Ingestion:**

Aspiration hazard. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately.

**Skin Contact:**

Remove any contaminated clothing. Wipe off excess from skin. Wash skin with soap and water for at least 15 minutes. Get medical attention if irritation develops or persists.

**Eye Contact:**

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

**Note to Physician:**

BEI=2,5-hexadione in urine, sample at end of shift at workweeks end, 5 mg/g creatine. Also, measure n-hexane in expired air. Analgesics may be necessary for pain management, there is no specific antidote. Monitor arterial blood gases in cases of severe aspiration.

---

## 5. Fire Fighting Measures

**Fire:**

Flash point: -21C (-6F) CC

Autoignition temperature: 224C (435F)

Flammable limits in air % by volume:

lcl: 1.1; ucl: 7.5

Extremely Flammable Liquid and Vapor! Vapor may cause flash fire. Dangerous fire hazard when exposed to heat or flame.

**Explosion:**

Above flash point, vapor-air mixtures are explosive within flammable limits noted above. Contact with oxidizing materials may cause extremely violent combustion. Explodes when mixed @ 28C with dinitrogen tetroxide. Sensitive to static discharge.

**Fire Extinguishing Media:**

Dry chemical, foam or carbon dioxide. Water may be ineffective.

**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 spray may be used to keep fire exposed containers cool. Vapors can flow along surfaces to distant ignition source and flash back. Vapor explosion hazard exists indoors, outdoors, or in sewers.

---

## 6. Accidental Release Measures

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! If a leak or spill has not ignited, use water spray to disperse the vapors, to protect personnel attempting to stop leak, and to flush spills away from exposures. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker SOLUSORB(R) solvent adsorbent is recommended for spills of this product.

---

## 7. Handling and Storage

Protect against physical damage. Store in a cool, dry well-ventilated location, away from direct sunlight and any area where the fire hazard may be acute. Store in tightly closed containers (preferably under nitrogen atmosphere). Outside or detached storage is preferred. Inside storage should be in a standard flammable liquids storage room or cabinet. Separate from oxidizing materials. Containers should be bonded and grounded for transfers to avoid static sparks. Storage and use areas should be No Smoking areas.

Use non-sparking type tools and equipment. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

---

## 8. Exposure Controls/Personal Protection

### Airborne Exposure Limits:

N-Hexane [110-54-3]:

-OSHA Permissible Exposure Limit (PEL): 500 ppm (TWA)

-ACGIH Threshold Limit Value (TLV): 50 ppm (TWA), Skin  
other isomers of hexane

-ACGIH Threshold Limit Value (TLV): 500 ppm (TWA), 1000ppm (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 exposure limit is exceeded, wear a supplied air, full-facepiece respirator, airlined hood, or full-facepiece self-contained breathing apparatus. This substance has poor warning properties.

### Skin Protection:

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

### Eye Protection:

Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

---

## 9. Physical and Chemical Properties

The following properties are for n-hexane, the major component.

### Appearance:

Clear, colorless liquid.

### Odor:

Gasoline-like odor.

### Solubility:

Insoluble in water.

### Specific Gravity:

0.66

### pH:

No information found.

### % Volatiles by volume @ 21C (70F):

100

### Boiling Point:

ca. 68C (ca. 154F)

**Melting Point:**

ca. -95C (ca. -139F)

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

3.0

**Vapor Pressure (mm Hg):**

150 @ 25C (77F)

**Evaporation Rate (BuAc=1):**

9

## 10. Stability and Reactivity

**Stability:**

Stable under ordinary conditions of use and storage. Heat will contribute to instability.

**Hazardous Decomposition Products:**

May produce acrid smoke and irritating fumes when heated to decomposition.

**Hazardous Polymerization:**

Will not occur.

**Incompatibilities:**

Strong oxidizers.

**Conditions to Avoid:**

Heat, flames, ignition sources and incompatibles.

## 11. Toxicological Information

N-Hexane: Oral rat LD50: 28710 mg/kg. Irritation eye rabbit: 10 mg mild. Investigated as a tumorigen, mutagen and reproductive effector.

Ingredient	---NTP Carcinogen---		IARC Category
	Known	Anticipated	
Hexane (110-54-3)	No	No	None
Methylcyclopentane (96-37-7)	No	No	None
2-Methylpentane (107-83-5)	No	No	None
3-Methylpentane (96-14-0)	No	No	None
Pentane (109-66-0)	No	No	None

## 12. Ecological Information

**Environmental Fate:**

When released into the soil, this material may biodegrade to a moderate extent. When released into the soil, this material is not expected to leach into groundwater. When released into the soil, this material is expected to quickly evaporate. When released into water, this material may biodegrade to a moderate extent. When released to water, this material is expected to quickly evaporate. When released into the water, this material is expected to have a half-life between 1 and 10 days. This material has an estimated bioconcentration factor (BCF) of less than 100. This material has a log octanol-water

partition coefficient of greater than 3.0. This material is not expected to significantly bioaccumulate. When released into the air, this material is expected to be readily degraded by reaction with photochemically produced hydroxyl radicals. When released into the air, this material is expected to have a half-life between 1 and 10 days.

**Environmental Toxicity:**

No information found.

### 13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved incinerator or disposed in a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

### 14. Transport Information

**Domestic (Land, D.O.T.)**

-----  
**Proper Shipping Name:** HEXANES  
**Hazard Class:** 3  
**UN/NA:** UN1208  
**Packing Group:** II  
**Information reported for product/size:** 215L

**International (Water, I.M.O.)**

-----  
**Proper Shipping Name:** HEXANES  
**Hazard Class:** 3.1  
**UN/NA:** UN1208  
**Packing Group:** II  
**Information reported for product/size:** 215L

### 15. Regulatory Information

-----\Chemical Inventory Status - Part 1\-----

Ingredient	TSCA	EC	Japan	Australia
Hexane (110-54-3)	Yes	Yes	Yes	Yes
Methylcyclopentane (96-37-7)	Yes	Yes	No	Yes
2-Methylpentane (107-83-5)	Yes	Yes	Yes	Yes
3-Methylpentane (96-14-0)	Yes	Yes	Yes	Yes
Pentane (109-66-0)	Yes	Yes	Yes	Yes

-----\Chemical Inventory Status - Part 2\-----

Ingredient	Korea	Canada DSL	NDSL	Phil.

Hexane (110-54-3)	Yes	Yes	No	Yes
Methylcyclopentane (96-37-7)	Yes	Yes	No	Yes
2-Methylpentane (107-83-5)	Yes	Yes	No	Yes
3-Methylpentane (96-14-0)	Yes	Yes	No	Yes
Pentane (109-66-0)	Yes	Yes	No	Yes

-----\Federal, State & International Regulations - Part 1\-----

Ingredient	-SARA 302-		-----SARA 313-----	
	RQ	TPQ	List	Chemical Catg.
Hexane (110-54-3)	No	No	Yes	No
Methylcyclopentane (96-37-7)	No	No	No	No
2-Methylpentane (107-83-5)	No	No	No	No
3-Methylpentane (96-14-0)	No	No	No	No
Pentane (109-66-0)	No	No	No	No

-----\Federal, State & International Regulations - Part 2\-----

Ingredient	CERCLA	-RCRA-	-TSCA-
		261.33	8 (d)
Hexane (110-54-3)	5000	No	No
Methylcyclopentane (96-37-7)	No	No	No
2-Methylpentane (107-83-5)	No	No	No
3-Methylpentane (96-14-0)	No	No	No
Pentane (109-66-0)	No	No	Yes

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No  
 SARA 311/312: Acute: Yes Chronic: Yes Fire: Yes Pressure: No  
 Reactivity: No (Mixture / Liquid)

**Australian Hazchem Code:** 3[Y]E  
**Poison Schedule:** No information found.

**WHMIS:**

This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

**16. Other Information**

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

**Label Hazard Warning:**

DANGER! EXTREMELY FLAMMABLE LIQUID AND VAPOR. VAPOR MAY CAUSE FLASH FIRE. HARMFUL OR FATAL IF SWALLOWED. HARMFUL IF INHALED. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. AFFECTS THE CENTRAL AND PERIPHERAL NERVOUS SYSTEMS.

