

**FINAL**

**WORK PLAN ADDENDUM  
SITE 14 - FENTRESS LANDFILL  
SITE 17 - FIREFIGHTING TRAINING AREA  
NAVAL AUXILIARY LANDING FIELD NAVAL  
FENTRESS, VIRGINIA**

**CONTRACT TASK 0040**

*Prepared For:*

**NAVAL FACILITIES  
ENGINEERING COMMAND  
ATLANTIC DIVISION  
Norfolk, Virginia**

*Under:*

**Contract N62470-89-D-4814**

*Prepared by:*

**BAKER ENVIRONMENTAL, INC  
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**APRIL 26, 1993**

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*For*

**NAVAL FACILITIES ENGINEERING COMMAND  
ATLANTIC DIVISION  
Norfolk, Virginia**

*Through*

**BAKER ENVIRONMENTAL, INC**

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## 1.0 INTRODUCTION

This Work Plan Addendum (WP Addendum) was prepared to conduct work at the Naval Auxiliary Landing Field (NALF) Fentress, Virginia. The WP Addendum addresses additional work to be performed by the Baker Team (Baker Environmental, Inc., and Foster Wheeler Enviresponse, Inc.) at Site 17 - The Fire Fighting Training Area. Coupled with this effort, the Baker Team will collect groundwater samples from monitoring wells located at Site 14 - Fentress Landfill, as outlined in Section 3.3 of this WP Addendum. Figure 1-1 provides the location of the NALF. Site 17 is located at the intersection of two abandoned concrete runways in the northwestern corner of the facility as shown on Figure 1-2.

The Work Plan, dated December 20, 1991 and Site Inspection Report, dated July 31, 1992 for CTO-0040, prepared by the Baker Team, contain detailed information regarding this site. These plans are referenced throughout this WP Addendum and should be used in conjunction with this document. The following sections describe the purpose and objectives, and organization for the WP Addendum.

### 1.1 Purpose and Objective

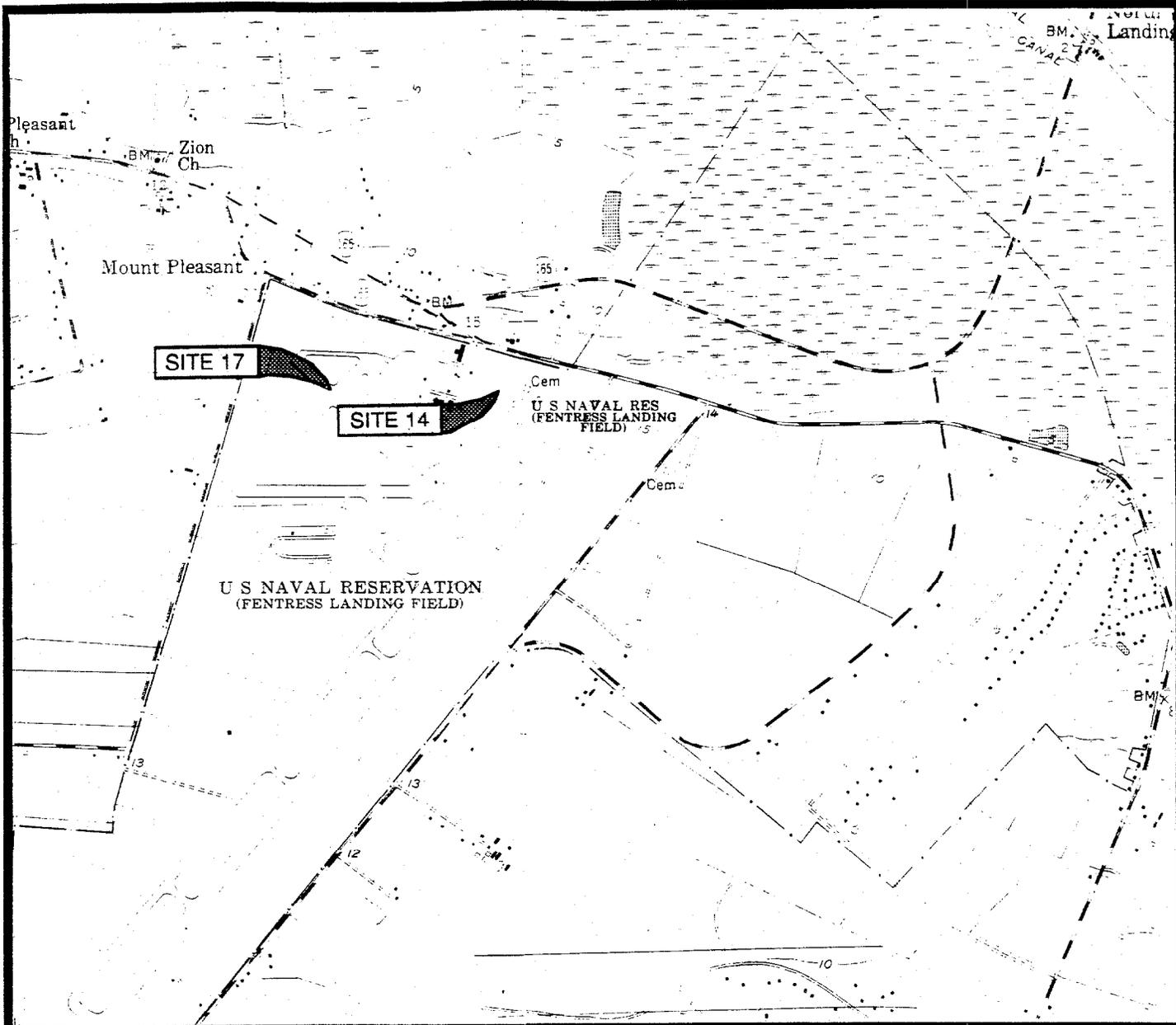
The purpose of the additional site investigation work presented in this WP Addendum is to:

- Determine the preliminary extent of the volatile constituents of concern in the subsurface soils at Site 17 by conducting a subsurface soil gas survey;
- Confirm the extent of the constituents of concern in the subsurface soils at Site 17 by collecting soil samples from various depths;
- Confirm the absence or presence of constituents of concern detected in the Site 14 groundwater; and,
- Based on the results of the investigation, determine if the data collected for Site 14 and Site 17 can support either a no further action recommendation or a remedial design and removal action recommendation.

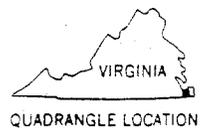
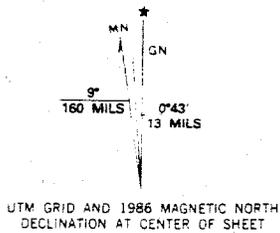
The objective of this additional investigation work is to collect supplemental site-specific data in sufficient detail to satisfy the objectives presented in the LANTDIV Scope of Work dated July 14, 1991. The work will be conducted in accordance with the Comprehensive Long-Term Environmental Action Navy (CLEAN) Program, Contract Number N62470-89-D-4814, Contract Task Order (CTO) 0040, and the Implementation Plan and Fee Proposal (IP/FP) "Modification to CTO-040 Additional Site Investigation Work," dated August 13, 1992.

### 1.2 WP Addendum Organization

This WP Addendum addresses the tasks and activities to be conducted at NALF for the SI Addendum. Section 2.0 provides background information for the site. Section 3.0 presents the technical approach which will be used. Section 4.0 presents the methodology to be followed to acquire and use valid data during the investigation. Section 5.0 presents the Health and Safety Plan for this project. Section 6.0 presents the schedule to be followed in conducting the WP Addendum.



**FIGURE 1-1**  
**SITE LOCATION MAP**  
**SITE 14 - FENTRESS LANDFILL**  
**AND**  
**SITE 17 - FIREFIGHTING TRAINING AREA**  
**NAVAL AUXILIARY LANDING FIELD**  
**FENTRESS, VIRGINIA**

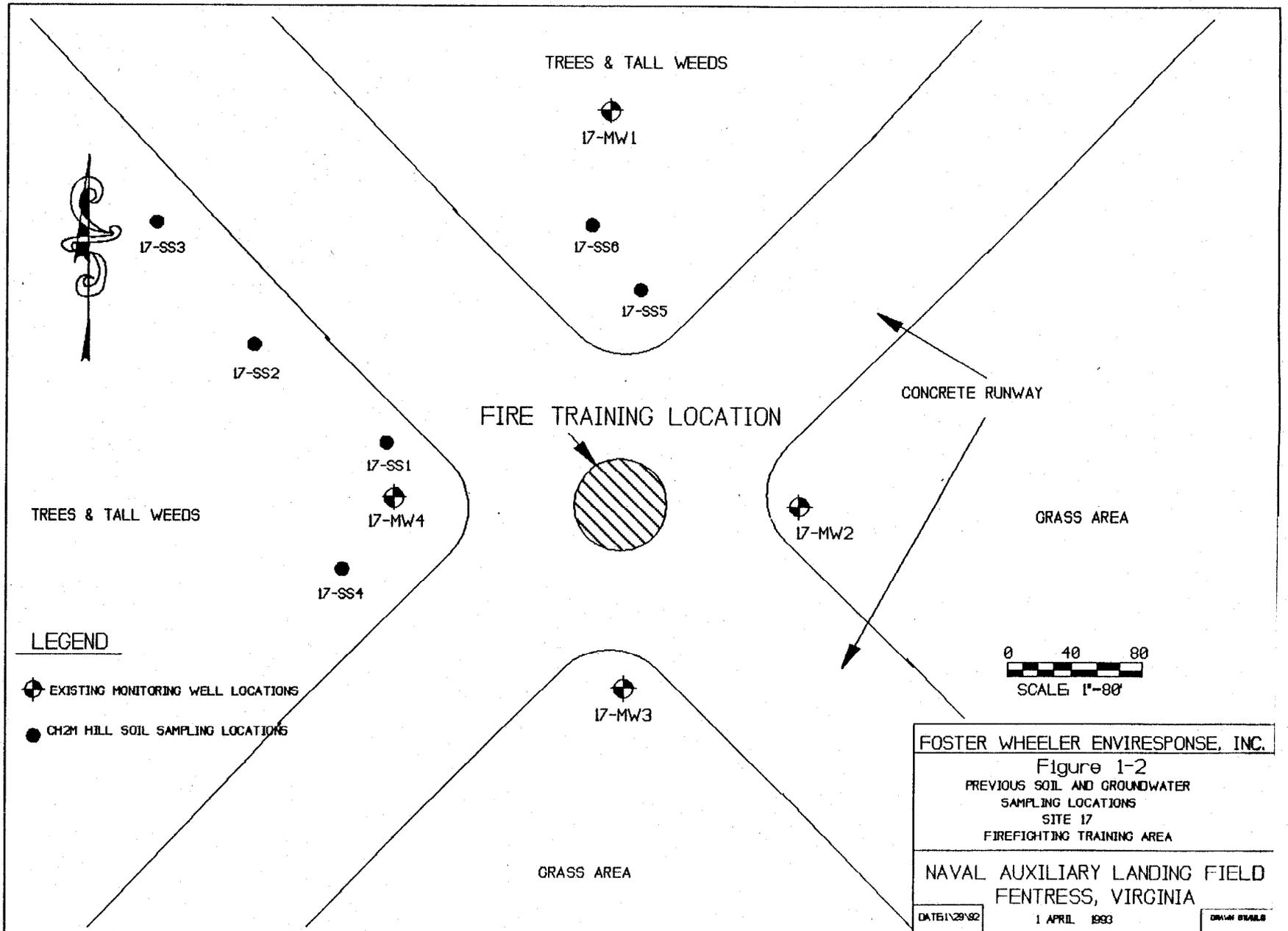


Fentress and Pleasant Ridge VA Quadrangles  
 7.5 Minute Topographic Series

Prepared by:  
 Foster Wheeler Enviresponse, Inc.

Date: April, 1993

Scale: 1" = 2000'



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## 2.0 BACKGROUND

The Work Plan and Site Inspection Report for CTO-0040, contains detailed information regarding the site history, environmental setting, geology, hydrology, and results of previous investigations pertaining to this site. These plans, should be used along with this WP Addendum.

### 2.1 Site History

The NALF was established during World War II and served as a U.S. Naval Air Landing Field from the mid 1940's to 1970. Presently the facility is used as a training site for Navy personnel and is maintained and operated by the Navy. The landing strip is used for training police recruits from Chesapeake and Virginia Beach, Virginia. The facility currently provides air training services for operations and command/control of fleet units and other Department of Defense (DOD) agencies in the Atlantic.

Site 17 was used as a training area where jet fuel and spent oils were ignited to teach firefighting skills to Navy personnel (CH<sub>2</sub>M Hill, 1991). The Site is currently abandoned.

Site 14, now a closed landfill at NALF Fentress, is located at the north end of Runway 23. It was used between 1945 and 1970 and covers approximately 3 acres. Previous reports addressed asbestos, PCBs, oil, and other chlorinated solvents as potential contaminants.

### 2.2 Environmental Location and Setting

The NALF is located in Fentress, Virginia, south of the City of Chesapeake at longitude 76°07'30" west and latitude 36°42'30" north. The local terrain is flat, with the relief varying between ten and fifteen above mean sea level, over much of facility. Surface water runoff is managed by a system of drainage ditches and surface channels, which direct runoff north and east of the facility toward the Intercoastal Waterway.

The town of Fentress is 15 miles west of Virginia Beach, in the lower coastal plain typical of the Tidewater area of Virginia. The facility is bounded by the North Landing River to the north and east, the Pocaty River and its tributaries to the south, and the town of Mt. Pleasant to the west. The Pocaty and North Landing Rivers are the nearest surface bodies of water. The Pocaty River is a tidal tributary of the North Landing River and the Chesapeake Bay. The North Landing River is also an Intercoastal Waterway.

### 2.3 Geology

The regional and local geology of NALF is described in the CTO-0040 WP, Section 2.2.

### 2.4 Hydrology

The hydrology of groundwater and surface water in the NALF area is described in the CTO-0040 WP, Section 2.3.

### 2.5 Summary of Previous Investigations

Field activities conducted to date at Site 17 have included the installation of monitoring wells, and collection and analysis of groundwater and soil samples. The following reports of previous investigations are applicable to this work:

- "Initial Assessment Study of Naval Air Station, Oceana, Virginia Beach, Virginia, NEESA B-067", dated December 1984 and prepared by Naval Energy and Environmental Support Activity (NEESA), Port Hueneme, California;

- "Environmental Investigation of the Landfill and Firefighting Training Area Auxiliary Landing Field, Fentress, Chesapeake, Virginia, Draft Report," dated March 1991, and prepared by CH<sub>2</sub>M Hill, Inc.;
- "Site Inspection Report, Site 14 - Fentress Landfill, Site 17 -Firefighting Training Area Naval Auxiliary Landing Field Naval", dated July 31, 1992, and prepared by Baker Environmental/Foster Wheeler Enviresponse.

During 1991, CH<sub>2</sub>M Hill conducted field activities consisting of installing four monitoring wells, 17-MW1 through 17-MW4, and collected six soil samples at depths from 12 to 18 inches below grade in visibly stained areas. The locations of these wells and soil samples are shown on Figure 1-2. Analytical results of CH<sub>2</sub>M Hill's sampling program are summarized in Table 2-1 and 2-2.

In December of 1991, the Baker Team conducted field activities consisting of groundwater sampling of four existing wells and soil sampling from ten locations. Soil samples were collected from two depth intervals in each location, 0 to 2 feet and 2 to 4 feet. The locations of these soil samples are shown on Figure 2-1. Analytical results of these activities are summarized in Table 2-3 through 2-8.

TABLE 2-1

**CONSTITUENTS OF CONCERN DETECTED IN SOIL AT SITE 17 - FIREFIGHTING TRAINING AREA  
NAVAL AUXILIARY LANDING FIELD  
FENTRESS, VIRGINIA**

(Concentrations in ug/kg)

PARAMETER	DETECTION	SAMPLE NUMBER					
	LIMIT	17-SS1	17-SS2	17-SS3	17-SS4	17-SS5	17-SS6
Lead (mg/kg)	9	65.6/15.2	12.8	10.5	12.5	16.9	12.2
Total Petroleum Hydrocarbons (mg/kg)	1.8-44	265/70	50.2	5.5	23	16.9	682
Ignitability	NA	NI	NI	NI	NI	NI	NI
<b>BASE NEUTRAL EXTRACABLE ORGANICS</b>							
1,4 Dichlorobenzene	370	780 J/480 J	--	--	--	--	--
2-Methylnapthalene	370	--/--	--	--	--	78 J	7,900 J
Napthalene	370	--/--	--	--	--	--	5,700 J
<b>VOLATILE ORGANIC COMPOUNDS</b>							
Ethylbenzene	6	--	--	--	--	--	480 J
Bromomethane	12	--	--	--	--	--	660 B,J
Chloromethane	12	--	--	--	--	--	1,000 B,J
Toluene	6	--	--	10	--	2 J	2,200
Xylenes (Total)	6	--	--	3 J	--	--	4,100
1,1-Dichloroethane	6	--	--	3 J	--	--	--
1,1,1-Trichloroethane	6	--	--	7	--	1 J	270 J

**NOTES:**

NA indicates Not Applicable

NI indicates Not Ignitable

J indicates an estimated value

B indicates compound was found in laboratory blank

-- indicates Not Detected

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**CONSTITUENTS OF CONCERN DETECTED IN GROUNDWATER  
 SITE 17 - FIREFIGHTING TRAINING AREA  
 NAVAL AUXILIARY LANDING FIELD  
 FENTRESS, VIRGINIA  
 (Concentrations in ug/l)**

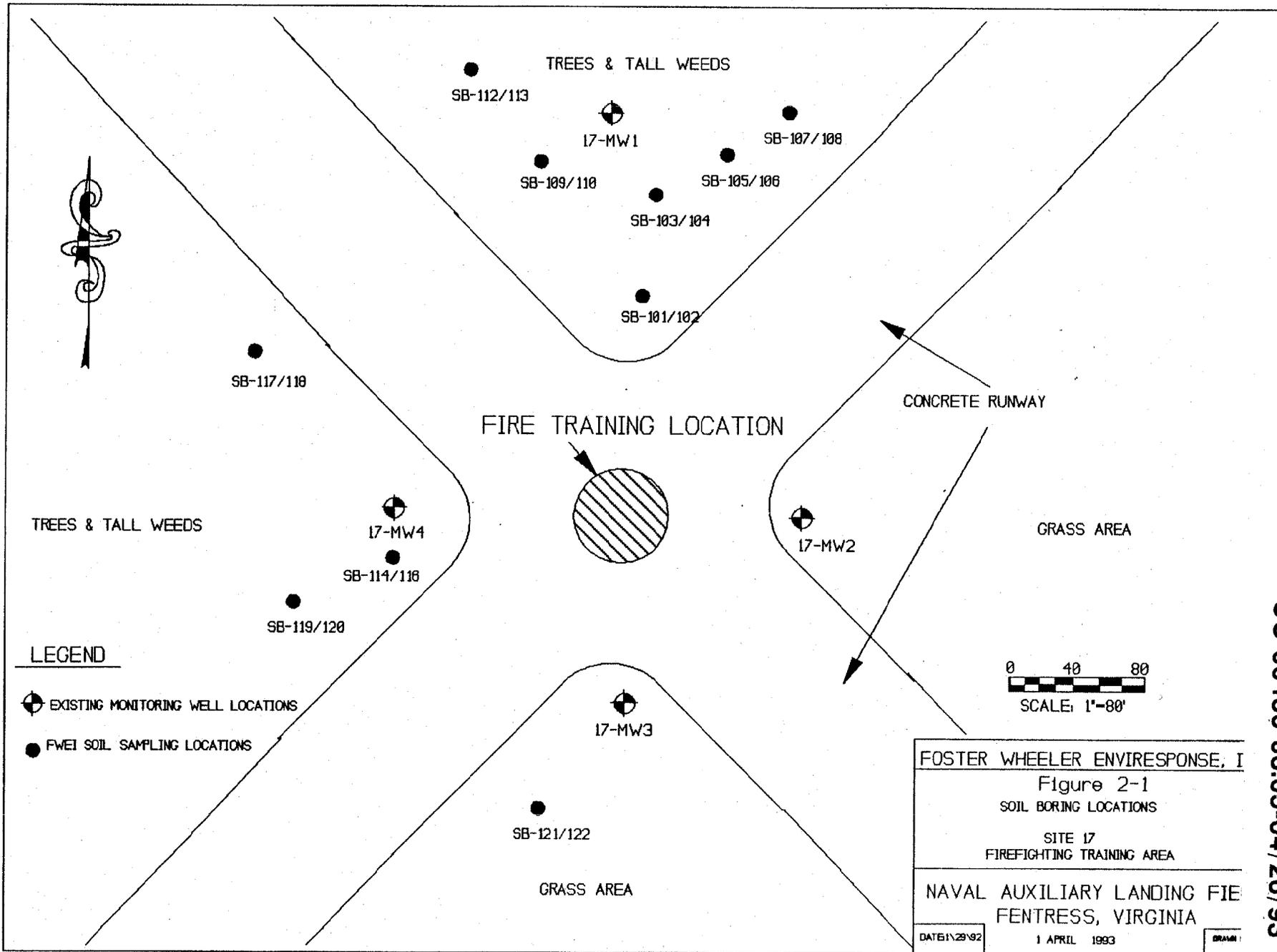
CHEMICAL	LOCATION DETECTED	CONCENTRATION DETECTED	MCL
Lead	17-MW3	5.8	50*
Total Petroleum	17-MW1	770	1,000*
Hydrocarbons	17-MW2	190	1,000*
	17-MW3	240	1,000*
	17-MW4	640	1,000*
Ethylbenzene	17-MW1	23	700**
	17-MW4	8	700**
Toluene	17-MW1	35	1,000**
	17-MW4	22	1,000**
Total Xylenes	17-MW1	140	10,000**
	17-MW4	44	10,000**

**NOTES:**

MCL indicates Maximum Contaminant Level

\* indicates concentration is a Virginia Groundwater Standard

\*\* indicates State Water Control Board MCL



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TABLE 2-3  
**SUMMARY OF VOLATILE ORGANIC COMPOUNDS  
 DETECTED IN SOIL  
 SITE 17 - FIREFIGHTING TRAINING AREA  
 NAVAL AUXILIARY LANDING FIELD  
 FENTRESS, VIRGINIA  
 DECEMBER 13, 1991**