**Label Precautions:**

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

**Label First Aid:**

Aspiration hazard. If swallowed, vomiting may occur spontaneously, but DO NOT INDUCE. If vomiting occurs, keep head below hips to prevent aspiration into lungs. Never give anything by mouth to an unconscious person. Call a physician immediately. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. In all cases call a physician.

**Product Use:**

Laboratory Reagent.

**Revision Information:**

MSDS Section(s) changed since last revision of document include: 8. Updated the ACGIH part of the Airborne section of TAB 8.

**Disclaimer:**

\*\*\*\*\*

**Mallinckrodt Baker, Inc. provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product. Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose. MALLINCKRODT BAKER, INC. MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE INFORMATION SET FORTH HEREIN OR THE PRODUCT TO WHICH THE INFORMATION REFERS. ACCORDINGLY, MALLINCKRODT BAKER, INC. WILL NOT BE RESPONSIBLE FOR DAMAGES RESULTING FROM USE OF OR RELIANCE UPON THIS INFORMATION.**

\*\*\*\*\*

**Prepared by:** Strategic Services Division  
Phone Number: (314) 539-1600 (U.S.A.)

---

# XYLENES

MSDS Number: X2000 --- *Effective Date: 08/02/00*

---

## 1. Product Identification

**Synonyms:** Dimethyl benzene, xylol, methyltoluene

**CAS No.:** 1330-20-7

**Molecular Weight:** 106.17

**Chemical Formula:** C<sub>6</sub>H<sub>4</sub>(CH<sub>3</sub>)<sub>2</sub>

**Product Codes:**

J.T. Baker: 5377, 5810, 5813, 9483, 9489, 9490, 9493, 9494, 9499, 9516, X516

Mallinckrodt: 8664, 8668, 8671, 8672, 8685, 8802, V052

---

## 2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
m-Xylene	108-38-3	40 - 65%	No
o-Xylene	95-47-6	15 - 20%	No
p-Xylene	106-42-3	< 20%	No
Ethyl Benzene	100-41-4	15 - 25%	Yes

---

## 3. Hazards Identification

### Emergency Overview

**DANGER! HARMFUL OR FATAL IF SWALLOWED. VAPOR HARMFUL. AFFECTS CENTRAL NERVOUS SYSTEM. CAUSES SEVERE EYE IRRITATION. CAUSES IRRITATION TO SKIN AND RESPIRATORY TRACT. MAY BE HARMFUL IF ABSORBED THROUGH SKIN. CHRONIC EXPOSURE CAN CAUSE ADVERSE LIVER, KIDNEY, AND BLOOD EFFECTS. FLAMMABLE LIQUID AND VAPOR.**

J.T. Baker SAF-T-DATA<sup>(tm)</sup> Ratings (Provided here for your convenience)

---

Health Rating: 2 - Moderate

Flammability Rating: 3 - Severe (Flammable)

Reactivity Rating: 0 - None

Contact Rating: 2 - Moderate

Lab Protective Equip: GOGGLES; LAB COAT; VENT HOOD; PROPER GLOVES;

CLASS B EXTINGUISHER.  
Storage Color Code: Red (Flammable)

---

### Potential Health Effects

---

**Inhalation:**

Inhalation of vapors may be irritating to the nose and throat. Inhalation of high concentrations may result in nausea, vomiting, headache, ringing in the ears, and severe breathing difficulties which may be delayed in onset. Substernal pain, cough, and hoarseness are also reported. High vapor concentrations are anesthetic and central nervous system depressants.

**Ingestion:**

Ingestion causes burning sensation in mouth and stomach, nausea, vomiting and salivation. Minute amounts aspirated into the lungs can produce a severe hemorrhagic pneumonitis with severe pulmonary injury or death.

**Skin Contact:**

Skin contact results in loss of natural oils and often results in a characteristic dermatitis. May be absorbed through the skin.

**Eye Contact:**

Vapors cause eye irritation. Splashes cause severe irritation, possible corneal burns and eye damage.

**Chronic Exposure:**

Chronic inhalation can cause headache, loss of appetite, nervousness and pale skin. Repeated or prolonged skin contact may cause a skin rash. Repeated exposure of the eyes to high concentrations of vapor may cause reversible eye damage. Repeated exposure can damage bone marrow, causing low blood cell count. May damage the liver and kidneys.

**Aggravation of Pre-existing Conditions:**

Persons with pre-existing skin disorders or eye problems, or impaired liver, kidney, blood, or respiratory function may be more susceptible to the effects of the substance.

---

## 4. First Aid Measures

**Inhalation:**

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

**Ingestion:**

Aspiration hazard. If swallowed, vomiting may occur spontaneously, but DO NOT INDUCE. If vomiting occurs, keep head below hips to prevent aspiration into lungs. Never give anything by mouth to an unconscious person. Call a physician immediately.

**Skin Contact:**

Immediately flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.

**Eye Contact:**

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

---

## 5. Fire Fighting Measures

### **Fire:**

Flash point: 29C (84F) CC

Autoignition temperature: 464C (867F)

Flammable limits in air % by volume:

l<sub>el</sub>: 1.0; u<sub>el</sub>: 7.0

### **Explosion:**

Above flash point, vapor-air mixtures are explosive within flammable limits noted above. Contact with strong oxidizers may cause fire. Sealed containers may rupture when heated. Sensitive to static discharge.

### **Fire Extinguishing Media:**

Dry chemical, foam or carbon dioxide. Water spray may be used to keep fire exposed containers cool, dilute spills to nonflammable mixtures, protect personnel attempting to stop leak and disperse vapors.

### **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. Vapors can flow along surfaces to distant ignition source and flash back.

---

## 6. Accidental Release Measures

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! If a leak or spill has not ignited, use water spray to disperse the vapors, to protect personnel attempting to stop leak, and to flush spills away from exposures. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker SOLUSORB(R) solvent adsorbent is recommended for spills of this product.

---

## 7. Handling and Storage

Protect against physical damage. Store in a cool, dry well-ventilated location, away from any area where the fire hazard may be acute. Outside or detached storage is preferred. Separate from incompatibles. Containers should be bonded and grounded for transfers to avoid static sparks. Storage and use areas should be No Smoking areas. Use non-sparking type tools and equipment, including explosion proof ventilation. Containers of this material may be hazardous when empty since they retain product

residues (vapors, liquid); observe all warnings and precautions listed for the product. Do Not attempt to clean empty containers since residue is difficult to remove. Do not pressurize, cut, weld, braze, solder, drill, grind or expose such containers to heat, sparks, flame, static electricity or other sources of ignition: they may explode and cause injury or death.

---

## 8. Exposure Controls/Personal Protection

### **Airborne Exposure Limits:**

-OSHA Permissible Exposure Limit (PEL):

100 ppm (TWA) xylene

100 ppm (TWA) ethylbenzene

-ACGIH Threshold Limit Value (TLV):

100 ppm (TWA) 150 ppm (STEL) xylene

Carcinogen Category (xylene): A4

100 ppm (TWA) 125 ppm (STEL) ethyl benzene

### **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. Use explosion-proof equipment.

### **Personal Respirators (NIOSH Approved):**

If the exposure limit is exceeded, a half-face organic vapor respirator may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece organic vapor respirator may be worn up to 50 times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-face piece positive-pressure, air-supplied respirator.

**WARNING:** Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

### **Skin Protection:**

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

### **Eye Protection:**

Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

---

## 9. Physical and Chemical Properties

The following physical data is for xylene.

### **Appearance:**

Clear, colorless liquid.

### **Odor:**

Characteristic odor.

**Solubility:**

Insoluble in water.

**Specific Gravity:**

0.86 @ 20C/4C

**pH:**

Not applicable.

**% Volatiles by volume @ 21C (70F):**

100

**Boiling Point:**

137 - 140C (279 - 284F)

**Melting Point:**

-25C (-13F)

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

3.7

**Vapor Pressure (mm Hg):**

8 @ 20C (68F)

**Evaporation Rate (BuAc=1):**

0.7

---

## 10. Stability and Reactivity

**Stability:**

Stable under ordinary conditions of use and storage.

**Hazardous Decomposition Products:**

Involvement in a fire causes formation of carbon monoxide and unidentified organic components.

**Hazardous Polymerization:**

Will not occur.

**Incompatibilities:**

Strong oxidizing agents and strong acids.

**Conditions to Avoid:**

Heat, flames, ignition sources and incompatibles.

---

## 11. Toxicological Information

**Toxicological Data:**

Xylene: oral rat LD50: 4300 mg/kg; inhalation rat LC50: 5000 ppm/4H; skin rabbit LD50: > 1700 mg/kg; Irritation eye rabbit: 87 mg mild (Std. Draize); irritation skin rabbit 500 mg/24 moderate (Std. Draize); investigated as a tumorigen, mutagen, reproductive effector.

Ethyl benzene: oral rat LD50: 3500 mg/kg; skin rabbit LD50: 17800 uL/kg; investigated as a tumorigen, mutagen, reproductive effector.

**Reproductive Toxicity:**

May cause teratogenic effects.

Ingredient	Known	Anticipated	IARC Category
m-Xylene (108-38-3)	No	No	3
o-Xylene (95-47-6)	No	No	3
p-Xylene (106-42-3)	No	No	3
Ethyl Benzene (100-41-4)	No	No	None

## 12. Ecological Information

### Environmental Fate:

Following data for xylene: When released into the soil, this material may evaporate to a moderate extent. When released into the soil, this material is expected to leach into groundwater. When released into the soil, this material may biodegrade to a moderate extent. When released into water, this material may evaporate to a moderate extent. When released into water, this material may biodegrade to a moderate extent. When released into the air, this material may be moderately degraded by reaction with photochemically produced hydroxyl radicals. When released into the air, this material is expected to have a half-life of less than 1 day. This material is not expected to significantly bioaccumulate. (mixed xylenes: octanol / water partition coefficient 3.1 - 3.2; bioconcentration factor = 1.3, eels)

### Environmental Toxicity:

For xylene: This material is expected to be slightly toxic to aquatic life. The LC50/96-hour values for fish are between 10 and 100 mg/l.

## 13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved incinerator or disposed in a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

## 14. Transport Information

### Domestic (Land, D.O.T.)

-----  
**Proper Shipping Name:** XYLENES  
**Hazard Class:** 3  
**UN/NA:** UN1307  
**Packing Group:** III  
**Information reported for product/size:** 398LB

### International (Water, I.M.O.)

-----  
**Proper Shipping Name:** XYLENES  
**Hazard Class:** 3.3  
**UN/NA:** UN1307

Packing Group: III

Information reported for product/size: 398LB

## 15. Regulatory Information

-----\Chemical Inventory Status - Part 1\-----				
Ingredient	TSCA	EC	Japan	Australia
m-Xylene (108-38-3)	Yes	Yes	Yes	Yes
o-Xylene (95-47-6)	Yes	Yes	Yes	Yes
p-Xylene (106-42-3)	Yes	Yes	Yes	Yes
Ethyl Benzene (100-41-4)	Yes	Yes	Yes	Yes

-----\Chemical Inventory Status - Part 2\-----				
Ingredient	Korea	--Canada--		Phil.
		DSL	NDSL	
m-Xylene (108-38-3)	Yes	Yes	No	Yes
o-Xylene (95-47-6)	Yes	Yes	No	Yes
p-Xylene (106-42-3)	Yes	Yes	No	Yes
Ethyl Benzene (100-41-4)	Yes	Yes	No	Yes

-----\Federal, State & International Regulations - Part 1\-----				
Ingredient	-SARA 302-		-----SARA 313-----	
	RQ	TPQ	List	Chemical Catg.
m-Xylene (108-38-3)	No	No	Yes	No
o-Xylene (95-47-6)	No	No	Yes	No
p-Xylene (106-42-3)	No	No	Yes	No
Ethyl Benzene (100-41-4)	No	No	Yes	No

-----\Federal, State & International Regulations - Part 2\-----			
Ingredient	CERCLA	-RCRA-	-TSCA-
		261.33	8 (d)
m-Xylene (108-38-3)	1000	No	No
o-Xylene (95-47-6)	1000	No	No
p-Xylene (106-42-3)	100	No	Yes
Ethyl Benzene (100-41-4)	1000	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No  
 SARA 311/312: Acute: Yes Chronic: Yes Fire: Yes Pressure: No  
 Reactivity: No (Mixture / Liquid)

**Australian Hazchem Code:** 3[Y]

**Poison Schedule:** No information found.

**WHMIS:**

This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

## 16. Other Information

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

**Label Hazard Warning:**

DANGER! HARMFUL OR FATAL IF SWALLOWED. VAPOR HARMFUL. AFFECTS CENTRAL NERVOUS SYSTEM. CAUSES SEVERE EYE IRRITATION. CAUSES IRRITATION TO SKIN AND RESPIRATORY TRACT. MAY BE HARMFUL IF ABSORBED THROUGH SKIN. CHRONIC EXPOSURE CAN CAUSE ADVERSE LIVER, KIDNEY, AND BLOOD EFFECTS. FLAMMABLE LIQUID AND VAPOR.

**Label Precautions:**

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

**Label First Aid:**

Aspiration hazard. If swallowed, vomiting may occur spontaneously, but DO NOT INDUCE. If vomiting occurs, keep head below hips to prevent aspiration into lungs. Never give anything by mouth to an unconscious person. Call a physician immediately. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. In all cases get medical attention immediately.

**Product Use:**

Laboratory Reagent.

**Revision Information:**

No changes.

**Disclaimer:**

\*\*\*\*\*

**Mallinckrodt Baker, Inc. provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product. Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose. MALLINCKRODT BAKER, INC. MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE INFORMATION SET FORTH HEREIN OR THE PRODUCT TO WHICH THE INFORMATION REFERS. ACCORDINGLY, MALLINCKRODT BAKER, INC. WILL NOT BE RESPONSIBLE FOR DAMAGES RESULTING FROM USE OF OR RELIANCE UPON THIS INFORMATION.**

\*\*\*\*\*

Prepared by: Strategic Services Division  
Phone Number: (314) 539-1600 (U.S.A.)