SAMPLE LOCATION SAMPLE NUMBER SAMPLE DEPTH SAMPLE MATRIX UNITS	17SB-101 SB-101 0 - 2 ft. Soil ug/kg	17SB-102 SB-102 2 - 4 ft. Soil ug/kg	17SB-103 SB-103 0 - 2 ft. Soil ug/kg	17SB-104 SB-104 2 - 4 ft. Soil ug/kg	17SB-105 SB-105 0 - 2 ft. Soil ug/kg	17SB-106 SB-106 2 - 4 ft. Soil ug/kg	17SB-107 SB-107 0 - 2 ft. Soil ug/kg	17SB-108 SB-108 2 - 4 ft. Soil ug/kg	17SB-109 SB-109 0 - 2 ft. Soil ug/kg	17SB-110 SB-110 2 - 4 ft. Soil ug/kg	17SB-111 SB-111 (Dup. 17SB-110) Soil ug/kg
<b>VOLATILE ORGANIC COMPOUNDS:</b>											
Methylene Chloride		4 BJ	5 BJ		7 BJ	2 BJ				18 BJ	8 BJ
Acetone	2 J	49	43	35 J	26 J	18		7 J	17	75	74
2-Butanone											
Benzene											14 J
Toluene		4 J		47						110	31 J
Chlorobenzene		15	16	33							
Ethylbenzene		5 J	6 J	72						81	28 J
Total Xylenes		37	64	450	9 J	2 J				730	260
<b>TOTAL VOCs:</b>	2	114	134	637	42	22		7	17	1014	
<b>TOTAL VOCs (1):</b>		61	86	602	9	2					
<b>TOTAL TICs:</b>	2,062 J	7,310 J	24,700 J	1,319 J	849 J			860 J	18,600 J	10,940 J	4,530 J

**NOTES:**

- Blank indicates compound was not detected
- ug/kg indicates micrograms per kilogram
- B indicates compound detected in lab blank
- J indicates compound detected below the contract required quantification level
- Dup. indicates duplicate sample
- (1) indicates total does not include Methylene Chloride and Acetone

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TABLE 2-3 (CONTINUED)

SUMMARY OF VOLATILE ORGANIC COMPOUNDS  
 DETECTED IN SOIL  
 SITE 17 - FIREFIGHTING TRAINING AREA  
 NAVAL AUXILIARY LANDING FIELD  
 FENTRESS, VIRGINIA  
 DECEMBER 13, 1991

SAMPLE LOCATION SAMPLE NUMBER SAMPLE DEPTH (FEET) SAMPLE MATRIX UNITS	17SB-112 SB-112 0 - 2 ft. Soil ug/kg	17SB-113 SB-113 2 - 4 ft. Soil ug/kg	17SB-114 SB-114 0 - 2 ft. Soil ug/kg	17SB-115 SB-115 (Dup. 17SB-114) Soil ug/kg	17SB-116 SB-116 2 - 4 ft. Soil ug/kg	17SB-117 SB-117 0 - 2 ft. Soil ug/kg	17SB-118 SB-118 2 - 4 ft. Soil ug/kg	17SB-119 SB-119 0 - 2 ft. Soil ug/kg	17SB-120 SB-120 2 - 4 ft. Soil ug/kg	17SB-121 SB-121 0 - 2 ft. Soil ug/kg	17SB-122 SB-122 2 - 4 ft. Soil ug/kg
<b>VOLATILE ORGANIC COMPOUNDS:</b>											
Methylene Chloride						1 J	2 J				
Acetone	53 J	38 J			5 BJ	20 B	77		5 BJ		
2-Butanone						7 J	9 J				
Benzene											
Toluene											
Chlorobenzene											
Ethylbenzene		9 J									
Total Xylenes	30 J	56									
<b>TOTAL VOCs:</b>	83	103			5	28	88		5		
<b>TOTAL VOCs (1):</b>	30	65				7	9				
<b>TOTAL TICs:</b>	5,680 J					178 J					

NOTES:

- Blank indicates compound was not detected
- ug/kg indicates micrograms per kilogram
- B indicates compound detected in lab blank
- J indicates compound detected below the contract required quantification level
- Dup. indicates duplicate sample
- (1) indicates total does not include Methylene Chloride and Acetone

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TABLE 2-4

**SUMMARY OF SEMI-VOLATILE ORGANIC COMPOUNDS  
DETECTED IN SOIL  
SITE 17 - FIREFIGHTING TRAINING AREA  
NAVAL AUXILIARY LANDING FIELD  
FENTRESS, VIRGINIA  
DECEMBER 13, 1991**

SAMPLE LOCATION SAMPLE NUMBER SAMPLE DEPTH SAMPLE MATRIX UNITS	17SB-101 SB-101 0 - 2 ft. Soil ug/kg	17SB-102 SB-102 2 - 4 ft. Soil ug/kg	17SB-103 SB-103 0 - 2 ft. Soil ug/kg	17SB-104 SB-104 2 - 4 ft. Soil ug/kg	17SB-105 SB-105 0 - 2 ft. Soil ug/kg	17SB-106 SB-106 2 - 4 ft. Soil ug/kg	17SB-107 SB-107 0 - 2 ft. Soil ug/kg	17SB-108 SB-108 2 - 4 ft. Soil ug/kg	17SB-109 SB-109 0 - 2 ft. Soil ug/kg	17SB-110 SB-110 2 - 4 ft. Soil ug/kg	17SB-111 SB-111 (Dup. 17SB-110) Soil ug/kg
<b>SEMI-VOLATILE ORGANIC COMPOUNDS:</b>											
2-Chlorophenol										72 J	
Isophorone											1400
Naphthalene		210 J	1,500 J	580	190 J	95 J				500	840 J
2-Methylnaphthalene		840	3,600	1,600	890	390 J				1,200	2,500
Dimethyl Phthalate											
Dibenzofuran		48 J	270 J	87 J						110 J	
2,4-Dinitrotoluene											
Fluorene										94 J	
Phenanthrene			180 J							26 J	
Di-n-Butylphthalate	130 BJ	130 BJ	220 BJ	160 BJ	130 BJ	98 BJ	110 BJ	95 BJ	120 BJ	120 BJ	140 BJ
Fluoranthene											
Pyrene										48 J	
bis (2-Ethylhexyl) Phthalate	670	4,000	790 J	160 J	2,200	380 J			2,000	8,700 B	16,000
Benzo (b) Fluoranthene											
<b>TOTAL SEMI-VOLATILE COMPOUNDS:</b>	800	5,288	6,560	2,587	3,160	963	110	95	2,120	10,800	20,880
<b>TOTAL TICs:</b>	50,650	89,300	312,700	81,000	39,400	25,750	13,040	9,100	39,820	66,000	254,200

**NOTES:**

ug/kg indicates micrograms per kilogram  
J indicates concentrations above the detection limit  
B indicates compound was detected in the lab blank  
Dup. indicates duplicate sample

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TABLE 2-4 (CONTINUED)

**SUMMARY OF SEMIVOLATILE ORGANIC COMPOUNDS  
DETECTED IN SOIL  
SITE 17 - FIREFIGHTING TRAINING AREA  
NAVAL AUXILIARY LANDING FIELD  
FENTRESS, VIRGINIA  
DECEMBER 13, 1991**

SAMPLE LOCATION SAMPLE NUMBER SAMPLE DEPTH SAMPLE MATRIX UNITS	17SB-112 SB-112 0 - 2 ft. Soil ug/kg	17SB-113 SB-113 2 - 4 ft. Soil ug/kg	17SB-114 SB-114 0 - 2 ft. Soil ug/kg	17SB-115 SB-115 (Dup. 17SB-114) Soil ug/kg	17SB-116 SB-116 2 - 4 ft. Soil ug/kg	17SB-117 SB-117 0 - 2 ft. Soil ug/kg	17SB-118 SB-118 2 - 4 ft. Soil ug/kg	17SB-119 SB-119 0 - 2 ft. Soil ug/kg	17SB-120 SB-120 2 - 4 ft. Soil ug/kg	17SB-121 SB-121 0 - 2 ft. Soil ug/kg	17SB-122 SB-122 2 - 4 ft. Soil ug/kg
<b>SEMI-VOLATILE ORGANIC COMPOUNDS:</b>											
2-Chlorophenol											
Isophorone											
Naphthalene		110 J									
2-Methylnaphthalene	690	510					84 J				
Dimethyl Phthalate											440 J
Dibenzofuran	130 J										
2,4-Dinitrotoluene	180 J										
Fluorene	140 J										
Phenanthrene	56 J										
Di-n-Butylphthalate	140 BJ	140 BJ	110 BJ	150 BJ	130 BJ	150 BJ	120 BJ	160 BJ	120 BJ	150 BJ	200 BJ
Fluoranthene				88 J							
Pyrene				45 J							
bis (2-Ethylhexyl) Phthalate	120 J		98 J	140 J	200 J	100 J	130 J	46 J		290 J	2,200
Benzo (b) Fluoranthene				54 J							
<b>TOTAL SEMI-VOLATILE COMPOUNDS:</b>	<b>1,456</b>	<b>760</b>	<b>276</b>	<b>359</b>	<b>330</b>	<b>250</b>	<b>334</b>	<b>206</b>	<b>120</b>	<b>440</b>	<b>2,840</b>
<b>TOTAL TICs:</b>	<b>118,100</b>	<b>75,200</b>	<b>16,310</b>	<b>10,460</b>	<b>20,350</b>	<b>42,750</b>	<b>70,440</b>	<b>18,470</b>	<b>13,100</b>	<b>11,730</b>	<b>20,800</b>

**NOTES:**

ug/kg indicates micrograms per kilogram

J indicates concentrations above the detection limit

B indicates compound was detected in the lab blank

Dup. indicates duplicate sample

OC-00136-03.05-04/26/93

TABLE 2-5  
 SOIL ANALYTICAL RESULTS  
 TOTAL LEAD  
 FIRE FIGHTING AREA  
 SITE 17  
 NAVAL AUXILIARY LANDING FIELD  
 FENTRESS, VIRGINIA  
 DECEMBER 14 AND 16, 1991

SAMPLE LOCATION SAMPLE NUMBER SAMPLE MATRIX UNITS	17SB-101 17SB-101 Soil mg/kg	17SB-101D (Dup.17SB-101) Soil mg/kg	17SB-102 17SB-102 Soil mg/kg	17SB-103 17SB-103 Soil mg/kg	17SB-104 17SB-104 Soil mg/kg	17SB-105 17SB-105 Soil mg/kg	17SB-106 17SB-106 Soil mg/kg	17SB-107 17SB-107 Soil mg/kg	17SB-108 17SB-108 Soil mg/kg	17SB-109 17SB-109 Soil mg/kg	17SB-110 17SB-110 Soil mg/kg	17SB-111 17SB-111 Soil mg/kg
TOTAL LEAD USEPA METHOD 239.2												
TOTAL LEAD	13.40	14.27	15.40	20.10	9.80	10.50	11.40	9.80	9.20	9.50	10.20	11.50

NOTES:

mg/kg indicates milligrams per liter

Blank space indicates compound was not detected

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**TABLE 2-5 (CONTINUED)**  
**SOIL ANALYTICAL RESULTS**  
**TOTAL LEAD**  
**FIRE FIGHTING AREA**  
**SITE 17**  
**NAVAL AUXILIARY LANDING FIELD**  
**FENTRESS, VIRGINIA**  
**DECEMBER 14 AND 16, 1991**

SAMPLE LOCATION SAMPLE NUMBER SAMPLE MATRIX UNITS	17SB-112 17SB-112 Soil mg/kg	17SB-113 17SB-113 Soil mg/kg	17SB-114 17SB-114 Soil mg/kg	17SB-115 17SB-115 Soil mg/kg	17SB-116 17SB-116 Soil mg/kg	17SB-117 17SB-117 Soil mg/kg	17SB-118 17SB-118 Soil mg/kg	17SB-119 17SB-119 Soil mg/kg	17SB-120 17SB-120 Soil mg/kg	17SB-121 17SB-121 Soil mg/kg	17SB-121D (Dup. 17SB-121) Soil mg/kg	17SB-122 17SB-122 Soil mg/kg
<b>TOTAL LEAD</b> USEPA METHOD 239.2												
<b>TOTAL LEAD</b>	13.20	5.60	36.40	227.0	10.80	18.80	15.40	17.30	17.20	8.50	9.22	11.70

**NOTES:**

mg/kg indicates milligrams per liter

Blank space indicates compound was not detected

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TABLE 2-6

GROUNDWATER ANALYTICAL RESULTS  
 TOTAL LEAD  
 SITE 17 - FIREFIGHTING TRAINING AREA  
 NAVAL AUXILIARY LANDING FIELD  
 FENTRESS, VIRGINIA  
 DECEMBER 14 AND 16, 1991

SAMPLE LOCATION SAMPLE NUMBER SAMPLE MATRIX UNITS	17-MW1 MW1 Water ug/l	17-MW2 MW2 Water ug/l	17-MW3 MW3 Water ug/l	17-MW4 MW4 Water ug/l	17-MW5 (Dup. 17-MW3) Water ug/l	17-MW6 (Dup. 17-MW4) Water ug/l	MCL Water ug/l
TOTAL LEAD USEPA METHOD 239.2							
TOTAL LEAD	1.00B	4.30	9.70	1.40B	1.40B	1.30B	50*

NOTES:

- ug/l indicates micrograms per liter
- B indicates analyte found in blank as well as the sample
- Blank space indicates compound was not detected
- Dup. indicates duplicate sample
- MCL indicate Maximum Contaminant Level
- \* indicates State Water Control Board Groundwater Standard

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TABLE 2-7

SUMMARY OF VOLATILE ORGANIC COMPOUNDS  
 DETECTED IN GROUNDWATER  
 SITE 17 - FIREFIGHTING TRAINING AREA  
 NAVAL AUXILIARY LANDING FIELD  
 FENTRESS, VIRGINIA  
 DECEMBER 14 AND 16, 1991

SAMPLE LOCATION SAMPLE NUMBER SAMPLE MATRIX UNITS	17-MW1 MW1 Water ug/l	17-MW2 MW2 Water ug/l	17-MW3 MW3 Water ug/l	17-MW4 MW4 Water ug/l	17-MW5 (Dup. 17-MW3) Water ug/l	17-MW6 (Dup. 17-MW4) Water ug/l	TRIP BLANK Water ug/l	MCL Water ug/l
<b>VOLATILE ORGANIC COMPOUNDS:</b>								
Methylene Chloride	1 J	1 J	1 J	1 J	2 J	2 J	3 J	NA
Acetone				11				NA
Tetrachloroethene	5J	5J	5J			5J		NA
Toluene	10			35	35	9		1,000*
Ethylbenzene	17			14	14	16		700*
Total Xylenes	68			90	92	61		10,000*
<b>TOTAL VOLATILE ORGANIC COMPOUNDS:</b>	101	6	6	151	143	93	3	NA
<b>TOTAL TICs:</b>	185			214	206			NA

NOTES:

- Blank indicates compound was not detected
- ug/l indicates micrograms per liter
- J indicates concentrations above detection level
- Dup. indicates duplicate sample
- MCL indicates Maximum Contaminant Level
- \* indicates State Water Control Board MCL
- NA indicates not applicable

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TABLE 2-8

SUMMARY OF BASE/NEUTRAL SEMI-VOLATILE ORGANIC COMPOUNDS  
 DETECTED IN GROUNDWATER  
 SITE 17 - FIREFIGHTING TRAINING AREA  
 NAVAL AUXILIARY LANDING FIELD  
 FENTRESS, VIRGINIA  
 DECEMBER 14 AND 16, 1991

SAMPLE LOCATION SAMPLE NUMBER SAMPLE MATRIX UNITS	17-MW1 MW1 Water ug/l	17-MW2 MW2 Water ug/l	17-MW3 MW3 Water ug/l	17-MW4 MW4 Water ug/l	17-MW5 (Dup. 17-MW3) Water ug/l	17-MW6 (Dup. 17-MW4) Water ug/l	SBLK01 Blank Water ug/l
<b>BASE/NEUTRAL ORGANIC COMPOUNDS</b>							
Isophorone						1 J	
Naphthalene	14			59	47	22	
2-Methylnaphthalene				15 J	22	8 J	
Acenaphthylene						1 J	
2,6-Dinitrotoluene	2 J						
Fluorene						1 J	
bis (2-Ethylhexyl) Phthalate	2 J	6 J	5 J	16 J	3 J	2 J	
<b>TOTAL BASE/NEUTRAL COMPOUNDS:</b>	18	6	5	90	72	35	
<b>TOTAL BASE/NEUTRAL ORGANIC COMPOUNDS (1):</b>	16			74	69	33	
<b>TOTAL TICs:</b>	639J				539J	491J	

**NOTE:**

ug/l indicates micrograms per liter

J Indicates concentrations above the detection limit

Dup. indicates duplicate sample

(1) indicates total does not include Dimethyl Phthalate, Di-n-butylphthalate, and bis (2-Ethylhexyl) Phthalate

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### 3.0 TECHNICAL APPROACH

Analytical results of samples collected during field activities in December 1991, as reported in the SI, represent low concentrations of volatile organic compounds (VOC) and elevated concentrations of total petroleum hydrocarbons (TPH) in soils around Site 17. Additional data is needed to define the horizontal and vertical extent of VOC and TPH. This data will be used to delineate the extent of the constituents of concern in Site 17 soils to be used in preparation of a remedial action recommendation. The following technical approach addresses work to be implemented to meet the objectives of the addendum.

#### 3.1 Soil Gas Survey

The soil gas survey of Site 17 will be conducted to provide screening data of constituents detected in soils during previous sampling events. This screening data will be utilized to design a subsequent soil boring program which will delineate the extent of contamination. The soil gas samples collected will be field analyzed for total volatile hydrocarbons (TVHC) and VOC constituents of concern.

##### 3.1.1 Soil Gas Sample Collection and Locations

Soil analytical results from previous investigations were utilized to establish grids for collecting soil gas samples as shown on Figure 3-1. Sampling grids consisting of 50 by 50 square foot blocks were established to provide sampling nodes. Initially, 30 soil gas samples will be collected corresponding with 30 grid nodes. Using this approach, sampling grids will be added to the overall sampling areas if soil gas results indicate that more expansive coverage is required. A total of 50 soil gas samples will be collected and field analyzed.

Based on previous analytical results, there are two areas of concern (AOC) at Site 17. The first AOC is located to the north of the fire training area. The second AOC is located to the west of the fire training area.

At the first AOC, soil gas samples will be collected at 17 grid nodes. These nodes are labeled A13, A14, A15, A16, B13, etc. One subsurface soil gas sample will be collected at a depth between seven and eight feet below grade or the shallow groundwater table, whichever is less. A total of 17 soil gas locations will be sampled to the north of the fire training area.

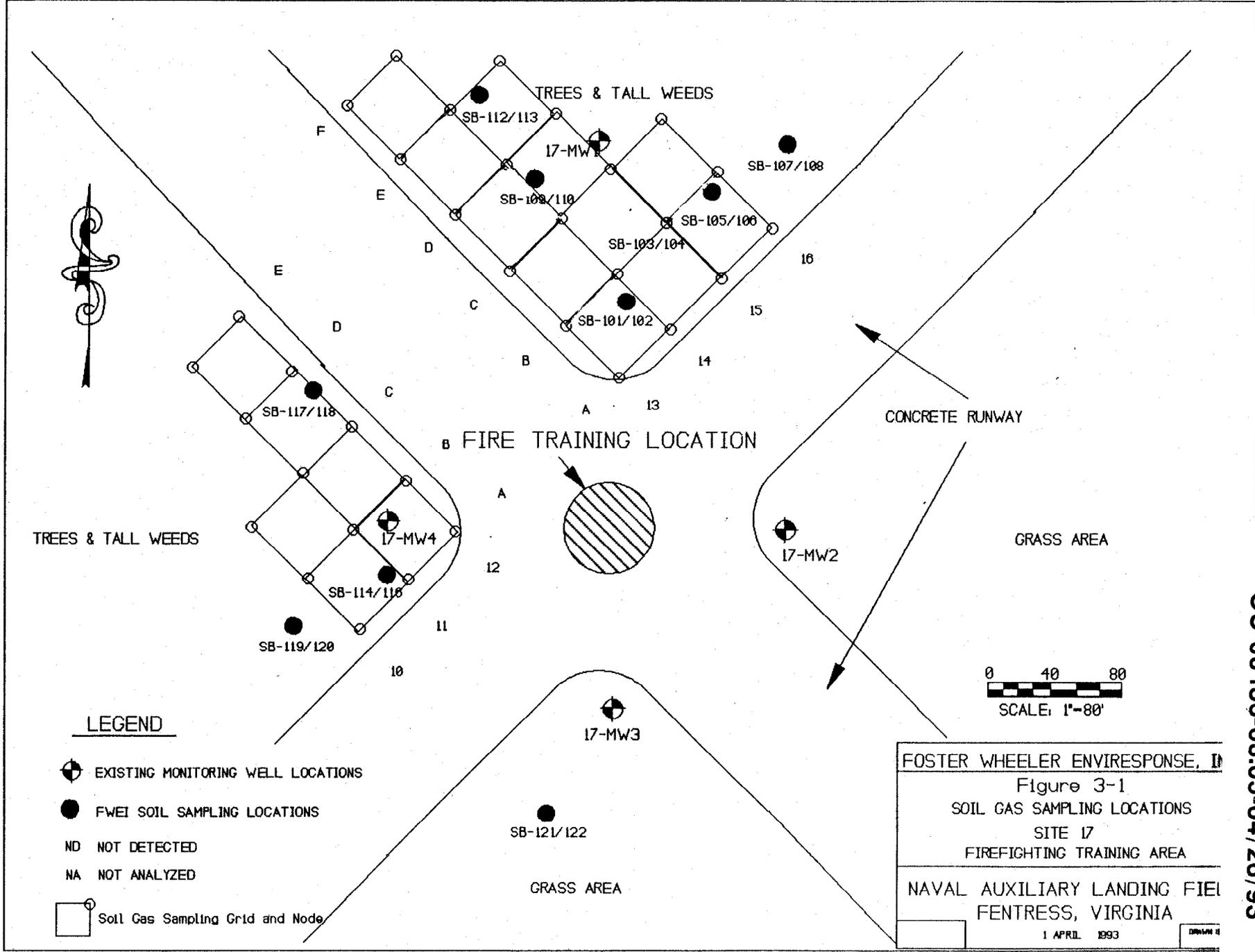
At the second AOC, soil gas samples will be collected at 13 grid nodes. These nodes are labeled A10, A11, A12, B10, etc. One subsurface soil gas sample will be collected at a depth between seven and eight feet below grade or the shallow groundwater table, whichever is less. A total of 13 soil gas locations will be sampled to the west of the fire training area.

After field analysis of the first 30 soil gas samples, further screening may be necessary to better the extent of the constituents of concern. Sampling nodes will be generated to collect additional soil gas samples at 50-foot centers. Sampling nodes will be tied into original nodes, shown on Figure 3-1, by following the numerical logic utilized for the original 30 soil gas samples.

##### 3.1.2 Soil Gas Sample Field Analysis and QA/QC

A trailer equipped with a hydraulic ground penetrator and gas chromatograph (GC) will be mobilized to the site for collection and on-site analysis of soil gas samples for the screening constituents of concern. Steel soil gas probes will be used for sampling and will be decontaminated either prior to arriving on-site or immediately prior to use by triple-rinse steam cleaning. Each sample will be collected in accordance with QA/QC procedures, which include the following:

- Analytical equipment will be calibrated prior to the beginning of the work and after every five samples;
- The equipment will be tested using system blanks prior to beginning of the work;



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- Steel probes will be properly decontaminated for each sample;
- An end plug for each probe will be used to eliminate cross-contamination or interferences resulting from soils at depths other than sample collection depth;
- New, sterile silicon tubing will be used for each sample; and,
- New, sterile syringes with steel needles and glass vials will be used for the collection of each sample.

Each glass syringe, containing the soil gas sample, will be sealed by airtight gaskets and submitted for analysis. Analysis will be completed on-site by use of the trailer equipped GC. The GC is to be equipped with both a flame ionization detector (FID) and an electron capture detector (ECD) to facilitate analysis of a wide range of analytical parameters.

Sample depths will be obtained by measuring penetration depths of standard probe lengths. Once the desired depth is reached, the probe will be purged by vacuum to remove air in the probe not representative of the sample point. Once purged, new silicon tubing will be attached to the vacuum source inducing a constant gas flow from the sample point. The soil gas sample will be collected by withdrawing soil gas through the syringe needle which is inserted into the silicon tubing.

Soil gas samples will be analyzed by introducing measured gas volumes from the sample to the GC. The GC will be run for a minimum of ten minutes per sample. In the event that a high concentration of a non-targeted gas masks readings of TVHC or other constituents of concern, a reduced volume of gas will be introduced and the sample re-analyzed.

### 3.2 Soil Borings

A soil boring program will be conducted to confirm and delineate soil gas results. Soil samples will be collected continuously using a drill rig and hollow stem augers with 2-inch by two foot long split spoon samplers.

#### 3.2.1 Sample Locations

Soil sample locations will be determined by the project manager in the field and will include a maximum of 25 borings. Soil boring locations will be selected to confirm the extent of contamination defined by the soil gas survey. At each boring location, continuous two foot split spoons will be advanced to a depth of eight feet below grade or the groundwater table, whichever is less. Two samples will be submitted for laboratory analysis from each boring location for a total of 50 soil samples.

Each split spoon interval will be screened with a photoionization meter to measure volatile vapor concentration. One soil sample will be submitted for laboratory analysis from the depth of the soil boring (ie., eight feet or less). One other soil sample will be submitted for laboratory analysis from the split spoon interval containing the highest volatile vapor concentration reading.

#### 3.2.2 Sample Designation

A sample numbering system will be used to identify each sample. The numbering system will provide a tracking procedure to allow retrieval of information about a particular sample and will assure that each sample is uniquely numbered. The sample identification system is outlined in the CTO-0040 Sampling Analysis Plan (SAP). The SAP includes the Field Sampling Plan (FSP) and the Quality Assurance Project Plan (QAPP) provided as appendices to the CTO-0040 WP.

### 3.2.3 Sampling Procedures and Equipment

The sampling procedures and equipment to be used for soil sampling are described in the CTO-0040 SAP, Section 3.0 and Appendix B.

### 3.2.4 Sample Control

The purpose of sample control is to maintain the quality of samples during collection, transportation, and storage for analysis. Sample control and equipment calibration in the field will follow the procedures detailed in the CTO-0040 QAPP, Sections 6.0, 7.0, and 8.0.

### 3.2.5 Laboratory Analysis

All of the soil samples will be submitted to the laboratory for analysis of TPH and BTEX compounds. Additionally, 25 of these samples will be analyzed for Target Compound List (TCL) VOCs, TCL semi-volatile organic compounds (SVOCs), and lead.

The total number of soil samples, analytical parameters, and estimated numbers of QA/QC samples are provided in Table 3-1. The requirements for sample containers, preservation, analytical methods, quality control samples, and laboratory control are described in the CTO-0040 QAPP, Sections 5.0, and 7.0 thru 11.0 inclusive.

### 3.2.6 Contaminated Materials Handling

Solids and liquids will be generated as a result of sampling operations and decontamination procedures on-site. The procedures to be followed to control the handling, packaging, and transporting of these materials are outlined in the CTO-0040 SAP, Section 3.9 and Appendices B and D.

## 3.3 Groundwater Sampling

Groundwater sampling will be conducted at Site 14. Groundwater sampling of the Site 14 monitoring wells will be conducted to confirm the groundwater quality data obtained during the first round of groundwater sampling.

### 3.3.1 Sample Locations and Frequency

A total of ten groundwater samples will be collected from the existing monitoring wells at Site 14. Groundwater wells to be sampled at Site 14 include MW1, MW2, MW2D, MW3, MW4, MW5, MW6, MW6D, MW7, and MW7D.

### 3.3.2 Sample Designation

A sample numbering system will be used to identify each sample. The numbering system will provide a tracking procedure to allow retrieval of information about a particular sample and will assure that each sample is uniquely numbered. The sample identification system is outlined in the CTO-0040 Sampling Analysis Plan (SAP). The SAP includes the Field Sampling Plan (FSP) and the Quality Assurance Project Plan (QAPP) provided as appendices to the CTO-0040 WP.

### 3.3.3 Sampling Procedures and Equipment

The sampling procedures and equipment to be used for groundwater sampling are described in the CTO-0040 SAP, Section 3.0 and Appendix A.

TABLE 3-1

## SUMMARY OF ENVIRONMENTAL AND QA/QC SOIL SAMPLES FOR SITE 17

SAMPLE DESIGNATION	TOTAL NUMBER OF ENVIRONMENTAL SAMPLES	QA/QC SAMPLES	LABORATORY ANALYSIS
17GW-121 through 17GW-145	25	5 10 5	Lead TCL VOCs TCL SVOCs
	50	5 5	TPHs BTEX

## NOTES:

- QA/QC samples for soil include two trip blanks, five duplicates, two field blanks, and one equipment rinsate.
- TCL VOCs: Target Compound List Volatile Organic Compounds
- TCL SVOCs: Target Compound List Semi-Volatile Organic Compounds
- TPHs: Total Petroleum Hydrocarbons
- BTEX: Benzene, Toluene, Ethylbenzene, and Xylene

#### 3.3.4 Sample Control

The purpose of sample control is to maintain the quality of samples during collection, transportation, and storage for analysis. Sample control and equipment calibration in the field will follow the procedures detailed in the CTO-0040 QAPP, Sections 6.0, 7.0, and 8.0.

#### 3.3.5 Laboratory Analysis

Groundwater samples collected from Site 14 will be submitted to the laboratory for analysis of VOCs, metals, cyanide, alkalinity, chloride, hexavalent chromium, sulfate, and total organic carbon. The total number of groundwater samples, analytical parameters, and estimated number of QA/QC samples are provided in Table 3-2.

The requirements for sample containers, preservation, analytical methods, quality control samples, and laboratory control are described in the CTO-0040 QAPP, Sections 5.0, and 7.0 thru 11.0 inclusive.

#### 3.3.6 Contaminated Materials Handling

Solids and liquids will be generated as a result of sampling operations and decontamination procedures on-site. The procedures to be followed to control the handling, packaging, and transporting of these materials are outlined in the CTO-0040 SAP, Section 3.9 and Appendix D.

The solids and liquids generated as a result of sampling operations and decontamination procedures will be contained in contractor supplied 55-gallon drums and neatly stored within the AOC from which they were collected. The drums will be properly labeled. When the laboratory results from the field investigation are received, the contractor will make a determination as to the levels of contamination in each drum. Disposition of the drum contents and determination of which drums to sample for hazardous constituents shall be made by the Navy based on the analytical results of samples collected.

TABLE 3-2

## SUMMARY OF ENVIRONMENTAL AND QA/QC GROUNDWATER SAMPLES FOR SITE 14

SAMPLE DESIGNATION	TOTAL NUMBER OF ENVIRONMENTAL SAMPLES	QA/QC SAMPLES	LABORATORY ANALYSIS
14GW-201 14GW-202 14GW-203 14GW-204 14GW-205 14GW-206 14GW-207 14GW-208 14GW-209 14GW-210	10	5 3 3 3 3 3 3	TCL VOCs TAL Metals (Total) TOC Hexavalent Chromium Chloride Sulfate Alkalinity

## NOTES:

- QA/QC samples for groundwater include two trip blanks, one duplicate, one field blank, and one equipment rinsate.
- TCL VOCs: Target Compound List Volatile Organic Compounds
- TAL: Target Analyte List
- TOC: Total Organic Carbon

#### 4.0 QUALITY ASSURANCE/QUALITY CONTROL

Quality Assurance (QA) is the review and oversight of the planning, implementation, and completion stages of an environmental data collection activity. QA is performed to assure that when data is provided to the data users, it is of the quality established in NEESA Level C. A QA Program is a system of documented checks that ensures monitoring data is valid and of the quality needed to meet the objectives of the end use of the data. The Quality Assurance Project Plan for CTO-0040 contains detailed information regarding the procedures which will be followed for quality assurance/quality control (QA/QC). This plan, referred to as the CTO-0040 QAPP, should be used along with this WP Addendum.

##### 4.1 Site Description

The description of this site is contained in the CTO-0040 QAPP, Section 3.0.

##### 4.2 Project Organization and Responsibilities

The project organization and responsibilities are designed to ensure that functions of quality assurance will be carried out expeditiously with effective communication and maximum effect on the operation of the project. Descriptions of these responsibilities are provided below.

###### 4.2.1 Baker Project Manager

The Baker Project Manager will be responsible for the overall successful completion of the project in accordance with the objectives outlined in the LANTDIV Scope of Work dated July 14, 1991.

###### 4.2.2 Project Manager

The Project Manager (PM) will be responsible for the successful completion of the project as outlined in this WP Addendum on-time and on budget with the highest level of technical competence and professionalism. The PM will be responsible for ensuring the completion of the project and will maintain oversight responsibilities.

###### 4.2.3 Field Manager

The Field Manager (FM) will be responsible for the implementation of the field scope of work to successfully acquire the necessary physical and chemical data. The responsibilities of the FM will include sampling and supervision of sample documentation. The FM will implement corrective actions and monitor continued conformance of data acquisition with project data quality objectives. The FM will track data quality, on-site generated data, train personnel in the implementation of SOPs, and carry out and report on corrective procedures. The FM will report directly to the PM.

##### 4.3 Quality Assurance Objectives for Measurements

The primary objectives of the WP Addendum will be to:

- Determine and confirm the extent of the constituents of concern in the subsurface soils at Site 17 by conducting a soil gas survey and collecting soil samples from various depths;
- Confirm the absence or presence of constituents of concern detected in the Site 14 groundwater; and,
- Based on the results of the investigation, determine if the data collected for Site 14 and Site 17 can support either a no further action recommendation or a remedial design and removal action recommendation.

##### 4.4 Data Quality Criteria

The criteria to be used for determining data quality are described in the CTO-0040 QAPP.

#### **4.5 Sampling Procedures**

The sampling procedures which will be followed for this site are described in the CTO-0040 SAP and QAPP.

#### **4.6 Sample Custody**

The procedures which will be followed concerning sample custody are described in the CTO-0040 QAPP, Section 7.0.

#### **4.7 Equipment Calibration**

The protocol which will be followed for equipment calibration is described in the CTO-0040 QAPP, 8.0.

#### **4.8 Analytical Procedures**

The analytical procedures which will be used are described in the CTO-0040 QAPP, Section 9.0.

#### **4.9 Data Reduction, Validation, and Reporting**

All data reduction during the chemical analyses procedures, internal validating, and reporting will be the responsibility of the laboratory. The laboratory will have validated SOPs for data reduction and reporting.

Data set reports will be prepared by the laboratory and submitted to the PM on an on-going basis. All laboratory results, including accuracy, precision, and performance evaluation results, will be submitted to the PM. The submitted data packages will be reviewed for completeness. If the data packages are not complete, the laboratory will be notified orally and in writing.

Data reduction activities will consist primarily of entering data onto computerized spreadsheets, tabulating analytical results for presentation, and presenting the results of the analyses in the Draft and Final Site Evaluation Report. Data validation, including the laboratory's internal validation, will be performed on laboratory generated data.

The data reduction, validation, and reporting procedures which will be used are described in the CTO-0040 QAPP, Section 10.0.

#### **4.10 Internal Quality Control Checks**

The internal quality control checks which will be followed are presented in the CTO-0040 QAPP, Section 11.0.

#### **4.11 Performance and System Audits**

The procedures for performance and system audits are described in the CTO-0040 QAPP, Section 12.0.

#### **4.12 Preventive Maintenance**

The preventive maintenance procedures for field and laboratory instruments are described in the CTO-0040 QAPP, Section 13.0.

#### **4.13 Calculation of Data Quality Indicators**

The calculation of data quality indicators are described in the CTO-0040 QAPP, Section 14.0.

#### **4.14 Corrective Action**

The corrective action procedures to be followed for resolving problems with the sampling and/or analytical system are described in the CTO-0040 QAPP, Section 15.0.

#### **4.15 Quality Assurance Reports**

The FM will report to the PM on a daily basis regarding progress of the field work and quality control issues associated with the field activities. All daily reports will be documented in a field logbook unless a need to report corrective action is identified.

The analytical laboratory will maintain detailed procedures of recordkeeping in order to support the validity of all analytical work. The laboratory will also retain copies of chain-of-custodies, internal calculation sheets, and other recorded information pertaining to preparation, shipping, receipt, analysis, and control of samples; and the generation, reduction, validation, control, and reporting of data.

Meetings to discuss the progress of the project will be held as requested. Concerns which arise during the course of work that may require changes to the analytical portion of the scope of work, or deviations from the established protocols specified in the approved project plans will be discussed and resolved at these meetings. Proposed adjustments will be submitted to the client for approval prior to implementation.

#### **4.16 References**

The references which have been used in the preparation of these quality assurance/quality control procedures are listed in the CTO-0040 QAPP, Section 17.0.

## 5.0 HEALTH AND SAFETY

The CTO-0040 Health and Safety Plan (HASP) contains detailed information regarding the procedures which will be followed during field activities and while the Project Team is on-site. The CTO-0040 HASP should be used in conjunction with this Health and Safety Plan. For reference, the CTO-0040 HASP is included as Attachment 1.

### 5.1 Site Entry Objectives

The objectives of the initial entry to this area are to characterize the degree, type, and extent of soil and groundwater contamination. This investigation will include the following on-site activities: soil probing for soil gas sampling, augering of soil borings, soil sampling, and groundwater sampling.

### 5.2 Site Organization and Coordination

The following personnel are designated to carry out the stated job functions on-site. One person may carry out more than one job function. However, when such collateral duties appear to require simultaneous attention, any health and safety activities will take immediate precedence over any other duty(ies).

**BAKER PROJECT MANAGER:** Richard Aschenbrenner (412-269-2015)

**FWEI PROGRAM MANAGER:** Douglas Stout (201-535-2437)

**PROJECT MANAGER:** James Emery (201-535-2493)

**SITE MANAGER/HEALTH AND SAFETY OFFICER:** Dennis Place (201-535-2201)

**FIELD TEAM MEMBERS:** To Be Determined

#### LANTDIV REPRESENTATIVES

EIC, James Steinberg (804-445-8855)

#### ACTIVITY REPRESENTATIVES

Activity Coordinator: Rick Hilton (804-433-2589)

#### CONTRACTOR(S)

Soil Gas Contractor:	Target Environmental Services, Inc.
Drilling Contractor:	McCallum Testing Laboratories, Inc.
Analytical Laboratory:	Pace New England
Data Validation:	Roy F. Weston, Inc.

### 5.3 Hazard Evaluation

The hazard evaluations for this site are contained in the CTO-0040 HASP, Section 3.0.

### 5.4 Personal Protective Equipment

The procedures which will be followed to determine the level of protection to be used are described in the CTO-0040 HASP, Section 5.0.

**5.5 Site Control**

The procedures which will be followed for site control are described in the CTO-0040 HASP, Section 8.0.

**5.6 Site Work Plans/Project Personnel**

The following personnel will perform the following tasks:

NAME *	FUNCTION
Dennis Place	Site Manager/Health and Safety Officer
Target Environmental Services, Inc.	Soil Gas Contractor
To Be Determined	FWEI Sample Collection
McCallum Testing Laboratories, Inc.	Drilling Contractor

\* Note: At the time of the preparation of this section, specific site personnel had not been fully determined. The personnel ultimately designated for completing these tasks will meet or exceed the criteria for working at this site.

**6.0 PROJECT SCHEDULE**

The following project schedule outlines the milestone dates for this CTO Modification.

Submit Draft Project Plans to LANTDIV	April 5, 1993
Submit Final Project Plans to LANTDIV	April 26, 1993
Begin Field Work, Fentress, VA	April 26, 1993
Complete Field Work, Fentress, VA	May 3, 1993
Submit Draft Report to LANTDIV	July 26, 1993
Submit Final Report to LANTDIV	August 26, 1993

**FINAL**  
**SITE-SPECIFIC**  
**HEALTH AND SAFETY PLAN**  
**SITE 14 - FENTRESS LANDFILL**  
**SITE 17 - FIREFIGHTING TRAINING AREA**  
**NAVAL AUXILIARY LANDING FACILITY**  
**FENTRESS, VIRGINIA**  
**CONTRACT TASK ORDER 0040**

**Prepared For:**

**NAVAL FACILITIES**  
**ENGINEERING COMMAND**  
**ATLANTIC DIVISION**  
**Norfolk, Virginia**

**Under:**

**Contract N62470-89-D-4814**

**Prepared By:**

**BAKER ENVIRONMENTAL, INC.**  
**Coraopolis, Pennsylvania**

**DECEMBER 20, 1991**

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**APPENDIX**

1 Chemical Safety Data Sheets*	
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\*A Chemical Safety Data Sheet for 2-methylnaphthalene is not provided.

## 1.0 INTRODUCTION

### 1.1 Purpose/Use of the Plan

This Health and Safety Plan (hereafter, HASP) is specific for Site Inspections (SI) (hereafter, SIs) to be conducted at the Naval Auxiliary Landing Facility (NALF), Fentress, Virginia. The SIs will address two sites at NALF: (1) the Landfill designated as Site No. 14 and, (2) the Fire Fighting Training Area at Site No. 17 (see Figure No. 1-1). The objectives of the SIs are to:

- Fill informational gaps.
- Collect the site specific data necessary to fully evaluate site conditions.
- Determine whether a Remedial Investigation/Feasibility Study is required.
- To develop an SI Report and Second Round Sampling Report.

There will be no construction activities conducted during these SIs. However, it should be recognized that most of the activity will be in areas where the extent of contamination is unknown, and due diligence in matters relating to health and safety must be critically observed.

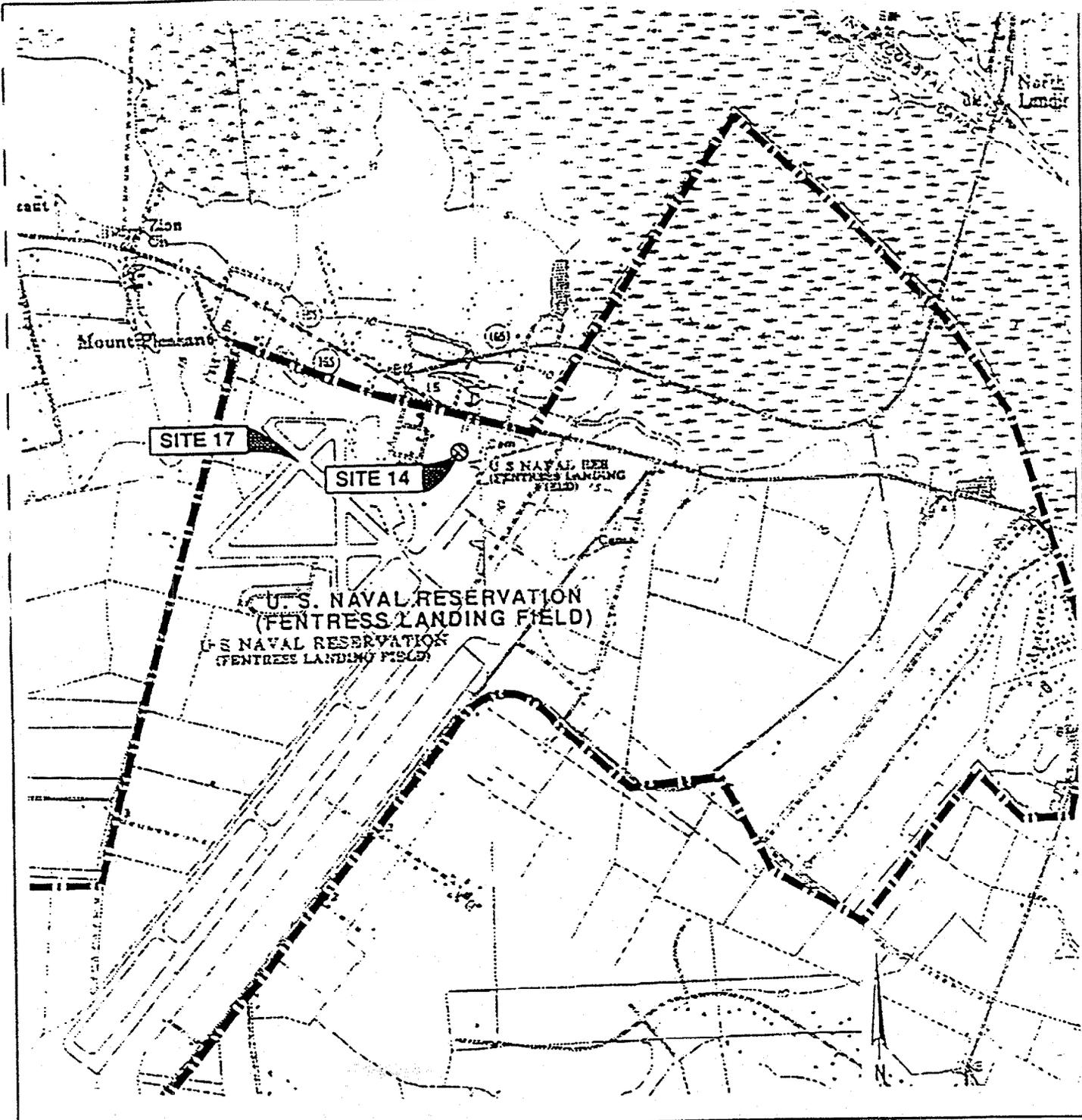
All the sections in this Plan follow the guidelines of the Occupational Safety and Health Act, which are known as the "HAZWOPER" regulations for working with hazardous materials. (29 CFR 1910.120). A copy of this HASP document is kept by both the Project Manager and the assigned site Health and Safety Officer. It is available for review from either of these individuals upon request.

### 1.2 Description of the Problems

There are two different problems associated with Sites 14 and 17, respectively.

Site 14 previously served as a landfill for housing and military wastes. There are a variety of waste types reported to have been disposed there, including asbestos, organic solvents, pesticides, and PCBs.

A review of available data indicates variable and infrequent levels of two base/neutral extractables (di-n-butylphthalate and bis-2-ethylhexylphthalate) and three volatile organic



Source: 7.5 minute USGS quadrangle map  
Fentress, VA.