AMOCO OIL -- UNLEADED REGULAR GASOLINE  
MATERIAL SAFETY DATA SHEET  
NSN: 913000B010045  
Manufacturer's CAGE: 15958  
Part No. Indicator: A  
Part Number/Trade Name: UNLEADED REGULAR GASOLINE

=====  
General Information  
=====

Company's Name: AMOCO OIL COMPANY  
Company's Street: 200 EAST RANDOLPH DRIVE  
Company's City: CHICAGO  
Company's State: IL  
Company's Country: US  
Company's Zip Code: 60601  
Company's Emerg Ph #: 800 447-8735  
Company's Info Ph #: 312 856-3907  
Record No. For Safety Entry: 001  
Tot Safety Entries This Stk#: 001  
Date MSDS Prepared: 07MAR88  
Safety Data Review Date: 25APR88  
MSDS Serial Number: BBBDF

=====  
Ingredients/Identity Information  
=====

Proprietary: NO  
Ingredient: GASOLINE  
Ingredient Sequence Number: 01  
NIOSH (RTECS) Number: LX3300000  
CAS Number: 8006-61-9  
OSHA PEL: 300 PPM/500 STEL  
ACGIH TLV: 300 PPM/500STEL;9192

=====  
Physical/Chemical Characteristics  
=====

Appearance And Odor: CLEAR, BRIGHT LIQUID. CHARACTERISTIC ODOR  
Boiling Point: 80F TO 430F  
Vapor Pressure (MM Hg/70 F): 9-15 D-323  
Vapor Density (Air=1): 3 TO 4  
Specific Gravity: H2O=1 0.75  
Solubility In Water: NEGLIGIBLE BELOW 0.1

=====  
Fire and Explosion Hazard Data  
=====

Flash Point: -45 F  
Lower Explosive Limit: 1.3%  
Upper Explosive Limit: 7.6%  
Extinguishing Media: DRY CHEMICAL B-C, CARBON DIOXIDE, WATER FOG, FOAM (WATER MAY BE INEFFECTIVE).  
Unusual Fire And Expl Hazrds: EXTREMELY FLAMMABLE VAPOR/AIR MIXTURES FORM.

=====  
Reactivity Data  
=====

Stability: YES  
Materials To Avoid: AVOID STRONG OXIDIZERS

=====  
Health Hazard Data  
=====

Route Of Entry - Inhalation: YES  
Route Of Entry - Skin: YES  
Route Of Entry - Ingestion: YES  
Health Haz Acute And Chronic: INHALATION: MODERATELY TOXIC FOR ACUTE HARMFUL IF SWALLOWED AND/OR ASPIRATED INTO LUNGS.

Signs/Symptoms Of Overexp: INHALATION:EXCESSIVE EXPOSURES TO VAPORS WILL PROLONGED OR REPEATED CONTACT CAN DEFAT THE SKIN AND LEAD TO IRRITATION AND/OR DERMATITIS.

Emergency/First Aid Proc: IN CASE OF EYE CONTACT,FLUSH WITH PLENTY OF WATER.SKIN CONTACT,WASH EXPOSED SKIN WITH SOAP AND WATER.REMOVE CONTAMINATED CLOTHING,INCLUDING SHOES AND THOROUGHLY CLEAN AND DRY BEFORE REUSE.INHALATION:IF HARMFUL EFFECTS OCCUR,REMOVE TO UNCONTAMINATED AREA. GIVE ARTIFICIAL RESPIRATION IF NOT BREATHING.INGESTION:IF SWALLOWED,DO NOT INDUCE VOMITING.GET MEDICAL ATTENTION.

---

---

Precautions for Safe Handling and Use

---

---

Steps If Matl Released/Spill: REMOVE OR SHUT OFF ALL SOURCES OF IGNITION. USE WATER SPRAY TO DISPERSE VAPORS.INCREASE VENTILATION IF POSSIBLE.

Waste Disposal Method: ENCLOSED-CONTROLLED INCINERATION IS RECOMMENDED UNLESS DIRECTED OTHERWISE BY APPLICABLE ORDINANCES.

Precautions-Handling/Storing: STORE AWAY FROM HEAT,IGNITION SOURCES,AND OPEN FLAME IN ACCORDANCE WITH APPLICABLE FEDERAL,STATE,OR LOCAL REGULATIONS.

Other Precautions: USE AS MOTOR FUEL ONLY.

---

---

Control Measures

---

---

Respiratory Protection: AVOID BREATHING VAPOR AND/OR MIST.USE WITH ADEQUATE VENTILATION.

Protective Gloves: YES

Eye Protection: SAFETY GLASSES

Other Protective Equipment: WEAR PROTECTIVE CLOTHING AND GLOVES IF PROLONGED OR REPEATED CONTACT IS LIKELY.

---

---

Transportation Data

---

---

Disposal Data

---

---

Disposal Data Review Date: 89348

Rec # For This Disp Entry: 01

Tot Disp Entries Per NSN: 001

Landfill Ban Item: YES

Disposal Supplemental Data: N/K IN CASE OF ACCIDENTAL EXPOSURE OR DISCHARGE, CONSULT HEALTH AND SAFETY FILE FOR PRECAUTIONS.

1st EPA Haz Wst Code New: D001

1st EPA Haz Wst Name New: IGNITIBLE

1st EPA Haz Wst Char New: IGNITABILITY

1st EPA Acute Hazard New: NO

---

---

Label Data

---

---

Label Required: YES

Label Status: G

Common Name: UNLEADED REGULAR GASOLINE

Special Hazard Precautions: INHALATION:MODERATELY TOXIC FOR ACUTE HARMFUL IF SWALLOWED AND/OR ASPIRATED INTO LUNGS. INHALATION: EXCESSIVE EXPOSURES TO VAPORS WILL PRODUCE SYMPTOMS OF INTOXICATION, HEADACHE,DIZZINESS,AND NAUSEA.SKIN:PROLONGED OR REPEATED CONTACT CAN DEFAT THE SKIN AND LEAD TO IRRITATION AND/OR DERMATITIS.

Label Name: AMOCO OIL COMPANY

Label Street: 200 EAST RANDOLPH DRIVE

Label City: CHICAGO

Label State: IL

Label Zip Code: 60601

Label Country: US

Label Emergency Number: 800 447-8735

AMOCO OIL -- JP-5 JET FUEL - TURBINE FUEL, AVIATION  
MATERIAL SAFETY DATA SHEET  
NSN: 9130002732379  
Manufacturer's CAGE: 15958  
Part No. Indicator: A  
Part Number/Trade Name: JP-5 JET FUEL

=====  
General Information  
=====

Item Name: TURBINE FUEL, AVIATION  
Company's Name: AMOCO OIL COMPANY  
Company's Street: 200 EAST RANDOLPH DRIVE  
Company's City: CHICAGO  
Company's State: IL  
Company's Country: US  
Company's Zip Code: 60601  
Company's Emerg Ph #: 800-447-8735 (HEALTH)  
Company's Info Ph #: 312-856-3907  
Record No. For Safety Entry: 004  
Tot Safety Entries This Stk#: 027  
Status: SE  
Date MSDS Prepared: 25JUL89  
Safety Data Review Date: 12JAN93  
Supply Item Manager: KY  
MSDS Preparer's Name: RICHARD A. SYMULESKI  
MSDS Serial Number: BGXMT  
Specification Number: MIL-T-5624  
Spec Type, Grade, Class: JP-5 GRADE  
Hazard Characteristic Code: F4  
Unit Of Issue: GL  
Unit Of Issue Container Qty: BULK  
Type Of Container: BULK  
Net Unit Weight: BULK

=====  
Ingredients/Identity Information  
=====

Proprietary: NO  
Ingredient: PETROLEUM DISTILLATE. (KEROSENE).  
Ingredient Sequence Number: 01  
Percent: UNKNOWN  
NIOSH (RTECS) Number: 1002450KE  
CAS Number: 64742-81-0  
OSHA PEL: NOT ESTABLISHED  
ACGIH TLV: NOT ESTABLISHED  
Other Recommended Limit: NONE SPECIFIED

-----  
Proprietary: NO  
Ingredient: NAPHTHALENE (SARA III)  
Ingredient Sequence Number: 02  
Percent: 1.0%  
NIOSH (RTECS) Number: QJ0525000  
CAS Number: 91-20-3  
OSHA PEL: 10 PPM/15 STEL  
ACGIH TLV: 10 PPM/15 STEL; 9293  
Other Recommended Limit: NONE SPECIFIED

-----  
Proprietary: NO  
Ingredient: XYLENES (O-, M-, P- ISOMERS) (SARA III)  
Ingredient Sequence Number: 03  
Percent: 1.0%  
NIOSH (RTECS) Number: ZE2100000  
CAS Number: 1330-20-7  
OSHA PEL: 100 PPM/150 STEL