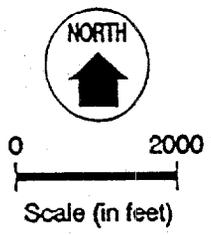


Figure 1-1  
NALF, Fentress, VA.  
LOCATION MAP - SITES 14 AND 17

compounds (VOCs) (acetone, methylene, chloride and 2-butanone) have been found in groundwater. The VOCs have also been detected in the surface water at Site 14.

Site 17 is the location of an inactive firefighting training ring. Soil samples taken previously indicate organic constituents, the presence of lead, total petroleum hydrocarbons (TPH), base/neutral extractables (1,4-dichlorobenzene, 2-methylnaphthalene, naphthalene) and varying concentrations of VOCs (acetone, methylene chloride, 2-butanone).

### 1.3 Scope of Work

Ten groundwater samples and three surface water samples are to be taken at Site 14. Four groundwater samples and 20 soil samples are to be taken from Site 17. This Health and Safety Plan is written considering the previous use of both sites, and preliminary data obtained from prior analyses. It is important to remember that this plan was based on preliminary information, and can be altered or modified by the Site Health and Safety Officer with approval from the Health and Safety Manager as newer information is obtained, and such change is deemed necessary.

## 2.0 RESPONSIBILITY FOR SITE SAFETY AND HEALTH

The following briefly describes the health and safety designations and general responsibilities for the SIs at the Naval Auxiliary Landing Facility, Sites 14 and 17, Fentress, Virginia.

### 2.1 Corporate FWEI Health and Safety Manager (HSM) - Dr. John J. Borris, NRCC: (201) 535-2439

The HSM has overall responsibility for development and implementation of this Health and Safety Plan (HASP). He also shall approve any changes to this plan due to modification of procedures, newly proposed site activities, or new information.

The HSM will be responsible for the development of company safety protocols and procedures necessary for field operations, and will also be responsible for the resolution of any outstanding safety issues which arise during site operations. The FWEI Site Health and Safety Officer (HSO) will consult with the HSM on any issues of Health and Safety.

In issues relating to the health and safety of field personnel, the HSM has authority over the FWEI Project Manager.

Dr. Borris is a Certified Clinical Chemist (Toxicology), a Professional Industrial Hygienist, and an EPA licensed Course Director for asbestos under the AHERA regulations, and those courses associated with OSHA HAZWOPER regulations (1910.120). He is an adjunct professor at Fairleigh-Dickinson University, and teaches courses on the control and management of hazardous materials. He holds the following accreditations for Chemical/Asbestos remediation:

- Asbestos Worker
- Asbestos Supervisor
- Air Monitor - NIOSH 582
- Asbestos Analyzer - NIOSH 7600
- 40 hr. Worker
- 8 hr. Supervisor
- Asbestos Inspector
- Asbestos Management Planner
- Asbestos Architectural/Engineering Designer
- Asbestos Safety Technician: New Jersey
- Certified First Aid/CPR Instructor (American Red Cross)

**2.2 FWEI Project Manager (PM) (To be determined)**

The PM has the responsibility for the safe conduct of operations and use of construction equipment during field work. He has direct responsibility for the safety of personnel on site and for the safe conduct of subcontractors on site. The Health and Safety Officer (HSO) reports directly to the PM. The PM shall assure that an HSO or assistant HSO is informed whenever personnel or subcontractors are to be on site. The PM shall inform the HSO prior to the changes or additions to the plan of work addressed in this HASP.

The PM or his on-site designee shall direct field operations, equipment use, and personnel actions so that they comply with this HASP and applicable government regulations

**2.3 FWEI Site Health and Safety Officer (HSO) (To be determined)**

The HSO will be present on-site during the conduction of all Level "B" and "C" operations and will be responsible for all health and safety activities and the delegation of duties to the H&S staff in the field. Where the site is identified as Level "D", the HSO may direct the site health and safety efforts through an assistant Health and Safety Officer approved by the HSM. The assistant will be responsible for implementation of the HASP. The HSO will direct or participate in other supervisory activities, as appropriate, when this does not interfere with his/her primary responsibility. The HSO or assistant has stop-work authorization which will be executed upon the determination of an imminent safety hazard, emergency condition, or other potentially dangerous situation, such as detrimental weather conditions. The HSO will initiate and execute all contact with support facilities and personnel when this action is appropriate.

**2.4 FWEI Assistant Health and Safety Officer (AHSO) (To be determined)**

An Assistant HSO may be designated in "low-hazard" Level D situations. He will have collateral duties but will be qualified for the health and safety responsibility by the HSM. In Level C conditions, he will be the person who accompanies field sampling teams and will report to the HSO. Additionally, he may be required to support the HSO when multiple operations are conducted that require monitoring and HSO surveillance. His primary responsibility is to provide the appropriate monitoring to ensure the safe conduct of field operations. His training will include instruction on equipment calibration, maintenance, and proper use. He will have access to continuous communications with the Command Post. He

will also assist in assuring that isolation is properly maintained during removal (i.e. rips and tears in poly, etc.). The number of future Assistant HSOs will be dependent upon the number of operations occurring simultaneously, the designated level of protection, and the individual assignments made by the HSO.

It is anticipated that only one Health and Safety Officer will be involved on the project at one time.

### 3.0 HAZARD ASSESSMENT

There are three potential hazards at Sites 14 and 17: (1) chemical, (2) physical and (3) conditional.

#### 3.1 Chemical Hazards

The following hazard assessment for each site is based on preliminary results of soil and water analyses:

##### 3.1.1 Site 14 - Landfill

<u>Waste Type Hazard</u>	<u>Material</u>
Vapor	Di-n-butyl phthalate (found) Bis-2-ethylhexyl phthalate (found) Acetone (found) Methylene chloride (found) 2-butanone (found) Other organics (not characterized)
Dust	Inorganic metal salts, and possibly metals

##### 3.1.2 Site 17 - Fire Fighting Area

<u>Waste Type Hazard</u>	<u>Material</u>
Vapor	Acetone (found) Methylene chloride (found) 2-butanone (found) 1,4 dichlorobenzene (found) 2-methylnaphthalene (found) naphthalene (found) Oil and grease Other petroleum hydrocarbons (not characterized)
Dust	Inorganic metal salts, and possibly metals

The following points summarize the physiological effects of such materials, which are more fully detailed in the Material Safety Data Sheets appearing in Appendix 1 of this HASP.

Methylene Chloride - A potential carcinogen. As a vapor, it may cause weakness; numbness; or tingling and nausea. It can irritate eyes and skin, cause vertigo, and intensify angina.

Di-n-butyl phthalate - is a volatile organic which, if inhaled, can cause irritation to the nasal passages, eyes, and throats.

Bis-2-ethylhexyl phthalate - is an organic compound that may cause irritation to the skin, and may reasonably be anticipated to be a carcinogen.

Acetone - is a volatile organic compound which can, if inhaled, cause irritation of the eyes, nose, and throat and can cause headache, dizziness, and dermatitis.

2-butanone (MEK) - is a volatile organic that cause irritation to the eyes, nose and may cause dizziness and vomiting.

1,4-dichlorobenzene - is a solid organic compound which can cause headache, irritation of the eyes and nasal passage, nausea, and vomiting.

2-methylnaphthalene (beta) - is a solid organic compound that can cause irritation to the eyes, nose, and throat.

naphthalene - is a solid organic compound that can cause nausea, vomiting, headache and may irritate the eyes and nasal passage.

Petroleum hydrocarbons - depending on the material, petroleum hydrocarbons can cause irritation of the eyes, nasal passage, and skin; dizziness, headache and vomiting.

"Oil and Grease" - Most fossil oils/greases cause contact dermatitis, and other skin eruptions.

Inorganic Metals/Salts - Depending on the material, inorganic salts of metals may cause a number of effects. Of those found at both sites, the following are the most hazardous:

- Lead (low) (moderate)      Ulceration of nasal septum; GI disturbances
- Zinc (moderate)              Cough, weakness, chills, fever, nausea, vomiting.

### 3.1.3 Risk Reduction from Chemical Exposure

The on-site Health and Safety Officer will select the appropriate protective equipment on a daily basis. This selection will be based on a knowledge of the contamination level associated

with the operation being performed (i.e. drilling sampling, waste removal, etc.) and on the results of routine monitoring.

### 3.1.4 Cumulative Risk to Clinical Exposure

The risk of each employee to chemical exposure will be tracked via time card entry. This system will be detailed by the Site Supervisor and/or Health and Safety Officer on initial mobilization. This procedure will systematically track individual exposure by task, concentrations of hazardous materials encountered, and by time.

### 3.2 Physical Hazards

It is possible that the following physical hazards will be encountered in this remediation:

- Heat/cold stress
- Overhead machinery hazards
- Noise
- Slip/trip/fall
- Unfamiliar situations, leading to contusions, abrasions, etc.

Heat and cold stress are covered within this Health and Safety Plan (see Section 11.4, First Aid, and 11.5, Heat Stress). The other physical hazards will be addressed by the site Health and Safety Officer at daily safety meetings, as different situations are encountered.

### 3.3 Conditional Hazards

Changes in environmental conditions which may present an increase in hazards are covered in Section 10.0, Emergency Response Plans.

### 3.4 PELs/TLVs

The table of exposure information which follows is compiled from Title 29 CFR Part 1910.1000 (OSHA Publication 3112, 1989), and represents the Permissible Exposure Limits, specific materials, (or classes of generic materials) found on site.

**3.5 Confined Space Entry**

Confined space entry will not be performed during the site inspections at Sites 14 and 17, therefore, safe entry procedures have not been included in this Health and Safety Plan.

**TABLE 3-1**  
**LIMITS FOR AIR CONTAMINANTS**

Substance	OSHA Transitional Limits			OSHA Final Rule Limits						
	PEL		Skin	PEL		STEL		Ceiling		Skin
	ppm	mg/m <sup>3</sup>		ppm	mg/m <sup>3</sup>	ppm	mg/m <sup>3</sup>	ppm	mg/m <sup>3</sup>	
Methylene Chloride <sup>(1)</sup> (dichloromethane)	--	--	--	500	--	--	--	1000	--	--
di-n-butylphthalate	--	5	--	--	5	--	--	--	--	--
bis-2-ethylhexylphthalate (dioctyl phthalate)	--	5	--	--	5	--	10	--	--	--
acetone	1000	2400	--	750	1800	1000	2400	--	--	--
2-butanone (MEK)	200	590	--	200	590	300	885	--	--	--
1,4-dichlorobenzene (p-dichlorobenzene)	75	450	--	75	450	110	675	--	--	--
2-methylnaphthalene <sup>(2)</sup>	--	--	--	--	--	--	--	--	--	--
naphthalene	10	50	--	10	50	15	75	--	--	--
petroleum hydrocarbons (as gasoline)	--	--	--	300	900	500	1500	--	--	--

(1) Currently under proposal by OSHA to be lowered to 25 ppm

(2) PEL not given

**PEL** Permissible Exposure Limit - TWA concentrations that must not be exceeded during any 8-hour work shift of a 40-hour work week

**STEL** Short Term Exposure Limit - a 15-minute TWA exposure that should not be exceeded at any time during a work day.

**Ceiling** A level that should not be exceeded at any time.

**ppm** parts per million (in air)

**mg/m<sup>3</sup>** milligrams per cubic meter (in air)

#### 4.0 TRAINING ASSIGNMENTS

##### 4.1 On-Site Supervisor

First Day: During the first day of mobilization for each site sampling, the Site Supervisor or his OSHA-trained designee (with 8-hr supervisory course completion), will conduct training exercises in the use of all applicable Standard Operating Procedures, the Emergency Response Plan, and this HASP.

##### 4.2 Safety and Health Officer

First Day: During the first day of mobilization, the Health and Safety Officer will meet with all site employees involved with the operation at each site, and will explain both the contents and the use of the HASP.

Daily: On a daily basis, the Health and Safety Officer or his designee will conduct a pre-safety meeting on any topic or topics which may have relevance to the day's operation, and/or discuss any noted deficiencies, etc. He/she will record these meetings and their content (see Section 11.7, Recordkeeping).

##### 4.3 Special Training Assignments

If any subcontractors are hired, it will be the responsibility of each subcontractor to assign a competent individual to augment the training during the first day of on-site work and subsequent daily safety meetings. Topics to be covered will address the safety and health requirements involved in Standard Operating Procedures for such tasks and/or operations, as they appear in the SOP's - Section 11.0 of this HASP.

##### 4.4 First Aid and CPR

At least one individual per site will be trained and qualified to administer first aid and CPR. The FWEI Health and Safety Officer or his alternate will be available and each subcontractor will provide at least one trained person per shift. The HSO will identify those individuals requiring this training in order to ensure that emergency treatment is available at field activities. These courses will be consistent with the requirements of the American Red Cross Association, and will be given by the HSM for FWEI Personnel, as needed.

4.5 Verification of Training

The Health and Safety Officer will collect current certifications for supervisory, initial and annual refresher training for Hazardous Waste Operations, according to 29 CFR 1910.120. No one will be allowed to work on the site without this certification.

## 5.0 PERSONAL PROTECTIVE EQUIPMENT

For the work to be performed at each site, either Levels C or D protection, as described under 29 CFR 1910.120, will be required. This exact determination will be made on a daily basis by the HSO or the Assistant HSO (where applicable), and will depend on the work being performed, the area, and the time required for the task. (Noise protection is discussed in Section 11.10, along with appropriate personal protective equipment, should hearing protection be required.)

### 5.1 Level D

- a. The Level D personal protective uniform consists of the following:

#### Level D Protection

##### Equipment:

- Chemical-resistant clothing (overalls and long-sleeved jacket; hooded, one- or two-piece chemical splash suit; disposable chemical-resistant one-piece suit)
- Outer chemical resistant gloves
- Chemical resistant safety boots
- Hard hat
- Personal air horns

The exact specifications of equipment will be determined by the Health and Safety Officer.

##### Optional:

- Coveralls, paper Tyvek
- Disposable boot covers
- Face shield
- Long cotton underwear
- Hearing protection

- b. Protection provided by Level D:

- The same level of skin protection as Level C, but a lower level of respirator protection. Level D may be allowed in those situations when:
  - The atmospheric contaminants, liquid splashes, or other direct contact will not adversely affect any skin exposure.

- The types of air contaminants have been identified, concentrations measured, and found to be acceptable according to the standards set forth in the monitoring section (Section 7.0 - "Air Monitoring").

5.2 Level C

The Level C personal protective uniform will consist of clothing listed in the Level D section above, with the requirement for a full-faced respirator with MSA suitable HEPA/organic vapor cartridge. The Level C uniform will be worn when required by the Health and Safety Officer.

5.4 Care and Cleaning of Personal Protective Equipment (PPE)

Procedures for care and cleaning of PPE are described Section 11.0 - SOPs under the titles: "Personal Protective Equipment: Care and Cleaning," and the "Respirator Program."

## **6.0 MEDICAL SURVEILLANCE REQUIREMENTS**

### **6.1 Medical Surveillance Program Outline**

An outline of the Medical Surveillance Program which covers all workers at this site, follows. This program is required by law.

#### **Medical Surveillance Program: General Requirements**

##### **6.1.1 Employees Covered**

- Medical surveillance is to be provided to employees who have been or expected to be exposed to hazardous substances or health hazards above established PELs, without regard to the use of respirators, for 30 or more days in a 12-month period.

##### **6.1.2 Frequency of Medical Exams**

- Medical examinations or consultation shall be made available to employees who may have been exposed during an emergency incident to hazardous substances at or above the PEL without regard to the use of respirators, for 30 or more days in a 12-month period.
- A baseline or initial medical exam is required, prior to initial assignment to an area where medical exams are required.
- When an employee brings to the employer's attention signs or symptoms indicating possible overexposure to hazardous substances.
- Upon termination of employment, or upon reassignment to an area where medical exams are not required.

##### **6.1.3 Content of Medical Exams**

Preassignment and/or periodic medical examinations, consistent with the requirements of 29 CFR 1910.120(f), Medical Surveillance, and shall continue to be provided for personnel assigned to the project.

1. **Medical and occupational histories.**
2. **Physical examination, including an evaluation of the candidate's ability to work with hazardous materials, to wear respirators and protective equipment, and to work in biothermal stress conditions.**
3. **Diagnostic blood tests, including:**
  - Complete blood count - differential and platelets
  - Hemoglobin and/or hematocrit
  - Methemoglobin
  - Albumin, globulin, and total protein
  - Total bilirubin
  - SGOT, SGPT
  - LDH
  - Alkaline phosphatase
  - Calcium
  - Phosphorus
  - Uric acid
  - Creatinine
  - Cholesterol
  - Glucose
4. **Urinalysis - including microscopic examination.**
5. **Chest x-ray - including posterior-anterior and lateral views.**
6. **Electrocardiogram - standard, 12-lead, resting type, as a minimum.**
7. **Pulmonary function tests, FEV1 and FVC.**
8. **Audiometry - pure tone audiometer tests at 500, 1000, 2000, 3000, 4000, and 6000 Hz.**
9. **Visual acuity.**

**6.1.4 Information Provided by the Employer to the Physician**

- A description of the employee's duties.
- Employee's exposure records.
- Personal protective equipment used by the employee.

**6.1.5 Physician's Written Opinion**

- Physician will make a report to the employer of medical conditions which may put the employee at an increased risk from work at the site or may limit the use of PPE.

**6.1.6 Record Keeping**

- Records will be kept to assist in future evaluation of the employee's health. They will be retained for thirty (30) years.

**6.2 Before Mobilization**

All workers during this phase of investigation must present evidence of a satisfactory physical examination conducted in a manner consistent with the objective of assessing suitability to perform work at this hazardous waste site and containing the elements of the program listed in 6.1.3. The Health and Safety Officer will require a satisfactory medical certificate no older than one year, and a letter from a corporate official that the employee has such a record in his/her personnel folder.

**6.3 During Work**

The Health and Safety Officer will periodically observe each worker for any signs of mental or physical fatigue. In addition, he/she will conduct the following programs, which are described elsewhere in this HASP:

1. Air monitoring (Section 7.0).
2. Heat stress (Section 11.0 - SOPs)
3. First Aid (Section 11.0 - SOPs)

## 7.0 AIR MONITORING

### 7.1 Real-Time Air Monitoring

Air monitoring equipment will be used to continuously monitor field activities to indicate levels of airborne contaminants and explosive atmospheres observed during sampling and other investigative activities. This equipment will also be used at the point of operation to monitor for respirator action levels established in Section 7.4.

An HNu Photoionization Detector will be used to monitor non-methane organic vapor concentrations with an ionization potential of  $<10.2$  eV. An  $O_2$ /Combustible Gas Meter will be used to monitor for explosive atmospheres, including methane atmospheres.

The HNu, and  $O_2$ /Combustible Gas Meter are to be calibrated prior to initiating on-site work activities, and recalibrated daily. All calibration recordings will be logged.

### 7.2 Perimeter Air Monitoring

During soil sampling activities, site perimeter air quality will be monitored at a designated down-wind location by the Health and Safety Officer to alert project personnel of potential exposure to nearby residents and passersby.

Before the onset of any soil sampling, preliminary air quality monitoring for organic vapors will be recorded at the site boundaries for the purpose of establishing background levels. The temperature and wind direction will be recorded at that time.

In an effort to appropriately control the ambient air quality during site inspections, the following action level has been established for perimeter monitoring:

- HNu deflection at the perimeter  $> 1$  ppm above background for a sustained period of at least 5 minutes.

Should this level be reached, work will cease, and a Work Plan revision will be discussed between the Project Manager and the Health and Safety Officer on site.

**7.3 Monitoring Equipment List**

The following list specifies the necessary equipment to be used during all site investigation activities:

<u>Type of Equipment</u>	<u>Number Needed</u>	<u>Calibrated</u>
HNu-PI-10.2 Ev probe @ 9.8	1	64 ppm Isobutylene w/span
MSA O <sub>2</sub> /Combustible Gas Meter	1	0.75% Pentane in air

**7.4 Respirator Equipment Requirements as Determined by Air Monitoring****Level D - No Respirator Required**

Background, to 1 ppm of organic vapor, as determined by HNu analysis.

**Level C - Full Face Respirator Required**

1 ppm to 5 ppm of organic vapor as determined by HNu analysis.

## 8.0 SITE CONTROL

### 8.1 General Requirements

All employees arriving for work on a daily basis will sign a log book noting arrival and departure times. The book will be signed each time an arrival or departure is made to or from the work area. A separate log will be maintained for visitors who do not enter the exclusion zone of the site.

The Site Supervisor will arrange for posting of adequate cones and barrier tape systems to delineate the work (exclusion), decontamination, and "clean" zones on a daily basis.

Other elements of site control are covered under: (1) the Emergency Response Plan Section 10.0 which describes the site, the site map, and identification of the nearest medical assistance, and (2) alarms provided in the SOPs - Section 11.0.

### 8.2 "Buddy System"

No employee will ever work in a situation where he/she is the sole person in an area which does not allow for ready observation by another worker who serves as the "buddy".

### 8.3 Hazardous Materials

All hazardous materials, including sampling wastes, etc., will be collected and disposed of according to the SOPs described in Section 11.0 for "Waste Handling" and "Waste Disposal".

## 9.0 DECONTAMINATION PROCEDURES

The objective of these procedures is to minimize the risk of exposure to hazardous substances from either contaminated personnel protective equipment or other equipment. These procedures were derived from the U.S. Environmental Protection Agency, Office of Emergency and Remedial Response's (OERR), "Interim Standard Operating Safety Guides (revised Sep. 82)." This version of the guides is in a format that is more appropriate for use in the field\*.

### 9.1 Personal Decontamination

Protective equipment must be worn by personnel when work activities involve known or suspected hazardous substances. The procedures for decontaminating personnel upon leaving the contaminated area are addressed for Level C protection. The procedures given are for the minimum amounts of decontamination used for Level C protection.

According to Federal law, the "maximum" decontamination procedure consists of specific activities at 19 stations. Each station emphasizes an important aspect of decontamination. When establishing a decontamination line for this project, several stations can be combined with other aspects into a procedure with fewer steps for minimum decontamination. This is shown in Figure 9-1. Such a combination is allowed by law for minimum projects, such as Site Inspections.

When the decontamination line is no longer required, contaminated wash and rinse solutions and contaminated articles must be contained and disposed of as hazardous wastes in compliance with Federal and State regulations, as detailed in Section 11.0 - SOPs for "Waste Handling" (11.14) and "Waste Disposal" (11.13).

\*Source: Excerpted from "Field Standard Operating Procedures for the Decontamination of Response Personnel (FOP 7), EPA Office of Emergency and Remedial Responses, Hazardous Response, Support Division, Washington, D.C., January 1985.

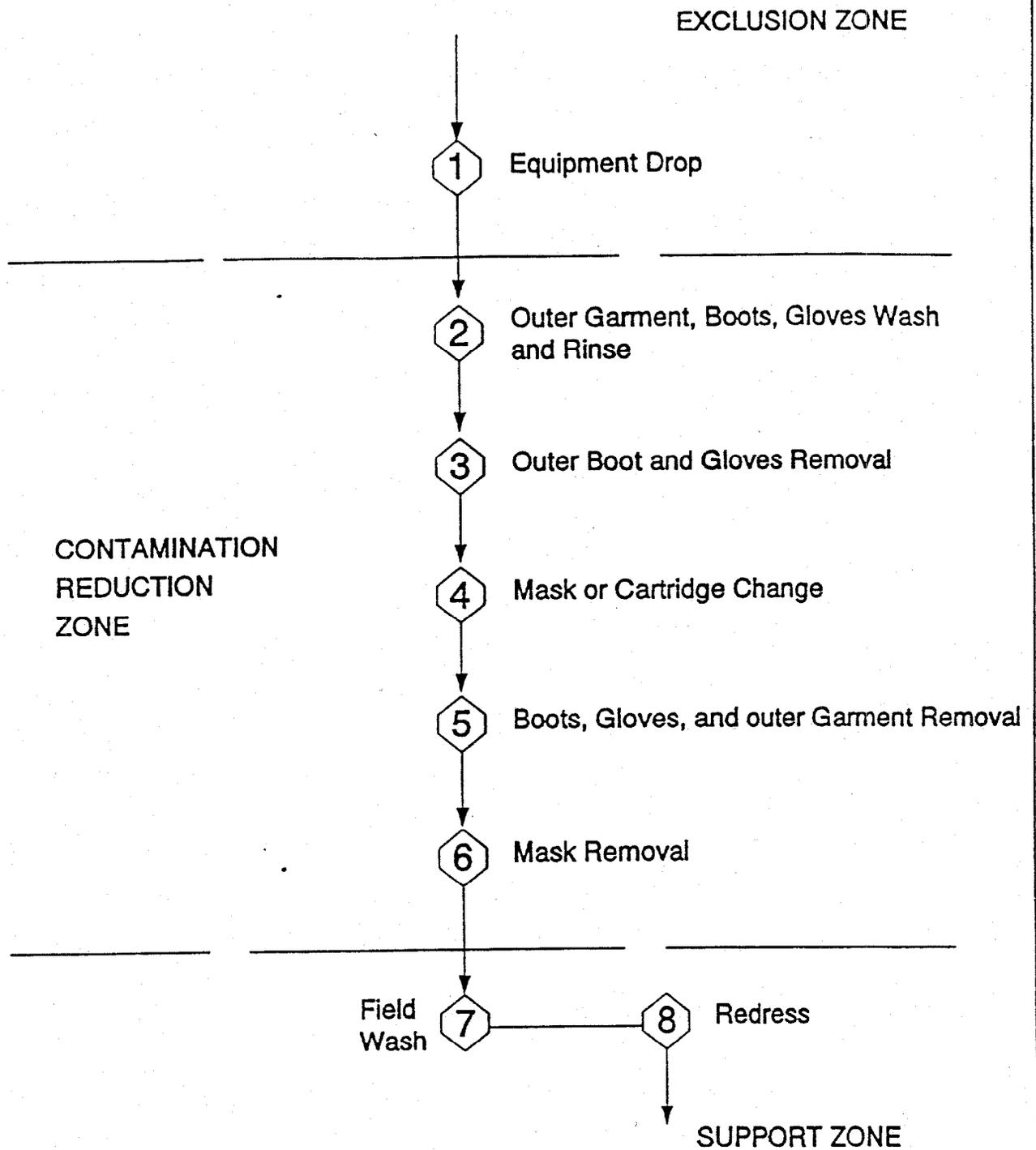


FIGURE 9-1  
DECONTAMINATION LAYOUT "LEVEL C" PROTECTION

**FSOP 7: Minimum Measures of Level "C" Decontamination**

**Station 1 ... Equipment Drop**

Deposit equipment used on site (tools, sampling, devices and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths. Segregation at the drop reduces the probability of cross-contamination. (During hot weather operations, a cool down station may be set up within this area.)

**Station 2 ... Outer Garment, Boots, and Gloves Wash and Rinse**

Scrub outer boots, outer gloves, and splash suit with decon solution or detergent water. Rinse off using copious amounts of water.

**Station 3 ... Outer Boot and Glove Removal**

Remove outer boots and gloves. Deposit in container with plastic liner.

**Station 4 ... Cartridge or Mask Change**

If worker leaves exclusion zone to change cartridge (or mask), this is the last step in the decontamination procedure. Worker's cartridge (or mask) is exchanged, new outer gloves and boot covers donned, joints taped, and worker returns to duty.

**Station 5 ... Boot, Gloves, and Outer Garment Removal**

Boots, chemical-resistant splash suite, outer gloves removed and deposited in separate containers lined with plastic.

**Station 6 ... Mask Removal**

Mask is removed. Avoid touching face with fingers. Facepiece is deposited on plastic sheet.

**Station 7 ... Field Wash**

Inner gloves removed. Hands and face are thoroughly washed.

**Station 8 ... Support Zone**

After entering the support zone, leave, and shower as soon as possible.

The equipment needed for performing Level C decontamination is given in the following list:

- Station 1:**
- a. Various size containers
  - b. Plastic liners
  - c. Plastic drop cloths
- Station 2:**
- a. Containers (20-30 gallons)
  - b. Decon solution or detergent water
  - c. 2-3 long-handled, soft-bristled scrub brushes
- Station 3:**
- a. Containers (20-30 gallons)
- Station 4:**
- a. Table with cartridge/mask replacements
  - b. Container for used cartridges
  - c. Plastic bags for masks
- Station 5:**
- a. Various containers for boots, gloves, and suits
- Station 6:**
- a. Containers
  - b. Plastic liners
- Station 7:**
- a. Water
  - b. Soap
  - c. Small table
  - d. Basin or bucket
  - e. Towels

The Health and Safety Officer will set up each decontamination area based on this general plan, and will mark off the zones with suitable cones/tapes, or other line barriers.

## **9.2 Sampling Equipment Decontamination**

Sampling equipment will be decontaminated prior to the collection of each sample. The decontamination procedures will include washing the equipment with soap solution and/or a solvent; rinsing with potable water; and rinsing with distilled water. All liquids used in the decontamination procedures will be collected.

- All decontamination wastes will be collected and stored prior to disposal. See Section 11.0 - SOPs, for "Waste Handling" (11. 14) and "Waste Disposal" (11. 13).

## 10.0 EMERGENCY RESPONSE PLANS: ON-SITE AND OFF-SITE

### 10.1 On-Site Plan

#### 10.1.1 General

In order to minimize the impact of an emergency occurring during the activities conducted at the two sites, an emergency response plan (ERP) is required. This plan is incorporated as an independent section of the HASP and consists of an emergency response system designed to reduce the impact of an emergency by rapid response and containment. The ERP will make optimum use of all available resources for speedy response and containment of the incident, so that the threat to people, the environment, and site property is minimized.

The provisions of the ERP are to be carried out immediately whenever there is an actual or imminent fire, explosion, serious injury, or release of hazardous materials which could threaten human health or the environment. The ERP will be reviewed and amended, as necessary, when the activities performed at the site modify the existing emergency response conditions. The following sections provide a description of the responsibilities, emergency actions, contacts/communications, and evacuation procedures necessary for an effective emergency response system.

#### 10.1.2 Responsibilities

As a result of the potential hazards identified at Sites 14 and 17, and the conditions under which operations are conducted, lines of authority have been established for supervising a potential emergency situation.

##### Emergency Coordinator

The Emergency Coordinator has overall responsibility.

The Emergency Coordinator for this project is (to be determined). In the event that the Emergency Coordinator is not available on site, the Alternate Emergency Coordinator for this project is (to be determined).

The Emergency Coordinator shall implement this emergency plan whenever conditions at the site warrant such action. The coordinator will have overall responsibility for assuring the evacuation, emergency treatment, emergency transport of on-site personnel, and notification of the appropriate emergency response units and management staff.

#### Site Inspection Coordinator

The Site Inspection Coordinator has the responsibility to determine the actions necessary to restore the site to a safe condition. The Site Inspection Coordinator for sites 14 and 17, is (to be determined).

#### 10.1.3 Emergency Procedures

Each emergency incident is a unique event. The scale, complexity, and degree of hazard associated with these site inspections could vary widely and could be associated with equipment failures, large escape of trapped gases, exposure to hazardous materials at toxic levels, fire, or explosion.

#### Evacuation and Response

1. In the event of an emergency situation, an air horn, or other appropriate device will be continuously sounded for approximately 10 seconds indicating the initiation of evacuation procedures. This procedure, in lieu of radio communication, is required as personnel may be scattered over the sites performing various tasks (for this reason, personnel will carry a miniature air horn hooked to their personal protective equipment).
2. The Emergency Coordinator is immediately responsible for the management of the emergency response and site personnel. All personnel are directly accountable to the Emergency Coordinator.
3. All personnel on site (in any control zone) will quickly shut down their respective operations and evacuate to the Support Zone or other designated upwind location. The Emergency Coordinator is responsible for the designation of safe distances and refuge areas at each location. This distance and location will be discussed before each new site task mobilization. Evacuation routes will depend upon an individual's location on

site at the time of the emergency and will generally involve the shortest and safest route between the two points (in an upwind location, when possible).

4. Simultaneously, the Emergency Coordinator will initiate the emergency response by determining the severity of the situation. Should the severity of the emergency be low, the Emergency Coordinator will contact appropriate facilities.
5. At the support zone, a head count will take place to assure all personnel are accounted for, and site control procedures will be initiated. At a minimum, the Emergency Coordinator will assign personnel the responsibility of controlling the site's main gate to deny entry to non-authorized personnel. Under no circumstances will incoming personnel or visitors be allowed to proceed into the area once the emergency response has been initiated. At the discretion of the Emergency Coordinator, other access points around the site perimeter may be controlled.
6. The Emergency Coordinator will see the access for emergency responders and their equipment is provided. At this point in the response procedure, the first responder (Emergency Coordinator) will relinquish lead activities to the second responders (Naval Emergency Response Teams) for completion of the response activities.

#### 10.1.4 Decontamination

In the event of medical emergencies during the response action, the following procedure will be in place to decontaminate the victim and protect medical personnel. The decision whether or not to decontaminate a victim will be the responsibility of the Site Health and Safety Officer.

1. If decontamination can be done, transport the victim to the contamination reduction zone and wash, rinse, or cut off protective clothing and equipment as per the decontamination procedures previously described in Section 9.0 of this HASP.

**NOTIFICATION PROCEDURE IN THE EVENT OF SEVERE EMERGENCIES****EMERGENCY PHONE NUMBERS**

- |     |   |                                  |
|-----|---|----------------------------------|
| 1.  | Site Location Phones<br>Site 14 - Lt. Layman<br>Site 17 - Lt. Layman      | (804) 433-2259<br>(804) 433-2259 |
| 2.  | Ambulance and Rescue Service  | 911                              |
| 3.  | Fire Department<br>(Emergency) 911<br>(Fire Chief)                        | (804) 547-6297<br>(804) 547-6211 |
| 4.  | Chesapeake General<br>736 North Battlefield Blvd.<br>Chesapeake, VA 23320 | (804) 547-8121                   |
| 5.  | Chesapeake Police Department<br>General/Police Dispatcher                 | Emergency 911<br>(804) 547-6161  |
| 6.  | Poison Control Center   | 1-800-552-6337                   |
| 7.  | State Police  | 1-800-925-2432                   |
| 8.  | Pollution, Toxic Chemicals and Oil Spills                                 | 1-800-424-8802                   |
| 9.  | U.S. Coast Guard  | (804) 484-8192                   |
| 10. | Navy CLEAN EIC - LANTDIV<br>Mr. Jesse Waltz                               | (804) 445-6911                   |
| 11. | NAS Oceana Environmental Coordinator<br>Mr. William Bullard               | (804) 433-2328                   |

**DIRECTIONS TO HOSPITAL FROM FENTRESS LANDING FIELD:**

Take Mount Pleasant (Rt. 165) to Battlefield Blvd. (Rt. 168) turn right and proceed to Chesapeake General Hospital, 736 N. Battlefield Blvd., Chesapeake, VA 22320.

2. If decontamination cannot be done, the victim will be placed in a plastic bag (or wrapped in clean cotton sheets in the event of severe burns) to reduce contamination to other personnel. The Emergency Coordinator will alert the responding emergency medical personnel as to the potential contamination present and instruct them as to the specific decontamination procedures, if necessary. Someone familiar with the incident shall accompany the victim to the medical treatment facility.

#### 10.1.5 Follow-Up and Documentation

Immediately following the emergency response and before normal site activities are resumed, the following follow-up and documentation procedures will occur:

1. The Emergency Coordinator shall notify appropriate State, Federal, and Local Government agencies as required.
2. Replacement or repair of equipment, as needed, will be authorized by the Emergency Coordinator.
3. The Emergency Coordinator, Site Inspection Coordinator, Project Manager, and representatives from the state emergency response units will generate a written report documenting the incident. It will be the responsibility of the Emergency Coordinator to complete the report.

The report must be accurate and authentic. Each person making an entry must date and sign the document. As minimum, the report must contain:

- A chronological history of the incident;
- Facts about the incident and when they became available;
- Title and names of personnel composing emergency response teams;
- Actions taken, decisions made, and orders given by whom to whom;
- Possible exposures of site personnel; and
- History of all injuries or illnesses during, or as a result of, the emergency.

**10.2 Off-Site Plan**

Off-site emergencies are not anticipated.

**10.3 Rehearsal of Emergency Procedures**

Emergency procedures (Response and Evacuation) will be practiced at least 2 hours per month.

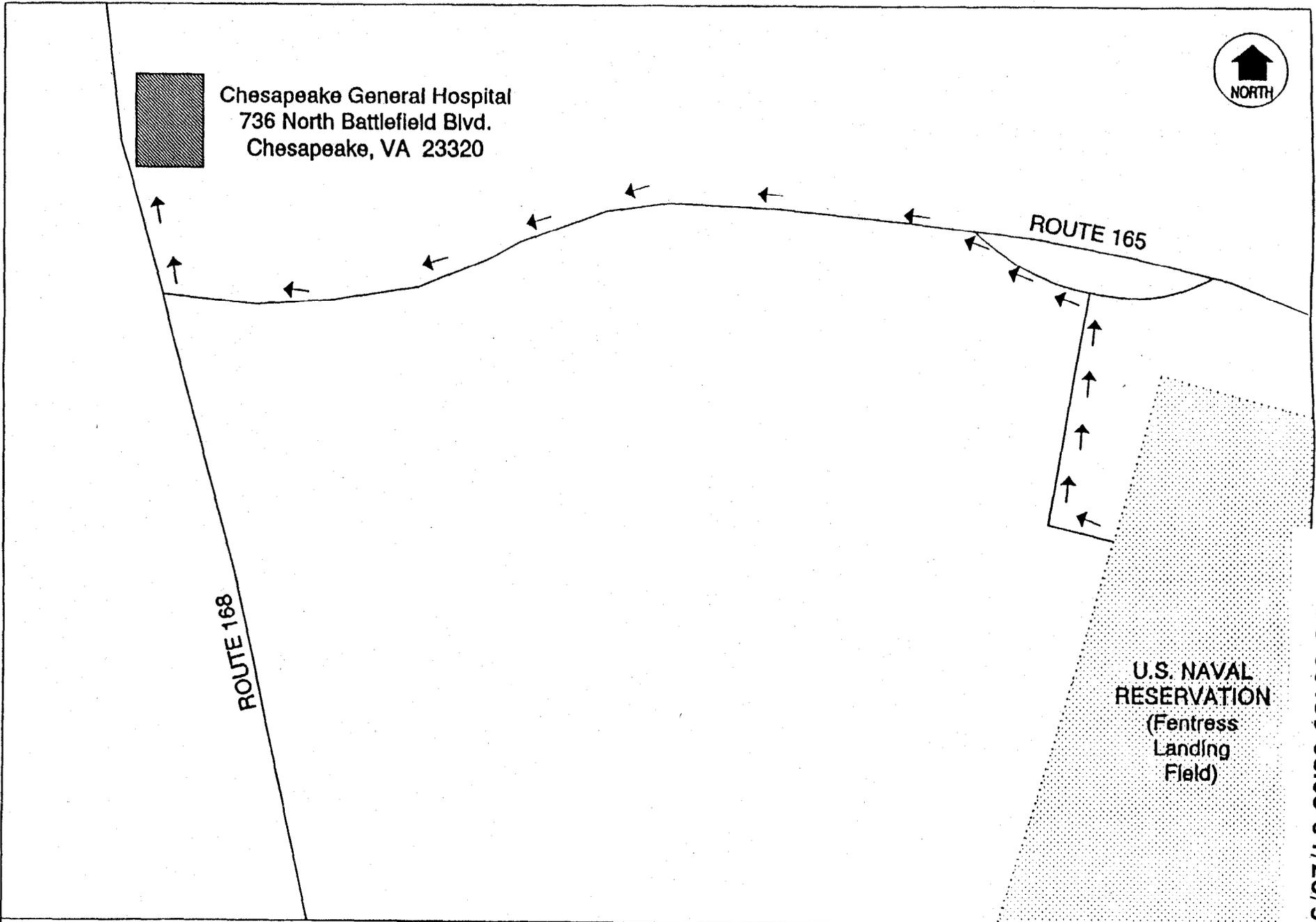


Figure 10-1

DIRECTIONS TO THE LOCAL HOSPITAL  
FENTRESS, VA.

Scale : Not to Sca

OC-00136-03.05-04/26/93

**11.0 (APPLICABLE) STANDARD OPERATING PROCEDURES**

The (Applicable) Standard Operating Procedures which follow address both performance and specification driven programs which are or may be required to adequately protect both the workers and the environment. For example, both the Hazard Communication and Respirator Programs must be given to all site workers. First aid response procedures, on the other hand may be reserved for review by select individuals. Finally, recordkeeping programs are unique for responsible individuals, and need not be reviewed by anyone other than the assigned keeper of the record.

These procedures may be modified as the need arises with approval of the Health and Safety Manager.

**11.1 Accident Reporting**

All accidents -- regardless of whether or not they require off-site medical treatment -- will be logged into an appropriate place in the daily log of health and safety activities kept by the Health and Safety Officer.

Those accidents which require off-site medical attention and/or other reporting requirements under OSHA, State, or Local regulations, will be reported on a formal accident report sheet.

The Health and Safety Officer will be responsible for gathering all the necessary information from the accident victim, witnesses, treatment responders, etc., so that the accident may be evaluated. A formal report may be necessary, and this will be determined in consultation with the Project Manager on site.

All paper work necessary for formal reports to OSHA, or other State or Local offices, and to the insurance underwriter, will also be prepared by the Health and Safety Officer or his designee as required.

## **11.2 Alarm System Procedures**

### **11.2.1 Air Horns**

Because of the limited area of this site inspection the alarm system procedure will utilize only the use of air horns, which will be carried by all workers.

In the event of an emergency, any individual worker may set the alarm system into operation by activating his/her air horn. If activated in the exclusion zone, there will be an immediate response to the alarm by the worker's "buddy," who will determine the need for additional assistance, and respond accordingly.

If the air horn is activated in the support zone, it will be a signal for immediate evacuation of all zones, by the route(s) outlined in the Emergency Response Plan, to assembly points given in this HASP.

Personnel assigned to response activities will proceed to the Command Post designated in the Emergency Response Plan for further instruction.

## **11.3 Calibration of Air Monitoring Equipment**

The following procedures apply to the calibration of air monitoring equipment to be used at the Auxiliary Landing Field Fentress, Chesapeake, Virginia, Sites 14 and 17.

### **HNu (Model PI 101) Calibration (checking with Isobutylene)**

The calibration of the analyzer can be rapidly checked by the use of an HNu small disposable cylinder containing isobutylene (HNu PN 101-350) with a regulator (HNu PN 101-351).

The ppm reading along with the SPAN setting, using isobutylene, is recorded in the calibration report.

In service, the analyzer calibration can be checked and re-adjusted, if necessary, by using this cylinder and regulator as follows:

- a. Connect the analyzer to the regulator and cylinder with a short piece (butt connection) of tubing. (The calibration gas in the cylinder consists of a mixture of isobutylene and zero air. Isobutylene is non-toxic and safe to use in confined areas. There are no listed exposure levels at any concentration).

The regulator sets and controls the flow rate of gas at a value preset at the factory. This will be about 250 cc/min.

It is important that the tubing be clean since contaminated tubing will affect the calibration reading. Do not use the cylinder below about 30 psig, as readings below that level can deviate up to 10% from the rated value.

Safely discard the disposable cylinder when empty. Do not refill this cylinder. It is against the law to transport refilled cylinders.

- b. With the SPAN setting and the function switch at the same positions as listed in the Application Data Sheet or Calibration Report, open the valve on the cylinder until a steady reading is obtained.
- c. If the reading is the same as the recorded data, the analyzer calibration for the original species of interest is still correct.
- d. If the reading has changed, adjust the SPAN setting until the reading is the same.
- e. Shut off the cylinder as soon as the reading is established.
- f. Record and maintain this new SPAN setting. Then recalibrate the analyzer on the species of interest as soon as possible.
- g. Whenever the analyzer is recalibrated, it is to be immediately checked with the small cylinder and the reading recorded. This can then be used for later checking in the field.

MSA Combustible Gas and Oxygen Alarm, Model 2611. Oxygen Calibration:

The Model 261 should be calibrated and zeroed for oxygen in an uncontaminated atmosphere (fresh air). Perform the following procedure:

- a. Open the instrument lid and turn the center ON-OFF control to the HORN OFF position. Both meter pointers will move and one or both Alarms may light.
- b. The % LEL meter pointer should be set to zero by adjusting the ZERO LEL control. Adjustment should be made within 30 seconds after instrument is turned on; this is to prevent accidental activation of the meter latch circuit.
- c. If the % oxygen meter pointer stabilizes at a value other than 20.0%, the pointer should be set to 20.8% by using the CALIBRATE O<sub>2</sub> control.
- d. Press the ALARM RESET button; the Alarm(s) should reset and the green pilot light should flash.
- e. Momentarily place a finger over the sample inlet fitting or the end of the sample line probe. Observe that the flow indicator float drops out of sight, indicating no flow. If the float does not drop, check the flow system for leaks as described in Troubleshooting and Repair, Section 3 - MAINTENANCE, Manual of the Instrument Manufacturer.

(Other air monitoring equipment will be added, according to the needs of the specific job requirements; i.e., personal air monitors, wind velocity, etc.)

- f. Press the CHECK button and observe the % LEL meter. The pointer must read 80% LEL or higher, as marked by the BATTERY zone on the meter. If the pointer reading is less, the battery pack must be recharged; no tests should be attempted as the instrument will malfunction. See Section 3, MAINTENANCE for battery charging instructions.