ACGIH TLV: 100 PPM/150 STEL9293  
Other Recommended Limit: NONE SPECIFIED

=====

Physical/Chemical Characteristics

=====

Appearance And Odor: CLEAR, BRIGHT LIQUID.  
Boiling Point: UNKNOWN  
Melting Point: UNKNOWN  
Vapor Pressure (MM Hg/70 F): UNKNOWN  
Vapor Density (Air=1): UNKNOWN  
Specific Gravity:

SHELL OIL -- SHELL 100 LL AVIATION GAS - GASOLINE, AVIATION  
MATERIAL SAFETY DATA SHEET  
NSN: 9130001791122  
Manufacturer's CAGE: 54527  
Part No. Indicator: B  
Part Number/Trade Name: SHELL 100 LL AVIATION GAS

## =====

## General Information

=====

Item Name: GASOLINE, AVIATION  
Company's Name: SHELL OIL CO.  
Company's Street: 1 SHELL PLAZA  
Company's P. O. Box: 2463  
Company's City: HUSTON  
Company's State: TX  
Company's Zip Code: 77001  
Company's Emerg Ph #: 713-473-9461  
Company's Info Ph #: 713-241-4819  
Record No. For Safety Entry: 011  
Tot Safety Entries This Stk#: 013  
Status: SE  
Date MSDS Prepared: 04MAR92  
Safety Data Review Date: 12MAY94  
Supply Item Manager: JDC  
MSDS Preparer's Name: JOHN P. SEPESI  
MSDS Serial Number: BTHLQ  
Specification Number: MIL-G-5572  
Spec Type, Grade, Class: NONE  
Hazard Characteristic Code: F3  
Unit Of Issue: GL  
Unit Of Issue Container Qty: BULK  
Type Of Container: BULK  
Net Unit Weight: BULK

=====

## Ingredients/Identity Information

=====

Proprietary: NO  
Ingredient: ALKANES, CYCLOALKANES, ALKENES & AROMATIC HYDROCARBONS  
Ingredient Sequence Number: 01  
Percent: BALANCE  
NIOSH (RTECS) Number: 1000011HC  
OSHA PEL: UNKNOWN  
ACGIH TLV: UNKNOWN  
Other Recommended Limit: NONE RECOMMENDED

-----

Proprietary: NO  
Ingredient: XYLENES (O-, M-, P- ISOMERS) (SARA III)  
Ingredient Sequence Number: 02  
Percent: 0-25  
NIOSH (RTECS) Number: ZE2100000  
CAS Number: 1330-20-7  
OSHA PEL: 100 PPM  
ACGIH TLV: 100 PPM/150STEL; 9394  
Other Recommended Limit: NONE RECOMMENDED

-----

Proprietary: NO  
Ingredient: TOLUENE (SARA III)  
Ingredient Sequence Number: 03  
Percent: 0-25  
NIOSH (RTECS) Number: XS5250000  
CAS Number: 108-88-3  
OSHA PEL: 200 PPM; Z-2  
ACGIH TLV: S, 50 PPM; 9394

Other Recommended Limit: NONE RECOMMENDED

-----  
Proprietary: NO  
Ingredient: BENZENE (SARA III)  
Ingredient Sequence Number: 04  
Percent: 0-4  
NIOSH (RTECS) Number: CY1400000  
CAS Number: 71-43-2  
OSHA PEL: SEE 1910.1028  
ACGIH TLV: 10 PPM; A2; 9394  
Other Recommended Limit: NONE RECOMMENDED

-----  
Proprietary: NO  
Ingredient: HEXANE (N-HEXANE)  
Ingredient Sequence Number: 05  
Percent: 0-3  
NIOSH (RTECS) Number: MN9275000  
CAS Number: 110-54-3  
OSHA PEL: 500 PPM  
ACGIH TLV: 50 PPM; 9394  
Other Recommended Limit: NONE RECOMMENDED

-----  
Proprietary: NO  
Ingredient: TETRAETHYL LEAD (SARA III)  
Ingredient Sequence Number: 06  
Percent:

Ethylbenzene, 99%  
ACROS00596

\*\*\*\* SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION \*\*\*\*

MSDS Name: Ethylbenzene, 99%

Catalog Numbers:

AC118080000, AC118080010, AC118080025, AC118080250

Synonyms:

Ethylbenzol, phenylethane

Company Identification (Europe): Acros Organics N.V.

Janssen Pharmaceuticaaan 3a

2440 Geel, Belgium

Company Identification (USA): Acros Organics

One Reagent Lane

Fairlawn, NJ 07410

For information in Europe, call: 0032(0) 14575211

For information in North America, call: 800-ACROS-01

For emergencies in Europe, call: 0032(0) 14575299

For emergencies in the US, call CHEMTREC: 800-424-9300

\*\*\*\* SECTION 2 - COMPOSITION, INFORMATION ON INGREDIENTS \*\*\*\*

CAS#	Chemical Name	%	EINECS#
100-41-4	Ethylbenzene	99.0	202-849-4

Hazard Symbols: XN F

Risk Phrases: 11 20

\*\*\*\* SECTION 3 - HAZARDS IDENTIFICATION \*\*\*\*

EMERGENCY OVERVIEW

Appearance: clear, colorless. Flash Point: 21 deg C.

Warning! Flammable liquid. Causes skin irritation. Causes eye irritation. May cause central nervous system depression. Aspiration hazard. May be absorbed through the skin. Causes digestive and respiratory tract irritation.

Target Organs: Central nervous system.

Potential Health Effects

Eye:

Causes moderate eye irritation. Vapors may cause eye irritation.

Skin:

Causes skin irritation. Prolonged and/or repeated contact may cause irritation and/or dermatitis. May be absorbed through the skin. Contact with the liquid may cause erythema, exfoliation and vesiculation.

Ingestion:

May cause irritation of the digestive tract. May cause gastrointestinal irritation with nausea, vomiting and diarrhea. May cause central nervous system depression, characterized by excitement, followed by headache, dizziness, drowsiness, and nausea. Advanced stages may cause collapse, unconsciousness, coma and possible death due to respiratory failure. Aspiration of material into the lungs may cause chemical pneumonitis, which may be fatal.

Inhalation:

Inhalation of high concentrations may cause central nervous system effects characterized by headache, dizziness, unconsciousness and coma. Causes respiratory tract irritation. Vapors may cause dizziness or suffocation.

## Chronic:

Chronic inhalation may cause effects similar to those of acute inhalation.

## \*\*\*\* SECTION 4 - FIRST AID MEASURES \*\*\*\*

## Eyes:

Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid immediately.

## Skin:

Get medical aid. Flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse.

## Ingestion:

Do NOT induce vomiting. If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid immediately.

## Inhalation:

Remove from exposure to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.

## Notes to Physician:

Treat symptomatically and

## Antidote:

None reported.

## \*\*\*\* SECTION 5 - FIRE FIGHTING MEASURES \*\*\*\*

## General Information:

Containers can build up pressure if exposed to heat and/or fire. As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Vapors may form an explosive mixture with air. Vapors can travel to a source of ignition and flash back. Use water spray to keep fire-exposed containers cool. Flammable Liquid. Vapors may be heavier than air. They can spread along the ground and collect in low or confined areas. Containers may explode when heated.

## Extinguishing Media:

For small fires, use dry chemical, carbon dioxide, water spray or alcohol-resistant foam. Use water spray to cool fire-exposed containers. Water may be ineffective. For large fires, use water spray, fog or alcohol-resistant foam. Contact professional fire-fighters immediately. Cool containers with flooding quantities of water until well after fire is out.

## \*\*\*\* SECTION 6 - ACCIDENTAL RELEASE MEASURES \*\*\*\*

General Information: Use proper personal protective equipment as indicated in Section 8.