- g. Turn the ON-OFF control to the ON position. The pilot lamp should light continuously.
- h. Accessory equipment such as sampling lines, probes, carrying harness, filters or line traps should be attached, as required. Tighten all connections and test for flow indication by blocking flow at the far end of the sampling system. If the flow indicator float still does not drop, check the internal flow system as described in Troubleshooting and Repair, Section 3 - MAINTENANCE.
- i. The Model 261 is now ready for atmospheric sampling.

2. Combustible System Calibration Check:

Before the calibration of the combustible gas indicator can be checked, the Model 261 must be in operating condition (see OXYGEN CALIBRATION). Calibration combustible check adjustment is made as follows:

- a. Check and zero the instrument, as in Oxygen Calibration.
- b. Attach the flow control to the recommended calibration gas tank (MSA calibration gas, 0.75% pentane in air).
- c. Connect the adapter-hose to the flow control.
- d. Open flow control valve.
- e. Connect the adapter-hose fitting to the inlet of the instrument. After approximately 15 seconds, the LEL meter pointer should be stable and within the range specified on the calibration sheet accompanying the calibration equipment. If the meter pointer is not in the correct range, stop the flow and remove the right hand side (speaker) panel. Turn on the flow and adjust the "S" control with a small screwdriver to obtain the reading specified on the calibration sheet.
- f. Disconnect the adapter-hose fitting from the instrument.
- g. Close the flow control valve.

- h. Remove the adapter-hose from the flow control.
- i. Remove the flow control from the calibration gas tank.

#### 11.4 First Aid and Emergency Treatment

##### 1. First Aid and Emergency Equipment

During S.I. activities at Sites 14 and 17, the Health and Safety Officer will maintain a variety of first aid and emergency equipment in the support zone. All personnel on site will have access to this equipment in the event of an injury or exposure occurs.

##### 2. Emergency First Aid: Response to Falls, Cuts, Abrasions, Etc.

In the event of any first aid situation requiring response to falls, cuts, abrasions, etc., any worker may respond to the victim. The sequence of assistance is as follows:

- a. Call for help if the situation appears to require more assistance than can be given.
- b. Treat the victim, if confident of the outcome.
- c. Do not treat the victim, if there is no confidence that the proper attention is being given.
- d. Move the victim to a safe place, with assistance, if required.
- e. Get the assistance of a trained First Aid person, or get medical attention, if necessary.

### 3. Emergency First Aid: Heat/Cold Exposure, or Other Related Condition (Heart Attack, Stroke)

#### Heat Exposure

##### Heat Stroke

The person's temperature control system that causes sweating stops functioning correctly. Brain damage and death may occur if temperature is not brought down.

##### Symptoms:

- |                                  |                    |
|----------------------------------|--------------------|
| a. Flushed, hot dry skin         | e. Headache        |
| b. High body temperature (106°F) | f. Rapid pulse     |
| c. Dizziness                     | g. Unconsciousness |
| d. Nausea                        |                    |

##### Treatment:

- a. Immediately cool body if temperature has reached 105°F by removing clothing and sponging body with alcohol, or cool water, or placing in tub of cold water until temperature is lowered sufficiently (<102°F). Stop cooling and observe for 10 minutes. Once temperature remains lowered, dry him of. Use fans or air conditioning if available. Do not give coffee, tea, or alcohol.
- b. Transfer to medical facility immediately.

##### Heat Exhaustion

Heat exhaustion is a result of over exertion in hot or warm weather. It is very likely on-site, due to stress caused by wearing Tyvek suits, boots, gloves, respirators, and SCBAs, even if ambient temperatures are mild.

##### Symptoms:

- |                         |             |
|-------------------------|-------------|
| a. Pale, clammy skin    | d. Headache |
| b. Profuse perspiration | e. Nausea   |
| c. Weakness             |             |

##### Treatment:

- a. Get into shade or cooler place.
- b. Immediately remove any protective clothing.
- c. Victim should sip salt water (1 tsp/per glass), half glass per hour.
- d. Victim should lie down with feet raised.
- e. Fan and cool with wet compresses.
- f. Seek prompt medical attention.

##### Prevention:

- a. If possible, schedule work for early morning or evening during warm weather.
- b. Work in shifts. Limit downrange time of personnel and follow by frequent breaks.
- c. Have cool liquids at hot line for downrange personnel to continuously replace body fluids.
- d. Site leader should continually monitor personnel for signs of heat stress.

### Heat Cramps

Heat cramps are muscular spasms, usually in abdomen or limbs due to loss of salt.

Treatment:

- a. Warm moist heat and pressure to reduce pain.
- b. Salt water by mouth (0.1%)

### Cold Exposure

Persons working outdoors in temperatures at or below freezing may experience frostbite. Two factors influence the development of a cold injury: ambient temperature and the velocity of the wind. Wind chill is used to describe the chilling effect of moving air in combination with low temperatures.

As a general rule, the greatest incremental increase in wind chill occurs when a wind of 5 mph increases to 10 mph. Additionally, water conducts heat 240 times faster than air. Thus, the body cools suddenly when chemical-protective equipment is removed if the clothing underneath is soaked with perspiration.

Local injury resulting from cold is included in the generic term "frostbite." There are several degrees of damage. Frostbite of the extremities can be categorized into:

- Frost nip or incident frostbite. The condition is characterized by sudden blanching or whitening of the skin.
- Superficial frostbite. Skin has a waxy or white appearance and is firm to the touch, but tissue beneath is resilient.
- Deep frostbite. Tissues are cold, pale, and solid; extremely serious injury.

Systemic hypothermia is caused by exposure to freezing or rapidly dropping temperature. Its symptoms are usually exhibited in five stages:

- a. Shivering;
- b. Apathy, listlessness, sleepiness and (sometimes) rapid cooling of the body to less than 95°F;
- c. Unconsciousness, glassy stare, slow pulse, and slow respiratory rate;
- d. Freezing of the extremities; and finally
- e. Death.

**Prevention:**

- a. Stay dry.
- b. Take warming breaks.
- c. Do not use cold therapy in treating frostbite.
- d. Transport to medical facility as soon as possible.

**Treatment:**

- a. Get victim out of wind/rain; take him/her to command post or heated car.
- b. Strip off wet clothes.
- c. If patient is only mildly impaired:
  - (1) Give warm drinks;
  - (2) Get him into dry clothing.
- d. If patient is conscious:
  - (1) Try to keep him awake, give warm drinks;
  - (2) Keep warm;
  - (3) Transport to medical facility.

**Heart Attack, Stroke****Symptoms:**

- a. Victim has severe chest pains, left arm numbness, and/or is unconscious.

**Treatment:**

- a. Call for help
- b. Render First Aid, if trained (CPR if not breathing)

If conscious, transport to medical facility immediately (see map attached).

If unconscious, call for ambulance. Do not attempt to transport an unconscious victim. Rather, place the person in a comfortable place, and protect him from the elements while waiting for medical assistance.

**11.5 Heat Stress Monitoring**

Wearing PPE puts a hazardous worker at considerable risk of developing heat stress. This can result in health effects ranging from transient heat fatigue to serious illness or death. Heat stress is caused by a number of interacting factors, including environmental conditions, clothing, workload, and the individual characteristics of the worker. Because heat stress is probably one of the most common (and potentially serious) illnesses at hazardous waste sites, regular monitoring and other preventive precautions are vital.

To monitor the worker, measure:

1. 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.
2. 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).
- If oral temperature exceeds 99.6°F (37.6°C), shorten the next work cycle by one-third without changing the rest period.
  - If oral temperature still exceeds 99.6°F (37.6°C) 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 (38.1°C).
3. Body water loss, if possible. Measure weight on a scale accurate to  $\pm 0.25$  lb at the beginning and end of each work day to see if enough fluids are being taken to prevent dehydration. Weights should be taken while the employee wears similar clothing or, ideally, is nude. The body water loss should not exceed 1.5 percent total body weight loss in a work day.

Initially, the frequency of physiological monitoring depends on the air temperature adjusted for solar radiation and the level of physical work (see Table 11-1). The length of the work cycle will be governed by the frequency of the required physiological monitoring.

Prevention:

Proper training and preventive measures will help avert serious illness and loss of work productivity. Preventing heat stress is particularly important because once someone suffers from heat stroke or heat exhaustion, that person may be predisposed to additional heat injuries.

To avoid heat stress, management should take the following steps:

1. Adjust work schedules:
  - a. Modify work/rest schedules according to monitoring requirements.
  - b. Mandate work slowdowns as needed.
  - c. Rotate personnel; alternate job functions to minimize overstress or over exertion at one task.
  - d. Add additional personnel to work teams.
  - e. Perform work during cooler hours of the day, if possible, or at night if adequate lighting can be provided.
  
2. Provide shelter (air-conditioned, if possible) or shaded areas to protect personnel during rest periods.
  
3. Maintain workers' body fluids at normal levels. This is necessary to ensure that the cardiovascular system functions adequately. Daily fluid intake must approximately equal the amount of water lost in sweat, i.e., 8 fluid ounces (0.23 liters) of water must be ingested for approximately every 8 ounces (0.23 kg) of weight lost. The normal thirst mechanism is not sensitive enough to ensure that enough water will be drunk to replace lost sweat. When heavy sweating occurs, encourage the worker to drink more. The following strategies may be useful:
  - a. Maintain water temperature at 50° to 60°F (10° to 15.6°C).
  - b. Provide small disposable cups that hold about 4 ounces (0.1 liter).
  - c. Have workers drink 16 ounces (0.5 liters) of fluid (preferably water or dilute drinks) before beginning work.
  - d. Urge workers to drink a cup or two every 15 to 20 minutes, or at each monitoring break. A total of 1 to 1.6 gallons (4 to 6 liters) of fluid per day are recommended, but more may be necessary to maintain body weight.
  - e. Weigh workers before and after work to determine if fluid replacement is adequate.
  
4. Encourage workers to maintain an optimal level of physical fitness: Where indicated, acclimatize workers to site work conditions.

5. Provide cooling devices to aid natural body heat exchange during prolonged work or severe heat exposure. Cooling devices include:
  - a. Field showers or hose-down areas to reduce body temperatures and/or to cool off protective clothing.
  - b. Cooling jackets, vests, or suits.
  
6. Train workers to recognize and treat heat stress. As part of training, identify the signs and symptoms of heat stress (see Table 11-2).

TABLE 11-1

## SUGGESTED FREQUENCY OF PHYSIOLOGICAL MONITORING

Adjusted Temperature	Normal Work Clothes After each _ minutes of work	Class D, C, B After each _ minutes of work
90°F (32.2°C) or above	45	15
87.5°-90°F (30.8°-32.2°C)	60	30
82.5°-87.5°F (28.1°-30.8°C)	90	60
77.5°-82.5°F (25.3°-28.1°C)	120	90
72.5°-77.5°F (22.5°-25.3°C)	150	120

TABLE 11-2

**SIGNS AND SYMPTOMS OF HEAT STRESS**

---

HEAT RASH may result from continuous exposure to heat or humid air.

HEAT CRAMPS are caused by heavy sweating with inadequate electrolyte replacement. Signs and symptoms include:

- a. Muscular spasms
- b. Pain in the hands, feet, and abdomen.

HEAT EXHAUSTION occurs from increased stress on various body organs including inadequate blood circulation due to cardiovascular insufficiency or dehydration. Signs and symptoms include:

- a. Pale, cool, moist skin
- b. Heavy sweating
- c. Dizziness
- d. Nausea
- e. Fainting

HEAT STROKE is the most serious form of heat stress. Temperature regulation fails and the body temperature rises to critical levels. Immediate action must be taken to cool the body before serious injury and death occur. Competent medical help must be obtained. Signs and symptoms are:

- a. Red, hot, usually dry skin
  - b. Lack of or reduced perspiration
  - c. Dizziness and confusion
  - d. Nausea
  - e. Strong, rapid pulse
  - f. Coma
-

**11.6 Personal Protective Equipment: Care and Cleaning****Introduction**

The following points cover the care and cleaning of the Level "C" work uniform: The materials to be covered include chemical resistant clothing, inner and outer chemical resistant gloves, chemical resistant safety boots, and hard hat.

**1. Chemical Resistant Suit:****Inspection procedures --**

Before donning, spread the suit out on a flat surface. Examine the outside for the following:

- a. Abrasion cuts, holes, or tears;
- b. Verify that the fabric is flexible;
- c. Look for separation in seams, or holes;
- d. Verify that the zippers, flaps, or other connecting devices are operable; and
- e. Check that elastic (if provided) is in good condition.

While wearing the suit, observe the following:

- a. Avoid sharp edges that may tear the suit;
- b. Brush off any excess contamination as the work proceeds; and
- c. Try to keep any contact with contamination to a minimum.

When decontaminating:

- a. Brush off any excess before entering the decon area;
- b. Tear the suit so that any materials on the surface fall away from the underclothing; and
- c. Properly dispose of the suit in receptacles provided.

2. Gloves:

- a. Inner gloves will consist of soft, pliable material, commonly used in medical practice. Before use, examine for holes, tears, etc. They are disposed of in decontamination.
- b. Outer gloves will be a permanent type, which will be decontaminated after every exit. They should be examined before and after each work day for cleanliness, tears, holes, etc. The exact composition of the glove will be determined by the Health and Safety Officer.

3. Chemically Resistant Boots:

The exact composition of the boot to be used will be selected by the Health and Safety Officer. As non-disposable items, boots are to be examined on a daily basis before and after use. Look for cleanliness, wear, holes, or chemical degradation.

4. Hard Hats:

Hard hats are to be visually inspected for cleanliness, proper fit, and integrity before and after each use.

5. Respirators:

Respirator care and cleaning is covered in the Respirator Program - SOP, Section 11.8.

6. Other Equipment:

All equipment beyond Level "C" (i.e., fully encapsulating suits, SCBA's, tanks, etc.) will be maintained by the H&S Officer on site, as necessary.

The Health and Safety Officer will periodically monitor the condition of protective clothing on all workers at the site.

**11.7 Recordkeeping**

Foster Wheeler will maintain the following applicable records relating to the site inspections at Sites 14 and 17 for a period of five (5) years, except in the case of medical records. In the case of medical records, Foster Wheeler will maintain medical surveillance records relating to its own personnel for a period of thirty (30) years, and will hand over such records relating to the employees of other companies at the termination of the mobilization.

A list of possible records and responsible individuals is presented below:

<u>Record</u>	<u>Responsibility</u>
Crucial Records: (Medical, Respirator, Equipment)	Health and Safety Officer
Site Control Log (Sign-In)	Security Guard/Site Supervisor
Daily Safety Meetings	Health and Safety Officer
Training: Health and Safety	Health and Safety Officer
Training: Emergency Response	Site Manager/Supervisor
Accident Reports	Health and Safety Officer
Permits:	
Confined Space Entry	Health and Safety Officer
Electrical Lock-Out	Health and Safety Officer
Hot Work	Health and Safety Officer
Daily Log: Health and Safety	Health and Safety Officer
Daily Log: Management Report	Site Manager/Supervisor
Daily Site Audit:	Site Manager/Supervisor/Health & Safety Officer
Federal Records/Letters	Site Manager
Training Records/Certification	Health and Safety Officer

Upon the completion of FWEI work, a written report shall be submitted within thirty (30) days regarding the availability of the above documentation, where applicable.

**11.8 Respirator Program**

The Health and Safety Officer will initiate the following program for determining the suitability of respirators for each task, "fit testing," and training in the care and storage of such respirators.

**RESPIRATORY PROTECTION PROGRAM**

1. Responsibility
2. Purchase of Equipment
3. Respirator Selection
4. Training for Employees
5. Fitting:
  - Positive & Negative Pressure Tests
  - Limitations
6. Protection Factors
7. Monitoring
8. Maintenance:
  - Cleaning
  - Detergents & Disinfectants
9. Storage
10. Inspection Procedure
11. Medical Surveillance
12. Respiratory Program Evaluation

This instruction provides the directive, responsibilities and requirements for conducting the Foster Wheeler Enviresponse Respiratory Protection Program. It is written in accordance with the Occupational Safety and Health Administration (OSHA) Respiratory Protection Regulation (29 CFR 1910.134).

**1. Responsibilities**

The responsibilities for enforcing the Foster Wheeler Enviresponse, Inc. (FWEI) Respiratory Protection Program are the project managers, health and safety deputies,

field supervisors and individual workers. The Health and Safety Officer is designated the program authority, in his absence, an alternate maybe provided.

## 2. Purchase of Equipment

FWEI will purchase respiratory protective equipment that is approved only for the particular contaminant that is present, for which it will be worn. An approved respirator is one that has been tested and found to meet minimum standards by the Mine Safety and Health Administration (MSHA) and the National Institute for Occupational Safety and Health (NIOSH). Approved respirators are accompanied by employee names or an identification number.

## 3. Respirator Selection

Respirators shall be selected on the basis of hazards to which the worker is exposed. Personnel will use only respirators that are OSHA approved. In selecting the proper respirator in a given situation, the Health and Safety Officer should use the following guidelines:

- a. Identify the substances and conditions for which the respirator is to be used. Include inert gas and oxygen deficient atmospheres with this assessment as well as other gases, particulates or combinations that may be encountered.
- b. Obtain a Material Safety Data (MSD) Sheet, or use other ready reference sources of information and assemble all pertinent information on the particular contaminant - fire and explosion, safety and toxicological data.
- c. Determine whether the protection will be needed for an emergency, day-to-day, or an intermittent use.
- d. Consider the person's personal characteristics (such as beards, corrective lenses, medical status) and capabilities for safe use and protection prior to issuance.

- e. Determine that the proper maintenance of the respirator has been taken and that it is clean and in operating condition.
- f. Instructions for selection and identification by color of cartridge/canisters.

The following is a list of respiratory protection devices maintained for FWEI field projects:

- a. MSA Ultra twin full face, air purifying respirator
- b. MSA combination pressure demand type (hip-air)
- c. MSA Ultralite air mask, pressure demand type (SCBA)
- d. MSA cartridges GMA-F, GMA-H, GMC-H
- e. Glenaire, half face, air purifying respirators
- f. Racal, powered air purifying respirator, PAPR

Once a respirator is selected, the user can then refer to the appropriate table.

<u>Respirator Type</u>	<u>Approved Schedule</u>
Self-Contained Breathing Apparatus	TC-13F
Gas Masks	TC-14G
Supplied-Air Respirators	TC-19C
Dust, Fume and Mist Respirators	TC-21C
Chemical Cartridge Respirators	TC-23C
Vinyl Chloride Respirators	TC-11

**11.9 Sanitation/Personal Precaution****11.9.1 Site Requirements**

The following will be provided at Sites 14 and 17:

- a. A supply of clearly marked potable water, tightly closed, and equipped with a tap.
- b. Single service cups/disposal for used cups.
- c. Outlets for non-potable water, clearly marked, for firefighting or other purposes. Cross-contamination of the potable supply shall be prevented.
- d. Access to a toilet facility which is either chemical, recirculating, combustion, or flush, depending on local code requirements.
- e. A place for food handling facility must meet all applicable laws, otherwise this activity may be restricted by on-site management. In the event, suitable alternatives to such facilities will be provided (i.e., nearby restaurants, food wagons, etc.).
- f. Clean wash water will be available in the decontamination zone, either in a portable shower, or trailer.

**11.9.2 Personal Precautions**

- a. Eating, drinking, chewing gum or tobacco, smoking, or any practice that increases the probability of hand-to-mouth transfer and ingestion of material, is prohibited in any area designated contaminated.
- b. No smoking will be allowed on site.
- c. Hands and face must be thoroughly wash upon leaving the work area (NALF, Fentress).

- d. Whenever decontamination procedures for outer garments are in effect, the entire body should be thoroughly washed as soon as possible after the protective garment is removed.
- e. No work garments are to be worn off site.
- f. No facial hair which interferes with a satisfactory fit of the mask-to-face seal, is allowed on personnel required to wear respirators.
- g. Contact with contaminated or suspected contaminated surfaces should be avoided. Whenever possible, do not walk through puddles, leachate, discolored surfaces, kneel on ground, lean, sit, or place equipment on drums, containers, or the ground.
- h. Medicine and alcohol can potentate the effects from exposure to toxic chemicals. Prescribed drugs should not be taken by personnel where the potential for absorption, inhalation, or ingestion of toxic substances exists unless specifically approved by a qualified physician. Alcoholic beverage intake should be minimized or avoided during after-hour operations.
- i. Alcoholic beverages are prohibited on site.
- j. Eye and ear protection will be required when prescribed by the Site Health and Safety Officer.
- k. Personal radios, TVs, and tape players are prohibited on site.
- l. Firearms are prohibited on site.
- m. All personnel will observe any posted sign, warning, fence, or barrier posted around contaminated areas.
- n. Parking of personal or company vehicles will only be permitted in areas designated. No vehicle will be left unattended while the motor is running.
- o. Remove all necessary equipment when no longer needed on the job.

**11.10 Noise**

A noise protection program will be initiated when the level of background noise reaches 85 decibels (8 hr. TWA), as determined by the HSO, or his designee, in the immediate worker area. The method of determination will include use of a suitable sound meter, appropriately calibrated, for the "A" weighted scale. The instrument used will be capable of determining the sound level between 40 and 120 dB. and will meet appropriate ANSI Standards (i.e. ANSI 51.4- 1971 (R1976) Type S2A).

**11.10.1 Exposure Levels**

Once the program is instituted, readings will be performed routinely, and allowable exposure levels as determined in 29 CFR 1910.95, para. b(2) will be observed according to the following table:

<u>Exposure</u>	<u>dba</u>
8 hrs.	90
6 hrs.	92
4 hrs.	95
3 hrs.	97
2 hrs.	100
1.5 hrs.	102
1.0 hrs.	105
0.5 hrs.	110
0.25 or less	115

**11.10.2 Noise Protection**

As needed, the site HSO will choose appropriate noise reduction equipment (NIOSH approved) from a variety of ear protections available on site, to include:

- Canal caps (minimum 15 dB)
- Ear muffs (minimum 20 dB)
- Ear plugs (minimum 25 dB)

## **11.11 Training of Personnel**

### **11.11.1 Basic Training**

#### **1910.120**

All personnel performing work at the facility must have received formal training prior to on-site work. This consists of 40 hours of initial training and 8 hours of annual refresher training if initial training exceeds one year. Managers and supervisors must have received an additional 8 hours of specialized off-site training geared toward their supervisory responsibilities. Evidence of such training will be presented to the Health and Safety Officer prior to work, and will consist of certifications from OSHA-recognized training facilities.

### **11.11.2 Pre-Investigation Briefing**

Prior to the performance of any site inspection activities, the Site Health and Safety Officer will review the contents of this Health and Safety Plan with all personnel who will be on-site and answer any questions regarding its contents. Following the briefing, all personnel will later be required to signify that they have read and understood the contents of the plan.

### **11.11.3 On-Site Supervision**

It will be the duty of the on-site supervisor to assure that all personnel involved in Exclusion Zone operations are adequately briefed. If subcontractors are hired, it is anticipated that this work will be augmented by subcontractor supervisory personnel who will be called upon to assist as necessary.

### **11.11.4 Daily Health and Safety Briefings Safety Meetings**

Each day, or as needed due to changing work tasks, the Site Health and Safety Officer will briefly review the safety requirements for the tasks to be performed with each field team, and/or discuss any other matters considered relevant.

### 11.11.5 Training for Emergency Response

The emergency response training program will be designed to ensure that personnel properly respond to emergency situations. The program will train all workers/management personnel to maintain compliance under emergency conditions. Such training must be held on a monthly basis, for at least two (2) hours.

Training elements will address emergency situations related to storms, power outages, fires, explosions and spills, including:

- a. Procedures for locating, using, inspecting, repairing and replacing emergency and monitoring equipment.
- b. Emergency communication procedures and alarm systems.
- c. Response to fires or explosions.
- d. Response to groundwater contamination incidents and procedures for containing, controlling and mitigating spills.
- e. Shutdown of operations and power failure procedures.
- f. Procedures for evacuation.
- g. That the program will be implemented on the first day of mobilization.

### 11.12 Site Specific Operations

#### 11.12.1 Sampling

All sampling personnel will wear personal protective equipment suitable for the task they are performing, i.e. "bailing", scooping of dirt etc.

This will be specified by the site Health and Safety Officer.

### 11.13 Waste Disposal

#### Introduction

Various types of wastes other than that which is excavated, will be generated during the site inspections and these wastes must be handled and disposed of properly, to prevent any risk to health and the environment. The wastes will include soil, wash water, purge and development water, solvents used for decontamination and protective clothing and miscellaneous solid materials resulting from the work operations.

The most conservative approach to treating these wastes is to drum and dispose as hazardous materials, in suitable DOT approved containers. Drums containing such materials will be sealed, and washed off before transport. However, due to the character of wastes, the conditions at the site, and the available historical data, other methods for waste disposal are justifiable, if they are verified by test or other methods. This will be determined by LANTDIV. As such, investigation generated wastes will be stored in a secure area on-site until their final disposition is determined.

### 11.14 Waste Handling

#### 11.14.1 General Description

There are several types of waste other than excavated soil which will result from the activities at the site. These materials are identified as: (1) soil; (2) liquids; and (3) solid materials, such as spent cartridges, protective clothing, jars, etc., which are generated during the site inspections. All such materials are to be collected into well-marked, 55-gallon drums, which meet all requirements of DOT, EPA, and/or OSHA regulations.

Those personnel who are assigned to handle the accumulation of waste materials, will be responsible for maintaining adequately labeled drums, intermediate plastic containers, and/or other equipment necessary to collect and move such drums to a staging area prior to disposal.

**11.14.2 Duties of Waste Handlers**

The general duties of waste handlers will consist of the following:

1. Place drum collection units in suitable collection areas, as required.
2. Collect and/or housekeep each drum area to assure that materials are properly collected.
3. Move filled and covered drums to the drum staging area prior to disposal.
  - a. Assure proper decontamination.
  - b. Assure proper drum movement, using appropriate drum carrier.
  - c. Maintain suitable berms, absorbents, etc., in the event of leaking drums.

**APPENDIX 1**  
**CHEMICAL SAFETY DATA SHEETS**

# DICHLOROMETHANE

<p><b>Common Synonyms</b> Methylene chloride Methylene dichloride</p>		<p>Watery liquid</p>	<p>Colorless</p>	<p>Sweet, pleasant odor</p>
<p>Sinks in water. Irritating vapor is produced.</p>				
<p>Stop discharge if possible. Avoid contact with liquid and vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.</p>				
<p><b>Fire</b></p>	<p>Not flammable. <b>POISONOUS GASES ARE PRODUCED WHEN HEATED.</b> Wear goggles and self-contained breathing apparatus. Cool exposed containers with water.</p>			
<p><b>Exposure</b></p>	<p>CALL FOR MEDICAL AID. <b>VAPOR</b> Irritating to eyes, nose and throat. If inhaled, will cause nausea and dizziness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. <b>LIQUID</b> Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. <b>IF IN EYES</b>, hold eyelids open and flush with plenty of water. <b>IF SWALLOWED</b> and victim is CONSCIOUS, have victim drink water or milk.</p>			
<p><b>Water Pollution</b></p>	<p>Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.</p>			
<p><b>1. RESPONSE TO DISCHARGE</b> (See Response Methods Handbook) Disperse and flush</p>		<p><b>2. LABEL</b> 2.1 Category: None 2.2 Class: Not pertinent</p>		
<p><b>3. CHEMICAL DESIGNATIONS</b> 3.1 CG Compatibility Class: Halogenated hydrocarbon 3.2 Formula: CH<sub>2</sub>Cl<sub>2</sub> 3.3 IMO/UN Designation: 8.2/1583 3.4 DOT ID No.: 1583 3.5 CAS Registry No.: 75-08-2</p>		<p><b>4. OBSERVABLE CHARACTERISTICS</b> 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Pleasant, aromatic; like chloroform; sweet, ethereal</p>		
<p><b>5. HEALTH HAZARDS</b> 5.1 Personal Protective Equipment: Organic vapor canister mask, safety glasses, protective clothing. 5.2 Symptoms Following Exposure: <b>INHALATION:</b> anesthetic effects, nausea and dizziness. <b>CONTACT WITH SKIN AND EYES:</b> skin irritation, irritation of eyes and nose. 5.3 Treatment of Exposure: <b>INHALATION:</b> remove from exposure. Give oxygen if needed. <b>INGESTION:</b> no specific antidote. <b>CONTACT WITH SKIN AND EYES:</b> remove contaminated clothing; wash skin or eyes if affected. 5.4 Threshold Limit Value: 100 ppm 5.5 Short Term Inhalation Limit: 500 ppm for 30 min. 5.6 Toxicity by Ingestion: Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smearing and reddening of the skin. 5.10 Odor Threshold: 205-307 ppm 5.11 RDLH Value: 5,000 ppm</p>				

<p><b>6. FIRE HAZARDS</b> 6.1 Flash Point: Not flammable under conditions likely to be encountered. 6.2 Flammable Limits in Air: 12%-18% 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Discoloration products generated in a fire may be irritating or toxic. 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: 1184°F 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent 6.10 Adiabatic Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available</p>	<p><b>10. HAZARD ASSESSMENT CODE</b> (See Hazard Assessment Handbook) A-P-X</p>
<p><b>7. CHEMICAL REACTIVITY</b> 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Corrosives: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: 36</p>	<p><b>11. HAZARD CLASSIFICATIONS</b> 11.1 Code of Federal Regulations: OSHA 11.2 HAS Hazard Rating for Bulk Water Transportation: Category Rating Fire ..... 1 Health ..... 2 Vapor Irritant ..... 2 Liquid or Solid Irritant ..... 1 Poisons ..... 2 Water Pollution Human Toxicity ..... 2 Aquatic Toxicity ..... 1 Aesthetic Effect ..... 2 Reactivity Other Chemicals ..... 2 Water ..... 1 Self Reaction ..... 0 11.3 NFPA Hazard Classification: Category Classification Health Hazard (Blue) ..... 2 Flammability (Red) ..... 0 Reactivity (Yellow) ..... 1</p>
<p><b>8. WATER POLLUTION</b> 8.1 Aquatic Toxicity: Not pertinent 8.2 Waterfowl Toxicity: Not pertinent 8.3 Biological Oxygen Demand (BOD): Not pertinent 8.4 Food Chain Concentration Potential: None</p>	<p><b>12. PHYSICAL AND CHEMICAL PROPERTIES</b> 12.1 Physical State at 15°C and 1 atm: Liquid 12.2 Molecular Weight: 84.93 12.3 Boiling Point at 1 atm: 104°F = 39.8°C = 313.0°K 12.4 Freezing Point: -142°F = -86.7°C = 178.5°K 12.5 Critical Temperature: 473°F = 245°C = 518°K 12.6 Critical Pressure: 895 psia = 60.9 atm = 6.17 MPa/m<sup>2</sup> 12.7 Specific Gravity: 1.322 at 20°C (liquid) 12.8 Liquid Surface Tension: Not pertinent 12.9 Liquid Water Interfacial Tension: Not pertinent 12.10 Vapor (Gas) Specific Gravity: 2.9 12.11 Ratio of Specific Heats of Vapor (Gas): 1.199 12.12 Latent Heat of Vaporization: 142 Btu/lb = 78.7 cal/g = 3.30 X 10<sup>4</sup> J/kg 12.13 Heat of Combustion: Not pertinent 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.25 Heat of Fusion: 18.89 cal/g 12.26 Limiting Value: Data not available 12.27 Reid Vapor Pressure: 13.9 psia</p>
<p><b>9. SHIPPING INFORMATION</b> 9.1 Grades of Purity: Aerial grade; technical grade 9.2 Storage Temperature: Data not available 9.3 Inert Atmosphere: Inerted 9.4 Venting: Data not available</p>	<p>NOTES</p>

DCM

DICHLOROMETHANE

12.17 SATURATED LIQUID DENSITY		12.18 LIQUID HEAT CAPACITY		12.19 LIQUID THERMAL CONDUCTIVITY		12.20 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit-inch per hour-square foot-F	Temperature (degrees F)	Centipoise
-70	91.320	35	.274	-110	1.205		N O T  P E R T I N E N T
-60	90.700	40	.275	-100	1.192		
-50	90.080	45	.276	-90	1.179		
-40	89.450	50	.277	-80	1.166		
-30	88.830	55	.278	-70	1.154		
-20	88.200	60	.279	-60	1.141		
-10	87.580	65	.279	-50	1.128		
0	86.959	70	.280	-40	1.115		
10	86.330	75	.281	-30	1.102		
20	85.709	80	.282	-20	1.090		
30	85.080	85	.283	-10	1.077		
40	84.459	90	.284	0	1.064		
50	83.830	95	.284	10	1.051		
60	83.209	100	.285	20	1.038		
70	82.589			30	1.025		
80	81.959			40	1.013		
90	81.341			50	1.000		
100	80.709			60	.987		
				70	.974		
				80	.961		

12.21 SOLUBILITY IN WATER		12.22 SATURATED VAPOR PRESSURE		12.23 SATURATED VAPOR DENSITY		12.24 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68.02	1.380	-10	.866	-10	.01525	0	.128
		-5	1.013	-5	.01783	10	.129
		0	1.180	0	.02031	20	.131
		5	1.370	5	.02333	30	.133
		10	1.586	10	.02671	40	.135
		15	1.830	15	.03050	50	.137
		20	2.105	20	.03472	60	.139
		25	2.414	25	.03941	70	.142
		30	2.762	30	.04462	80	.144
		35	3.151	35	.05039	90	.145
		40	3.585	40	.05676	100	.147
		45	4.068	45	.06378	110	.149
		50	4.606	50	.07149	120	.151
		55	5.201	55	.07996	130	.153
		60	5.860	60	.08922	140	.155
		65	6.588	65	.09934	150	.156
		70	7.389	70	.11040	160	.158
		75	8.270	75	.12240	170	.159
		80	9.237	80	.13540	180	.161
		85	10.300	85	.14960	190	.163
						200	.164
						210	.165
						220	.167
						230	.168
						240	.169
						250	.171

# DIBUTYL PHTHALATE

DPA

<p><b>Common Synonyms</b> DBP Butyl phthalate Phthalic acid dibutyl ester RC Phthalate DBP Windex 300</p>		<p><b>City liquid</b></p>	<p><b>Colorless</b></p>	<p><b>Odorless</b></p>
<p>Stop discharge if possible Call fire department Isolate and remove discharged material. Notify local health and pollution control agencies.</p>				
<p><b>Fire</b></p>		<p><b>Combustible.</b> Extinguish with dry chemical, foam, or carbon dioxide</p>		
<p><b>Exposure</b></p>		<p><b>LIQUID</b> No appreciable harm.</p>		
<p><b>Water Pollution</b></p>		<p>Dangerous to aquatic life in high concentrations. Fouling to shorelines. May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.</p>		
<p><b>1. RESPONSE TO DISCHARGE</b> (See Response Methods Handbook) Mechanical containment Should be removed Chemical and physical treatment</p>		<p><b>2. LABEL</b> 2.1 Category: None 2.2 Class: Not pertinent</p>		
<p><b>3. CHEMICAL DESIGNATIONS</b> 3.1 CG Compatibility Class: Ester 3.2 Formula: C<sub>16</sub>H<sub>22</sub>O<sub>4</sub> 3.3 IBC/UN Designation: Not listed 3.4 DOT ID No.: 6085 3.5 CAS Registry No.: 84-74-2</p>		<p><b>4. OBSERVABLE CHARACTERISTICS</b> 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Slight characteristic ester odor; mild; practically none; slightly aromatic</p>		
<p><b>5. HEALTH HAZARDS</b></p> <p>5.1 Personal Protective Equipment: Eye protection. 5.2 Symptoms Following Exposure: Vapors from very hot material may irritate eyes and produce headache, drowsiness, and convulsions. 5.3 Treatment of Exposure: Remove to fresh air. Wash affected skin areas with water. Flush eyes with water. 5.4 Threshold Limit Value: 5 mg/m<sup>3</sup> 5.5 Short Term Inhalation Limit: Not pertinent 5.6 Toxicity by Ingestion: Grade 1; LD<sub>50</sub> = 5 to 15 g/kg ind 5.7 Late Toxicity: Birth defects in rats; polyarthritis in humans 5.8 Vapor (Gas) Irritant Characteristics: Not pertinent 5.9 Liquid or Solid Irritant Characteristics: No appreciable hazard. Practically harmless to the skin. 5.10 Odor Threshold: Data not available 5.11 IDLH Value: 2,500 mg/m<sup>3</sup></p>				

**6. FIRE HAZARDS**

6.1 Flash Point: 368°F O.C.; 318°F C.C.  
6.2 Flammable Limits in Air: 0.5%-2.5% (calculated)  
6.3 Fire Extinguishing Agents: Dry powder, carbon dioxide, foam  
6.4 Fire Extinguishing Agents Not to be Used: Water or foam may cause frothing.  
6.5 Special Hazards of Combustion Products: Not pertinent  
6.6 Behavior in Fire: Not pertinent  
6.7 Ignition Temperature: 757°F  
6.8 Electrical Hazard: Not pertinent  
6.9 Burning Rate: Data not available  
6.10 Adiabatic Flame Temperature: Data not available  
6.11 Stoichiometric Air to Fuel Ratio: Data not available  
6.12 Flame Temperature: Data not available

**7. CHEMICAL REACTIVITY**

7.1 Reactivity with Water: No reaction  
7.2 Reactivity with Common Materials: No reaction  
7.3 Stability During Transport: Stable  
7.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
7.5 Polymerization: Not pertinent  
7.6 Inhibitor of Polymerization: Not pertinent  
7.7 Water Ratio (Reactant to Product): Data not available  
7.8 Reactivity Group: 34

**8. WATER POLLUTION**

8.1 Aquatic Toxicity: 1200 ppm/24 hr/bluegill/TL<sub>50</sub>/fresh water  
8.2 Waterfowl Toxicity: LC<sub>50</sub> > 4000 ppm  
8.3 Biological Oxygen Demand (BOD): 0.435/lb. 5 days  
8.4 Food Chain Concentration Potential: None

**9. SHIPPING INFORMATION**

9.1 Grades of Purity: 99.8%  
9.2 Storage Temperature: Data not available  
9.3 Inert Atmosphere: Data not available  
9.4 Venting: Data not available

**10. HAZARD ASSESSMENT CODE**  
(See Hazard Assessment Handbook)  
A-T-U-X-Y

**11. HAZARD CLASSIFICATIONS**

11.1 Code of Federal Regulations: Not listed  
11.2 NAB Hazard Rating for Bulk Water Transportation:  
Category Rating  
Fire ..... 1  
Health  
Vapor Irritant ..... 0  
Liquid or Solid Irritant ..... 0  
Poison ..... 0  
Water Pollution  
Human Toxicity ..... 1  
Acute Toxicity ..... 0  
Anesthetic Effect ..... 1  
Reactivity  
Other Chemicals ..... 3  
Water ..... 1  
Self Reaction ..... 0  
11.3 NFPA Hazard Classification:  
Category Classification  
Health Hazard (Blue) ..... 0  
Flammability (Red) ..... 1  
Reactivity (Yellow) ..... 0

**12. PHYSICAL AND CHEMICAL PROPERTIES**

12.1 Physical State at 15°C and 1 atm: Liquid  
12.2 Molecular Weight: 278.35  
12.3 Boiling Point at 1 atm: 606°F = 335°C = 608°K  
12.4 Freezing Point: -31°F = -35°C = 238°K  
12.5 Critical Temperature: 832°F = 500°C = 773°K  
12.6 Critical Pressure: 250 psia = 17 atm = 1.7 MN/m<sup>2</sup>  
12.7 Specific Gravity: 1.049 at 20°C (liquid)  
12.8 Liquid Surface Tension: 34 dynes/cm = 0.034 N/m at 20°C  
12.9 Liquid Water Interfacial Tension: 27 dynes/cm = 0.027 N/m at 22.7°C  
12.10 Vapor (Gas) Specific Gravity: Not pertinent  
12.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
12.12 Latent Heat of Vaporization: Not pertinent  
12.13 Heat of Combustion: -13,300 Btu/lb = -7400 cal/g = -310 X 10<sup>3</sup> J/kg  
12.14 Heat of Decomposition: Not pertinent  
12.15 Heat of Solution: Not pertinent  
12.16 Heat of Polymerization: Not pertinent  
12.25 Heat of Fusion: Data not available  
12.26 Limiting Value: Data not available  
12.27 Reid Vapor Pressure: Data not available

NOTES

<b>DPA</b>	<b>DIBUTYL PHTHALATE</b>
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12.17 SATURATED LIQUID DENSITY		12.18 LIQUID HEAT CAPACITY		12.19 LIQUID THERMAL CONDUCTIVITY		12.20 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F (estimate)	Temperature (degrees F)	British thermal unit-inch per hour- square foot-F	Temperature (degrees F)	Centipoise
40	66.309	32	.430	45	.956	55	24.790
50	66.020	34	.430	50	.954	60	22.770
60	65.730	36	.430	55	.952	65	20.950
70	65.440	38	.430	60	.949	70	19.310
80	65.139	40	.430	65	.947	75	17.820
90	64.849	42	.430	70	.945	80	16.470
100	64.559	44	.430	75	.943	85	15.250
110	64.270	46	.430	80	.941	90	14.140
120	63.980	48	.430	85	.939	95	13.120
130	63.690	50	.430	90	.937	100	12.200
140	63.400	52	.430	95	.934	105	11.350
150	63.100	54	.430	100	.932	110	10.560
160	62.810	56	.430	105	.930	115	9.870
170	62.520	58	.430	110	.928	120	9.220
180	62.230	60	.430	115	.926		
190	61.940	62	.430	120	.924		
200	61.650	64	.430	125	.921		
210	61.360	66	.430	130	.919		
		68	.430	135	.917		
		70	.430	140	.915		
				145	.913		
				150	.911		
				155	.908		
				160	.906		
				165	.904		
				170	.902		

12.21 SOLUBILITY IN WATER		12.22 SATURATED VAPOR PRESSURE		12.23 SATURATED VAPOR DENSITY		12.24 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	220	.001	220	.00003		N
	N	230	.001	230	.00005		O
	S	240	.002	240	.00008		T
	O	250	.003	250	.00011		
	L	260	.004	260	.00016		P
	U	270	.006	270	.00023		E
	B	280	.009	280	.00032		R
	L	290	.013	290	.00045		T
	E	300	.018	300	.00062		I
		310	.025	310	.00086		N
		320	.035	320	.00117		E
		330	.048	330	.00158		N
		340	.066	340	.00213		T
		350	.089	350	.00284		
		360	.119	360	.00376		
		370	.158	370	.00494		
		380	.209	380	.00646		
		390	.274	390	.00838		

# DIOCTYL PHTHALATE

<p><b>Common Synonyms</b></p> <p>Phthalic acid, bis (2-octylhexyl ester) DOP Bis (2-octylhexyl) phthalate Di (2-octylhexyl) phthalate Octal</p>	<p>Offy liquid      Colorless      Slight odor</p>	<p>Floes on water.</p>
<p>Stop discharge if possible. Call fire department. Isolate discharge if possible. Notify local health and pollution control agencies.</p>		
<b>Fire</b>	<p>Combustible. Extinguish with dry chemical, foam, or carbon dioxide.</p>	
<b>Exposure</b>	<p>Not harmful.</p>	
<b>Water Pollution</b>	<p>Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes.  Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>	
<b>1. RESPONSE TO DISCHARGE</b> <small>(See Response Methods Handbook)</small> Mechanical containment Chemical and physical treatment	<b>2. LABEL</b> 2.1 Category: None 2.2 Class: Not pertinent	
<b>3. CHEMICAL DESIGNATIONS</b> 3.1 CG Compatibility Class: Ester 3.2 Formula: <chem>CC1=CC=CC=C1C(=O)OCC(C)CCCC(C)C</chem> 3.3 IMO/IUN Designation: Not listed 3.4 DOT ID No.: Data not available 3.5 CAS Registry No.: 117-84-0	<b>4. OBSERVABLE CHARACTERISTICS</b> 4.1 Physical State (as shipped): Solid 4.2 Color: Colorless 4.3 Odor: Very slight	
<b>5. HEALTH HAZARDS</b>		
<p>5.1 Personal Protective Equipment: Not required 5.2 Symptoms Following Exposure: Produces no ill effects at normal temperatures but may give off irritating vapor at high temperature. 5.3 Treatment of Exposure: Leave contaminated area; wash skin with soap and water; flush eyes with water. 5.4 Threshold Limit Values: Not pertinent 5.5 Short Term Inhalation Limits: Not pertinent 5.6 Toxicity by Ingestion: Grade G; LD<sub>50</sub> above 15 g/kg (rat) 5.7 Lethal Toxicity: Not established 5.8 Vapor (Gas) Irritant Characteristics: Nonirritating to the eyes and throat. 5.9 Liquid or Solid Irritant Characteristics: No appreciable hazard. Practically harmless to the skin. 5.10 Odor Threshold: Not pertinent 5.11 IDLH Values: Data not available</p>		