## Spills/Leaks:

Absorb spill with inert material, (e.g., dry sand or earth), then place into a chemical waste container. Remove all sources of ignition. A vapor suppressing foam may be used to reduce vapors. Water spray may reduce vapor but may not prevent ignition in closed spaces.

## \*\*\*\* SECTION 7 - HANDLING and STORAGE \*\*\*\*

## Handling:

Wash thoroughly after handling. Use with adequate ventilation. Ground and bond containers when transferring material. Avoid contact with eyes, skin, and clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Keep container

tightly closed. Avoid contact with heat, sparks and flame. Avoid ingestion and inhalation. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames.

**Storage:**

Keep away from heat, sparks, and flame. Keep away from sources of ignition. Store in a tightly closed container. Keep from contact with oxidizing materials. Store in a cool, dry, well-ventilated area away from incompatible substances.

\*\*\*\* SECTION 8 - EXPOSURE CONTROLS, PERSONAL PROTECTION \*\*\*\*

**Engineering Controls:**

Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Ethylbenzene	100 ppm ; 434 mg/m <sup>3</sup> ; 125 ppm STEL; 543 mg/m <sup>3</sup> STEL	100 ppm TWA; 435 mg/m <sup>3</sup> TWA 800 ppm IDLH (10 percent lower explosive limit)	100 ppm TWA; 435 mg/m <sup>3</sup> TWA

OSHA Vacated PELs:

Ethylbenzene:

100 ppm TWA; 435 mg/m<sup>3</sup> TWA

**Personal Protective Equipment**

**Eyes:**

Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

**Skin:**

Wear appropriate protective gloves and clothing to prevent skin exposure.

**Clothing:**

Wear appropriate protective gloves and clothing to prevent skin exposure.

**Respirators:**

Follow the OSHA respirator regulations found in 29CFR 1910.134 or European Standard EN 149. Always use a NIOSH or European Standard EN 149 approved respirator when necessary.

\*\*\*\* SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES \*\*\*\*

Physical State: Liquid  
 Appearance: clear, colorless  
 Odor: aromatic odor  
 pH: Not available.  
 Vapor Pressure: 7.1 mm Hg @ 20 C  
 Vapor Density: 3.7  
 Evaporation Rate:

**APPENDIX II**  
**SITE ORGANIZATION AND CONTROL**

## SITE ORGANIZATION AND CONTROL

- SITE CONTROL MEASURES

The following section defines measures and procedures for maintaining site control. Site control is an essential component in the implementation of the site health and safety program.

- General

Prior to any site work the following items will be addressed:

- Site reconnaissance
- Obtain drawings of site and/or existing private utilities for the site.
- Contact utility locating services (U-L-O-C-O) and/or local utility companies and request a site inspection.
- Check for physical restraints/obstructions such as overhead utilities, signs, canopies, etc.
- Determine work areas (decontamination, staging, etc...).
- Barricade work areas, as necessary, to isolate from pedestrians and vehicles.

- Site Communications Plan

Successful communications between field teams and contact with personnel in the support zone is essential. The following communications systems should be available during activities at the Site.

- Noise Makers (horns, whistles, sirens)

SIGNAL	DEFINITION
One long blast	Evacuate area to nearest emergency exit.
Two short blasts	Localized problem. Not dangerous to workers.
Two Long blasts	All clear. Resume activities.

- *Hand Signals*

<b>SIGNAL</b>	<b>DEFINITION</b>
Hands clutching throat	Out of air/cannot breath
Hands on top of head	Need assistance
Thumbs up	OK/I am all right/I understand
Thumbs down	No/negative
Arms waving upright	Send back-up support
Grip partner's wrist	Exit area immediately

- *Buddy System (where necessary):*

This system is used in situations where partners provide each other with assistance and observe his or her partner for signs of chemical exposure or for medical emergencies.

Safe Work Practices:

Standing orders have been developed to maintain strong safety awareness and to enforce safe procedures at the Site.

- **Work Area**

No smoking, eating or drinking;  
 No horse-play;  
 No matches or lighters;  
 Implement the communications system; and  
 Wear the appropriate level of protection as defined in this plan.

Excavations/Trenching:

Hazards encountered during soil and test pit excavation or trenching include both chemical and physical agents, and are as follows:

- Exposure to airborne contaminants released during intrusive activities. Flammable atmospheres may also be encountered.
- Excavation cave in.
- Falling during access/egress, while monitoring, or stumbling into excavation.

- Overhead hazard may result from material, tools, rock and/or soil falling into the excavation.
- Congested work area due to too many workers in small area.

Hazard prevention includes:

- Monitor for airborne contaminants. Allow test pits/excavations to purge and/or use PPE.
- Provide adequate shoring and sloping of sides of the excavation. Regularly inspect trenches for changing conditions.

Solid rock, cemented sand or gravel = 90 degrees  
 Compact angular gravel = 63 degrees 26 feet deep  
 Compacted sharp sand = 33 degrees 41 feet deep  
 Rounded loose sand = 26 degrees 34 feet deep

- Provide ramps or ladders to trenches to allow safe access and egress.
- Provide an adequate barrier around open pits (barricades, barricade tape, etc.)
- Maintain ample work room between workers.

#### Confined Space Entry Procedures (CSEP)

A confined space provides the potential for unusually high concentrations of contaminants, explosive atmospheres, limited visibility, and restricted movements.

General provisions include:

- When possible, confined spaces should be identified with a posted sign which reads: Caution - Confined Space.
- Only personnel trained and knowledgeable of the requirements of the Confined Space Entry Procedures will be authorized to enter a confined space or be a confined space observer.
- Natural ventilation shall be provided for the confined space prior to initial entry and for the duration of the CSEP. Positive/forced mechanical ventilation may be required. However, care should be taken to not spread contamination outside of the enclosed area.

- If flammable liquids may be contained within the confined space, explosion proof equipment will be used. All equipment shall be positively grounded.
- The contents of any confined space shall, where necessary, be removed prior to entry. All sources of ignition must be removed prior to entry.
- Hand tools used in confined spaces shall be in good repair explosion proof and spark proof, and selected according to intended use. Where possible, pneumatic power tools are to be used.
- Hand-held lights and other illumination utilized in confined spaces shall be equipped with guards to prevent contact with the bulb and must be explosion proof.
- Compressed gas cylinders, except cylinders used for a self-contained breathing apparatus, shall not be taken into confined spaces. Gas hoses shall be removed from the space and the supply turned off at the cylinder valve when personnel exit from the confined space.
- If a confined space requires respiratory equipment or where rescue may be difficult, safety belts, body harnesses, and lifelines will be used. The outside observer shall be provided with the same equipment as those working within the confined space.
- A ladder is required in all confined spaces deeper than the employee's shoulders. The ladder shall be secured and not removed until all employees have exited the space.
- Only self-contained breathing apparatus or NIOSH approved airline respirators equipped with a 5-minute emergency air supply (egress bottle) shall be used in untested confined spaces or in any confined space with conditions determined immediately dangerous to life and health.
- Where air-moving equipment is used to provide ventilation, chemicals shall be removed from the vicinity to prevent introduction into the confined space.
- Vehicles shall not be left running near confined space work or near air-moving equipment being used for confined space ventilation.
- Smoking in confined spaces will be prohibited at all times.
- Any deviation from these Confined Space Entry Procedures requires the prior permission of the Safety Manager.

**APPENDIX III**  
**CONTINGENCY PLAN**

## CONTINGENCY PLAN

### CONTINGENCY PLAN

This section describes contingencies and emergency planning procedures to be implemented at the Site. This plan is compatible with local, state and federal disaster and emergency management plans as appropriate.

#### Pre-Emergency Plan

During the periodic site briefings, all employees will be trained in and reminded of provisions of the emergency response plan, communications systems, and evacuation routes. The HASP identifies the hazardous conditions associated with specific site activities. The plan will be reviewed on a regular basis and revised, if necessary, by the Safety Manager. This will ensure that the plan is adequate and consistent with prevailing site conditions.

#### Personnel Roles and Lines of Authority

The Site Supervisor has primary responsibility for responding to and correcting emergency situations. This includes taking appropriate measures to ensure the safety of site personnel and the public. Possible actions may involve evacuation of personnel from the site area, and/or evacuation of adjacent residents. He/she is additionally responsible for ensuring that corrective measures have been implemented, appropriate authorities notified, and follow-up reports completed. The Safety Manager may be called upon to act on the behalf of the site supervisor, and may direct responses to any medical emergency. The individual contractor organizations are responsible for assisting the project manager in his/her mission within the parameters of their scope of work.

The CATLIN Program Manager: Mike E. Mason, (910) 452-5861, or (800) 346-7360;

The CATLIN Safety Coordinator: Teri M. Piver, (910) 452-5861, or (800) 346-7360

#### Evacuation Routes/Procedures

In the event of an emergency, which necessitates an evacuation of the site, the following alarm procedures will be implemented:

Evacuation alarm notification should be made using one long blast on the air horn. All personnel should evacuate upwind of any activities. Insure that a predetermined location is identified off-site in case of an emergency, so that all personnel can be accounted for.

Personnel will be expected to proceed to the closest exit with your buddy, and mobilize to the safe distance area associated with the evacuation route. Personnel will remain at that area until the re-entry alarm is sounded or an authorized individual provides further instructions.

#### Emergency Medical Treatment Procedures

Any person who becomes ill or injured in the Exclusion Zone must be decontaminated to the maximum extent possible. If the injury or illness is minor, full decontamination should be completed and first aid administered prior to transport. If the patient's condition is serious, at least partial decontamination should be completed (i.e., complete disrobing of the victim and redressing in clean coveralls or wrapping in a blanket). First aid should be administered while awaiting an ambulance or paramedics. All injuries and illnesses must immediately be reported to the project manager.

Any person being transported to a clinic or hospital for treatment should take with them information on the chemical they have been exposed to at the site.

Any vehicle used to transport contaminated personnel will be treated and cleaned as necessary.

### Heat Stress

One or more of the following measures will be used to help control heat stress:

- Provision of adequate liquids to replace body fluids. Workers must replace water and salt lost from sweating. Employees must be encouraged to drink more than the amount required to satisfy thirst. Thirst satisfaction is not an accurate indicator of adequate salt and fluid replacement.
- Replacement fluids can be commercial mixes, such as Gatorade, or a combination of these with fresh water. Replacement fluids should be cool (50-60° F) but not chilled (40° F).
- Establishment of a work regimen that will provide adequate rest periods for cooling down. This may require additional shifts of workers.
- During the hot season, workers should frequently drink small amounts (i.e. one cup every 15 - 20 minutes).
- Cooling devices such as cooling vests may be worn beneath protective garments.
- All breaks are to be taken in a cool area (77° F is best).
- Employees shall remove impermeable protective garments during rest periods.
- Workers shall not be assigned other tasks during rest periods.
- All employees shall be informed of the importance of adequate rest, acclimation and proper diet in the prevention of heat stress.
- A copy of the "American Red Cross Standard First Aid" will be available on-site.

## Heat Stress Monitoring

- For workers wearing permeable clothing, refer to the "American Conference of Government Industrial Hygienists' (ACGIH) Threshold Limit Values for Heat Stress".
- For workers wearing semi-permeable or impermeable ensembles the ACGIH standard cannot be used. For these situations, workers should be monitored when temperature in the work area is above 70° F. Therefore, the following measures should be employed.

- Heart rate. Count the radial pulse during a 30-second period as early as possible in the rest period.

If the heart rate exceeds 110 beats per minute at the beginning of the rest period, shorten the next work cycle by one third and keep the rest period the same. If the heart rate still exceeds 110 beats per minute at the next rest period, shorten the following work cycle by one-third.

- Oral temperature. Use a clinical thermometer (3 minutes under the tongue) or similar device to measure the oral temperature at the end of the work period (before drinking replacement fluids).

If the oral temperature exceeds 99.6° F shorten the next work cycle by one-third without changing the rest period. If the oral temperature still exceeds 99.6° F at the beginning of the next rest period, shorten the following work cycle by one-third.

Do **not** permit a worker to wear a semi-permeable or impermeable garment when his/her oral temperature exceeds 100.6° F.

- Body water loss. If possible, measure weight at the beginning of each workday to see if enough fluids are being taken to prevent dehydration. The body water loss should not exceed 1.5 percent of the total body weight loss in a workday.

## Cold Stress

The potential exists for cold stress (frostbite or hypothermia) to occur when conducting work activities in an environment where air temperatures may fall below freezing. Following is a brief description identifying exposure symptoms:

Hypothermia- condition in which the body loses heat faster than it is produced. Vasodilators (alcohol and drugs) allow the body to lose heat faster which accelerate hypothermia. The five stages of hypothermia: (1) shivering; (2) apathy; (3) unconsciousness; (4) freezing; and (5) death.

Frostbite- condition in which there is a freezing of partial freezing of some part of the body. Individuals previously exposed to frostbite are more susceptible to contracting it again. Vasoconstrictors (tobacco products), constrict the blood vessels, and accelerate frostbite. The three stages of frostbite are: (1) frost-nip - the beginnings of frostbite whereby the skin begins to turn white; (2) superficial-similar to frost-nip except the skin begins to turn numb; and (3) deep- the affected area is frozen to the bone, cold, numb, and very hard.

To prevent conditions from occurring, the following is recommended:

- Dress in a minimum of three layers (a skin layer to absorb moisture and keep skin dry, an insulating layer, and an outer chemical-protective layer).
- Avoid touching cold surfaces (especially metal) with bare skin, minimize exposed skin surfaces.
- Keep active, use shelter areas during rest cycles.
- Maintain body fluids.
- Use wind breaks whenever possible.

#### Fire or Explosion

In the event of a fire or explosion, the local fire department should be summoned immediately. Upon their arrival, the project manager or designated alternate will advise the fire commander of the location, nature, and identification of the hazardous materials onsite.

If it is safe to do so, site personnel may:

- Remove or isolate flammable or other hazardous materials that may contribute to the fire.

#### Spill or Leaks

In the event of a spill or a leak, site personnel will:

- Inform their supervisor immediately;
- Locate the source of the spillage and stop the flow if it can be done safely; and
- Begin containment and recovery of the spilled materials.

**APPENDIX B**

**BORING LOG**

**WELL SAMPLING WORKSHEET**

**CHAIN OF CUSTODY RECORD**



WELL SAMPLING WORKSHEET

PROJECT \_\_\_\_\_

DATE \_\_\_\_\_

PROJECT NO. \_\_\_\_\_

SAMPLED BY \_\_\_\_\_

WELL NO. \_\_\_\_\_

TIME \_\_\_\_\_

WELL DIAMETER \_\_\_\_\_

WELL DEPTH - A \_\_\_\_\_

DEPTH TO WATER - B \_\_\_\_\_

(A-B) FT H<sub>2</sub>O IN WELL - C \_\_\_\_\_

GALLONS/FT - D \_\_\_\_\_

(C x D) ONE VOLUME - E \_\_\_\_\_

(E x 3) THREE VOLUMES - F \_\_\_\_\_

VOLUME OF BAILER - G \_\_\_\_\_

(F-G) NO. BAILS REQUIRED - H \_\_\_\_\_

NO. BAILS TAKEN - I \_\_\_\_\_

FIELD TESTS:

pH \_\_\_\_\_

CONDUCTIVITY \_\_\_\_\_

OTHERS \_\_\_\_\_

VOLUMES:

3' x 1.5" BAILER = 0.24 GAL/BAIL

4' x 1.5" BAILER = 0.37 GAL/BAIL

1-1/4" WELL = 0.064 GAL/FT

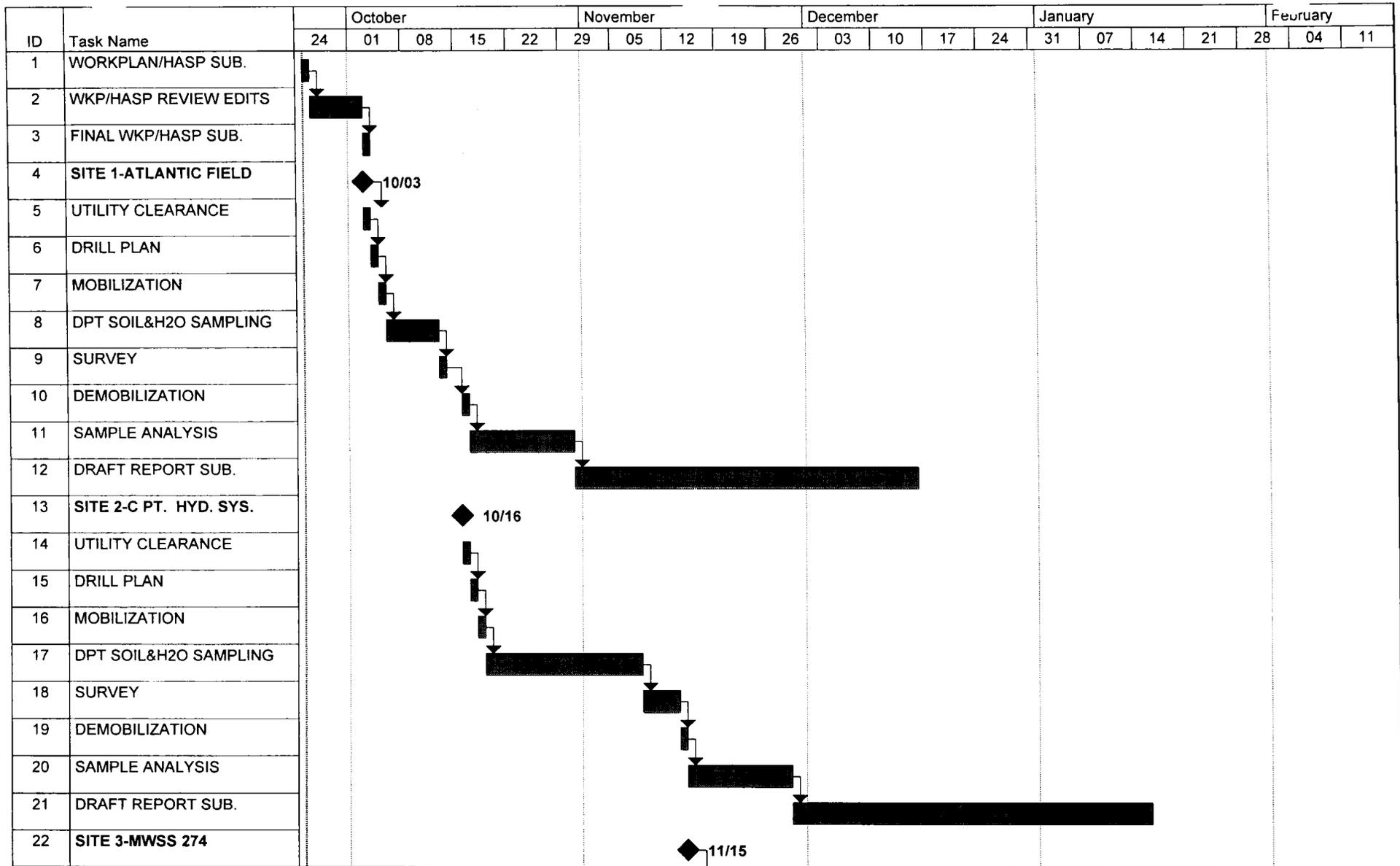
2" WELL = 0.163 GAL/FT

4" WELL = 0.653 GAL/FT



**APPENDIX C**

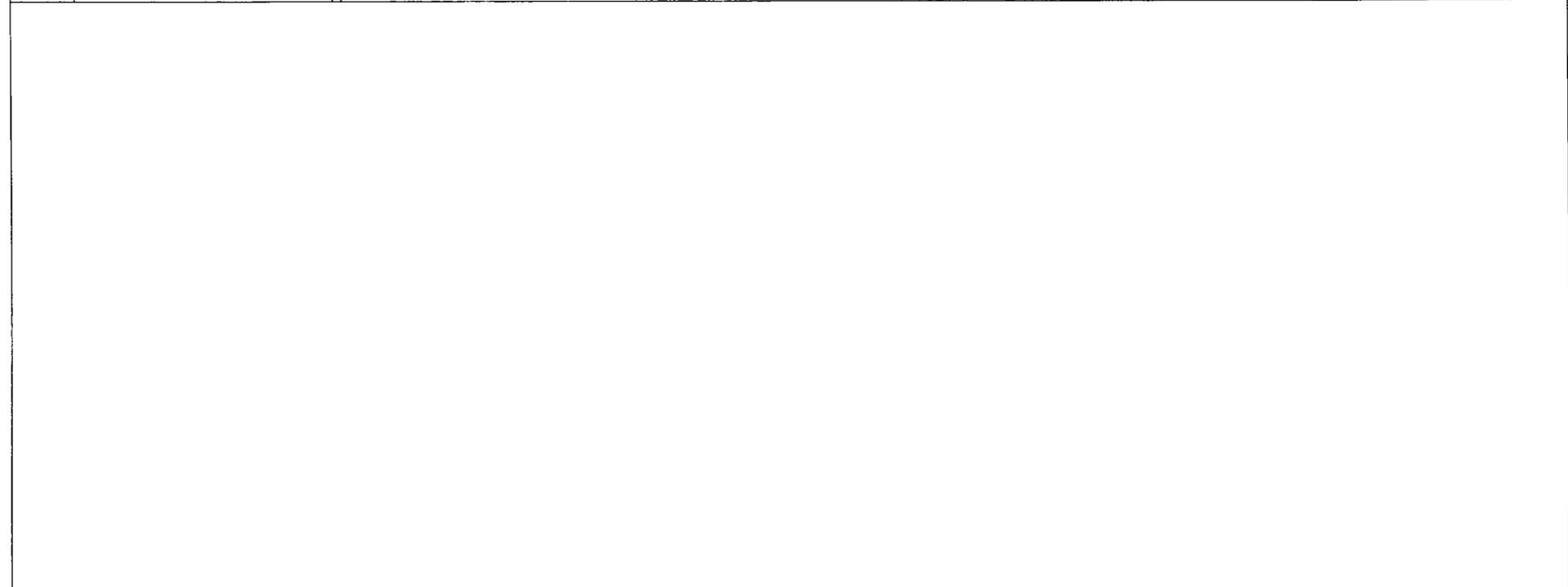
**PROJECT SCHEDULE**



Project: VARIOUS 200163  
Date: Mon 09/25/00



ID	Task Name	October					November					December					January			February		
		24	01	08	15	22	29	05	12	19	26	03	10	17	24	31	07	14	21	28	04	11
23	UTILITY CLEARANCE																					
24	DRILL PLAN																					
25	MOBILIZATION																					
26	DPT SOIL&H2O SAMPLING																					
27	SURVEY																					
28	DEMOBILIZATION																					
29	SAMPLE ANALYSIS																					
30	DRAFT REPORT SUB.																					



Project: VARIOUS 200163 Date: Mon 09/25/00	Task		Summary		Rolled Up Progress	
	Split		Rolled Up Task		External Tasks	
	Progress		Rolled Up Split		Project Summary	
	Milestone		Rolled Up Milestone			