<p><b>6. FIRE HAZARDS</b></p> <p>6.1 Flash Point: 425°F O.C. 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Dry powder, carbon dioxide, foam 6.4 Fire Extinguishing Agents Not to be Used: Water or foam may cause frothing 6.5 Special Hazards of Combustion Products: None 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Data not available 6.10 Adiabatic Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available</p>	<p><b>10. HAZARD ASSESSMENT CODE</b> <small>(See Hazard Assessment Handbook)</small> A-T-U-X-Y</p>								
<p><b>7. CHEMICAL REACTIVITY</b></p> <p>7.1 Reactivity With Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: 34</p>	<p><b>11. HAZARD CLASSIFICATIONS</b></p> <p>11.1 Code of Federal Regulations: Not listed 11.2 NIOSH Hazard Rating for Bulk Water Transportation: Not listed 11.3 NFPA Hazard Classification:  <table style="width: 100%; border: none;"> <tr> <td style="text-align: right;">Category</td> <td style="text-align: right;">Classification</td> </tr> <tr> <td style="text-align: right;">Health Hazard (Blue)</td> <td style="text-align: right;">_____ 0</td> </tr> <tr> <td style="text-align: right;">Flammability (Red)</td> <td style="text-align: right;">_____ 1</td> </tr> <tr> <td style="text-align: right;">Reactivity (Yellow)</td> <td style="text-align: right;">_____ 0</td> </tr> </table> </p>	Category	Classification	Health Hazard (Blue)	_____ 0	Flammability (Red)	_____ 1	Reactivity (Yellow)	_____ 0
Category	Classification								
Health Hazard (Blue)	_____ 0								
Flammability (Red)	_____ 1								
Reactivity (Yellow)	_____ 0								
<p><b>8. WATER POLLUTION</b></p> <p>8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None</p>	<p><b>12. PHYSICAL AND CHEMICAL PROPERTIES</b></p> <p>12.1 Physical State at 15°C and 1 atm: Liquid 12.2 Molecular Weight: 390.8 12.3 Boiling Point at 1 atm: 727°F = 386°C = 656°K 12.4 Freezing Point: Not pertinent 12.5 Critical Temperature: Not pertinent 12.6 Critical Pressure: Not pertinent 12.7 Specific Gravity: 0.980 at 25°C (liquid) 12.8 Liquid Surface Tension (mN/m): 15 dynes/cm = 0.015 N/m at 20°C 12.9 Liquid Water Interfacial Tension (mN/m): 30 dynes/cm = 0.03 N/m at 20°C 12.10 Vapor (Gas) Specific Gravity: Not pertinent 12.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 12.12 Latent Heat of Vaporization: Not pertinent 12.13 Heat of Combustion: -15,138 Btu/lb = -8410 cal/g = -352 x 10<sup>3</sup> J/kg 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.25 Heat of Fusion: Data not available 12.26 Limiting Values: Data not available 12.27 Reid Vapor Pressure: Low</p>								
<p><b>9. SHIPPING INFORMATION</b></p> <p>9.1 Grades of Purity: Data not available 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Open (flame arrester)</p>	<p style="text-align: center;">NOTES</p>								

DOP	<b>DIOCTYL PHTHALATE</b>
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12.17 SATURATED LIQUID DENSITY		12.18 LIQUID HEAT CAPACITY		12.19 LIQUID THERMAL CONDUCTIVITY		12.20 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F (estimate)	Temperature (degrees F)	British thermal unit-inch per hour- square foot-F	Temperature (degrees F)	Centipoise (estimate)
34	62.350	32	.478	45	.944	32	15.670
36	62.280	34	.478	50	.942	34	14.770
38	62.210	36	.478	55	.940	36	13.920
40	62.150	38	.478	60	.939	38	13.140
42	62.080	40	.478	65	.937	40	12.400
44	62.010	42	.478	70	.935	42	11.700
46	61.940	44	.478	75	.933	44	11.060
48	61.870	46	.478	80	.931	46	10.450
50	61.800	48	.478	85	.929	48	9.878
52	61.730	50	.478	90	.927	50	9.343
54	61.660	52	.478	95	.925	52	8.841
56	61.590	54	.478	100	.924	54	8.370
58	61.520	56	.478	105	.922	56	7.927
60	61.450	58	.478	110	.920	58	7.511
62	61.380	60	.478	115	.918	60	7.119
64	61.310	62	.478	120	.916	62	6.751
66	61.240	64	.478	125	.914	64	6.404
68	61.170	66	.478	130	.912	66	6.078
70	61.100	68	.478	135	.911	68	5.770
72	61.040	70	.478	140	.909	70	5.481
74	60.970	72	.478	145	.907	72	5.207
76	60.900	74	.478	150	.905	74	4.950
78	60.830	76	.478	155	.903	76	4.707
80	60.760			160	.901		
82	60.690			165	.899		
84	60.620			170	.897		

12.21 SOLUBILITY IN WATER		12.22 SATURATED VAPOR PRESSURE		12.23 SATURATED VAPOR DENSITY		12.24 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77.02	.005	340	.006	340	.00028		N
		345	.007	345	.00030		O
		350	.008	350	.00038		T
		355	.009	355	.00041		
		360	.011	360	.00048		P
		365	.013	365	.00056		E
		370	.015	370	.00064		R
		375	.017	375	.00074		T
		380	.020	380	.00086		I
		385	.023	385	.00099		N
		390	.026	390	.00113		E
		395	.031	395	.00130		N
		400	.035	400	.00149		T
		405	.040	405	.00170		
		410	.046	410	.00194		
		415	.053	415	.00222		
		420	.061	420	.00252		
		425	.070	425	.00287		
		430	.080	430	.00325		
		435	.091	435	.00369		
		440	.103	440	.00417		
		445	.117	445	.00471		

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ENTER CHEMICAL NAME  
ACETONE

TYPE WHAT INFORMATION YOU REQUIRE  
/ALL/, SPECIFIC INFORMATION (BY 4-LETTER COMMAND, /HELP/, OR /NONE/).  
ALL

CHEMICAL NAME  
ACETONE

FORMULA  
C3H6O

SYNONYMS  
2-PROPANONE  
DIMETHYL KETONE

KETONE PROPANE  
METHYL KETONE  
DIMETHYLFORMALDEHYDE  
DIMETHYLKETAL  
PYROACETIC ACID  
UN 1090  
PROPANONE  
PYROACETIC ETHER  
BETA-KETOPROPANE  
KETONE, DIMETHYL

PROPANONENE  
RCRA U002  
STCC 4908105  
OHS00140

## PERMISSIBLE EXPOSURE LIMIT

750 PPM OSHA TWA; 1000 PPM OSHA STEL  
750 PPM ACGIH TWA; 1000 PPM ACGIH STEL  
250 PPM NIOSH RECOMMENDED 10 HOUR TWA  
MUTAGENIC DATA (RTECS)

## REPRODUCTIVE EFFECTS DATA (RTECS)

AQUATIC TOXICITY RATING 0 (TLM96 >1000 PPM)  
LEPOMIS MACROCHIRUS 8,300 PPM

CERCLA HEALTH RATINGS - TOXICITY 1 - IGNITABILITY 3 - REACTIVITY 0 -  
PERSISTENCE 0

TOXICOLOGY: ACETONE IS A SKIN, EYE AND MUCOUS MEMBRANE IRRITANT. IT IS MODERATELY TOXIC BY INHALATION AND SLIGHTLY TOXIC BY SKIN CONTACT AND INGESTION. ACETONE IS A CENTRAL NERVOUS SYSTEM DEPRESSANT. ACUTE EXPOSURE MAY RESULT IN WEAKNESS IN THE LEGS, DRYNESS OF

THE MOUTH AND THROAT, RESTLESSNESS AND FATAL KETOSIS. REPEATED OR PROLONGED EXPOSURE TO ACETONE MAY CAUSE AN UNPLEASANT SMELL, HEAVY EYES AND HEMATOLOGIC CHANGES. WORKERS EXPOSED TO 1000 PPM FOR

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3 HOURS/DAY FOR 7-13 YEARS REPORTED CHRONIC INFLAMMATION OF THE RESPIRATORY TRACT, STOMACH AND DUODENUM, ANTHEMIA AND A SENSATION OF HEAT.

THE ODOR OF ACETONE CAN BE DETECTED AT 20 PPM. THIS IS CONSIDERED TO BE AN ADEQUATE WARNING PROPERTY. THE THRESHOLD LIMIT VALUE WAS SET TO LIMIT IRRITATION.

PERSONS WITH CHRONIC RESPIRATORY OR SKIN DISEASES MAY BE AT INCREASED

RISK FROM EXPOSURE. ALCOHOL MAY ENHANCE THE TOXIC EFFECTS.

ORL-MAN TDLO: 2857 MG/KG	IHL-HMN TCLO: 500 PPM
IHL-MAN TCLO: 440 UG/M3/6M	IHL-MAN TCLO: 10 MG/M3 6H
IHL-MAN TCLO: 12,000 PPM/4H	ORL-RAT LD50: 5800 MG/KG
ORL-MUS LD50: 3000 MG/KG	ORL-RBT LD50: 5340 MG/KG
IHL-RAT LC50: 50,100 MG/M3/8H	SKN-RBT LD50: 20 GM/KG
SKIN AND EYE IRRITATION (RTECS)	
EYE-HMN 500 PPM	EYE-RBT 3950 UG SEV
SKN-RBT 395 MG OPEN MLD	

IMMEDIATELY DANGEROUS TO LIFE OR HEALTH CONCENTRATION  
20,000 PPM  
OSHA/NIOSH

#### PHYSICAL DESCRIPTION

CLEAR, COLORLESS, VOLATILE LIQUID WITH A CHARACTERISTIC, SWEETISH MINT-LIKE ODOR AND SWEETISH TASTE.

#### CHEMICAL AND PHYSICAL PROPERTIES

MOLECULAR WEIGHT: 58.08

BOILING POINT AT 1 ATM, F: 133 F (56 C)  
SOLUBILITY IN WATER, G/100 G WATER AT 20C: SOLUBLE  
FLASH POINT, CLOSED CUP, F (OR OPEN CUP IF 0C): -4 F (-20 C)  
VAPOR PRESSURE @ 20 C, MMHG: 180 MMHG  
MELTING POINT, F: -139 F (-95 C)  
UPPER EXPLOSIVE LIMIT IN AIR, % BY VOLUME: 13  
LOWER EXPLOSIVE LIMIT IN AIR, % BY VOLUME: 2.5  
AUTOIGNITION TEMPERATURE: 869 F (465 C)  
SPECIFIC GRAVITY: 0.7899  
VAPOR DENSITY (AIR=1): 2.0

ODOR THRESHOLD: 20 PPM  
OCTANOL/WATER PARTITION COEFFICIENT: -0.24

#### INCOMPATIBILITIES

ACETONE:

ACIDS: INCOMPATIBLE  
AMINES (ALIPHATIC): INCOMPATIBLE  
BROMINE: VIOLENT REACTIONS WITH EXCESS AMOUNTS OF BROMINE  
BROMINE TRIFLUORIDE: EXPLOSION ON CONTACT  
BROMOFORM: VIOLENT REACTION IN PRESENCE OF BASES

CHLOROFORM: VIOLENT REACTION IN PRESENCE OF A BASE  
CHROMIUM TRIOXIDE: IGNITION ON CONTACT AT AMBIENT TEMPERATURE  
CHROMYL CHLORIDE: INCANDESCENT REACTION  
DIOXYGEN DIFLUORIDE + SOLID CARBON DIOXIDE: EXPLOSION AT -78 C

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HEXACHLOROMELAMINE: POSSIBLE EXPLOSION  
HYDROGEN PEROXIDE: EXPLOSION  
NITRIC ACID: IGNITION  
NITRIC + ACETIC ACID MIXTURE: POSSIBLE EXPLOSION  
NITRIC + SULFURIC ACID MIXTURE: VIOLENT OXIDATION  
NITROSYL CHLORIDE: EXPLOSIVE REACTION

NITROSYL PERCHLORATE: IGNITION AND EXPLOSION  
NITRYL PERCHLORATE: IGNITION AND EXPLOSION  
OXIDIZERS (STRONG): FIRE AND EXPLOSION HAZARD  
PERMCMOSULFURIC ACID: EXPLOSION  
PLASTICS: INCOMPATIBLE  
PLATINUM + NITROSYL CHLORIDE: POSSIBLE EXPLOSION  
POTASSIUM-TERT-BUTOXIDE: IGNITION  
RAYON: INCOMPATIBLE  
SODIUM HYPOBROMITE: EXPLOSION  
SODIUM HYPOIODITE: POSSIBLE EXPLOSION

SULFUR DICHLORIDE: VIOLENT REACTION  
SULFURIC ACID AND POTASSIUM BICHROMATE: IGNITION  
THIODIGLYCOL + HYDROGEN PEROXIDE: POSSIBLE EXPLOSION  
THIOTRIAZYL PERCHLORATE: POSSIBLE EXPLOSION  
1,1,1-TRICHLOROETHANE: EXOTHERMIC CONDENSATION BY A BASIC CATALYST  
TRICHLOROMELAMINE: POSSIBLE EXPLOSION  
SEE ALSO KETONES

## KETONES:

ACETALDEHYDE: VIOLENT CONDENSATION REACTION

NITRIC ACID + HYDROGEN PEROXIDE: FORMATION OF EXPLOSIVE PRODUCT  
PERCHLORIC ACID: VIOLENT DECOMPOSITION

THERMAL DECOMPOSITION PRODUCTS MAY INCLUDE TOXIC OXIDES OF CARBON.

VAPOR-AIR MIXTURES ARE EXPLOSIVE.

VAPORS ARE HEAVIER THAN AIR AND MAY TRAVEL A CONSIDERABLE DISTANCE TO A SOURCE OF IGNITION AND FLASH BACK.

## PERSONAL PROTECTIVE EQUIPMENT

FOLLOWING INFORMATION FROM NIOSH/OSHA "OCCUPATIONAL HEALTH GUIDELINES FOR CHEMICAL HAZARDS":

EMPLOYERS SHALL PROVIDE AND ENSURE THAT EMPLOYEES USE APPROPRIATE PROTECTIVE CLOTHING AND EQUIPMENT NECESSARY TO PREVENT REPEATED OR PROLONGED SKIN CONTACT WITH THIS SUBSTANCE. FACE SHIELDS SHALL COMPLY WITH 29CFR1910.133(A)(2), (A)(4), (A)(5), AND (A)(6).

EMPLOYERS SHALL ENSURE THAT CLOTHING CONTAMINATED WITH THIS SUBSTANCE

IS PLACED IN CLOSED CONTAINERS FOR STORAGE UNTIL IT CAN BE DISCARDED OR UNTIL THE EMPLOYER PROVIDES FOR THE REMOVAL OF THE CONTAMINANT FROM THE CLOTHING. IF THE CLOTHING IS TO BE LAUNDERED OR OTHERWISE CLEANED TO REMOVE THE CONTAMINANT, THE EMPLOYER SHALL INFORM THE PERSON PERFORMING THE CLEANING OF THE HAZARDOUS PROPERTIES OF THE SUBSTANCE.

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ACGIH "GUIDELINES FOR THE SELECTION OF CHEMICAL PROTECTIVE CLOTHING" INDICATED THE FOLLOWING PROTECTIVE RATINGS FOR MATERIALS COMMONLY USED FOR PROTECTIVE CLOTHING. THESE RATINGS ARE BASED PRIMARILY ON QUANTITATIVE TEST RESULTS AND QUALITATIVE RESISTANCE INFORMATION.

(THE RECOMMENDATIONS APPLY TO THE PURE SUBSTANCE ONLY; BREAKTHROUGH-TIME MAY VARY FOR MIXTURES.) (A "+" DESIGNATES A BLEND OF MATERIALS, WHILE A "/" DESIGNATES A COATED OR LAMINATED MATERIAL.)

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## ACETONE:

EXCELLENT/GOOD:  
BUTYL RUBBER

GOOD/FAIR:  
TEFLON

NATURAL RUBBER + NEOPRENE + NEOPRENE-BUTADIENE RUBBER  
POLYURETHANE  
POLYVINYL ACETATE  
SILVERSHIELD

## POOR/FAIR:

NITRILE + POLYVINYL CHLORIDE  
NEOPRENE + STYRENE-BUTADIENE RUBBER  
SARANEX  
STYRENE-BUTADIENE RUBBER

VITON/CHLOROBUTYL  
STYRENE-BUTADIENE RUBBER/NEOPRENE

## POOR:

CHLORINATED POLYETHYLENE  
NATURAL RUBBER  
NEOPRENE  
NITRILE  
POLYETHYLENE  
POLYVINYL ALCOHOL

POLYVINYL CHLORIDE  
VITON  
NEOPRENE + NATURAL RUBBER  
NEOPRENE/NATURAL RUBBER

## GOGGLES

FOLLOWING INFORMATION FROM NIOSH/OSHA "OCCUPATIONAL HEALTH GUIDELINES FOR CHEMICAL HAZARDS":

EMPLOYERS SHALL PROVIDE AND ENSURE THAT EMPLOYEES USE SPLASH-PROOF

SAFETY GOGGLES WHICH COMPLY WITH 29CFR1910.133(A)(2)-(A)(6) WHERE THIS LIQUID MAY CONTACT THE EYES.

## WASHING CHEMICALS FROM THE SKIN

FOLLOWING INFORMATION FROM NIOSH/OSHA "OCCUPATIONAL HEALTH GUIDELINES

## FOR CHEMICAL HAZARDS":

EMPLOYERS SHALL ENSURE THAT EMPLOYEES WHOSE SKIN BECOMES WET WITH THIS SUBSTANCE PROMPTLY WASH OR SHOWER TO REMOVE ANY CONTAMINANT FROM THE SKIN.

## ROUTINE CHANGING OF WORK CLOTHING

NO SPECIFIC REQUIREMENT. IF INDICATED BY THE NATURE OF THE CONTAMINANT AND THE EXTENT OF EXPOSURE, CHANGE INTO UNCONTAMINATED CLOTHING BEFORE LEAVING THE WORK PREMISES.

## CLOTHING REMOVAL FOLLOWING ACCIDENTAL CONTAMINATION

FOLLOWING INFORMATION FROM NIOSH/OSHA "OCCUPATIONAL HEALTH GUIDELINES FOR CHEMICAL HAZARDS":

EMPLOYERS SHALL ENSURE THAT ANY CLOTHING WHICH BECOMES WET WITH THIS FLAMMABLE LIQUID BE REMOVED IMMEDIATELY AND NOT REWORN UNTIL THE SUBSTANCE IS REMOVED FROM THE CLOTHING.

## SPECIFIC EMERGENCY PROVISIONS

NO SPECIFIC REQUIREMENT. IF INDICATED BY THE NATURE OF THE SUBSTANCE AND THE PROBABILITY OF EXPOSURE, PROVIDE AN EYE WASH AND FACILITIES FOR QUICK DRENCHING OF THE BODY WITHIN THE IMMEDIATE WORK AREA FOR EMERGENCY USE.

## RESPIRATOR SELECTION (UPPER LIMIT DEVICES PERMITTED)

## 1000 PPM

- CHEMICAL CARTRIDGE RESPIRATOR WITH AN ORGANIC VAPOR CARTRIDGE
- POWERED AIR-PURIFYING RESPIRATOR WITH AN ORGANIC VAPOR CARTRIDGE
- SUPPLIED-AIR RESPIRATOR
- SELF-CONTAINED BREATHING APPARATUS

## 6250 PPM

- SUPPLIED-AIR RESPIRATOR OPERATED IN CONTINUOUS FLOW MODE

## 12,500 PPM

- (FRONT- OR BACK-MOUNTED) GAS MASK WITH AN ORGANIC VAPOR CANISTER
- SUPPLIED-AIR RESPIRATOR WITH A FULL FACE-PIECE
- SELF-CONTAINED BREATHING APPARATUS WITH A FULL FACE-PIECE

## 20,000 PPM

- SUPPLIED-AIR RESPIRATOR WITH FULL FACEPIECE OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE

## ESCAPE

- (FRONT- OR BACK-MOUNTED) GAS MASK WITH AN ORGANIC VAPOR CANISTER

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- APPROPRIATE ESCAPE-TYPE SELF-CONTAINED BREATHING APPARATUS

## FIREFIGHTING

- SELF-CONTAINED BREATHING APPARATUS WITH A FULL FACE-PIECE OPERATED IN PRESSURE-DEMAND OR POSITIVE-PRESSURE MODE
- SUPPLIED-AIR RESPIRATOR WITH A FULL FACEPIECE OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE WITH AUXILIARY SELF-CONTAINED BREATHING APPARATUS OPERATED IN POSITIVE PRESSURE MODE

## ROUTE OF ENTRY INTO BODY

INHALATION  
SKIN ABSORPTION  
INGESTION  
SKIN OR EYE CONTACT

## SYMPTOMS

SKIN IRRITATION

EYE IRRITATION  
MUCOUS MEMBRANE IRRITATION  
CENTRAL NERVOUS SYSTEM DEPRESSION  
HEADACHE  
DIZZINESS  
DROWSINESS  
MALAISE  
NAUSEA  
INCOORDINATION  
DYSPHONIA

ANOREXIA  
ABDOMINAL PAIN  
VOMITING  
HEMATEMESIS  
HYPOTHERMIA  
DYSPNEA  
COLLAPSE  
STUPOR  
COMA  
SKIN HYPEREMIA

SKIN EDEMA  
DERMATITIS  
ERYTHEMA  
CORNEAL EPITHELIUM DAMAGE  
CONJUNCTIVITIS  
KIDNEY DAMAGE  
LIVER DAMAGE  
KIDNEY LESIONS  
LIVER LESIONS  
PHARYNGEAL DAMAGE

REPRODUCTIVE EFFECTS IN EXPERIMENTAL ANIMALS

FIRST AID PROCEDURES FOLLOWING EXPOSURE

IF THIS CHEMICAL GETS INTO THE EYES, WASH THE EYES IMMEDIATELY WITH LARGE AMOUNTS OF WATER OR NORMAL SALINE, OCCASIONALLY LIFTING UPPER AND LOWER LIDS, UNTIL NO EVIDENCE OF CHEMICAL REMAINS (APPROXIMATELY 15-20 MINUTES). GET MEDICAL ATTENTION IMMEDIATELY.

IF THIS CHEMICAL GETS ON THE SKIN, REMOVE CONTAMINATED CLOTHING AND SHOES IMMEDIATELY. WASH AFFECTED AREA WITH SOAP OR MILD DETERGENT AND

LARGE AMOUNTS OF WATER UNTIL NO EVIDENCE OF CHEMICAL REMAINS (APPROXIMATELY 15-20 MINUTES). GET MEDICAL ATTENTION IMMEDIATELY.

IF THIS CHEMICAL HAS BEEN INHALED, REMOVE FROM EXPOSURE AREA TO FRESH AIR IMMEDIATELY. IF BREATHING HAS STOPPED, PERFORM ARTIFICIAL RESPIRATION. KEEP PERSON WARM AND AT REST. TREAT SYMPTOMATICALLY AND SUPPORTIVELY. GET MEDICAL ATTENTION IMMEDIATELY.

IF THIS SUBSTANCE IS INGESTED AND IF THE PERSON IS CONSCIOUS AND NOT CONVULSING, INDUCE EMESIS BY GIVING SYRUP OF IPECAC (KEEPING THE HEAD

BELOW THE HIPS TO PREVENT ASPIRATION), FOLLOWED BY WATER. REPEAT IN 20 MINUTES IF NOT EFFECTIVE INITIALLY. IN PATIENTS WITH DEPRESSED RESPIRATION OR IF EMESIS IS NOT PRODUCED, PERFORM GASTRIC LAVAGE CAUTIOUSLY (DREISBACH, HANDBOOK OF POISONING, 12TH ED.). TREAT SYMPTOMATICALLY AND SUPPORTIVELY. GASTRIC LAVAGE SHOULD BE PERFORMED BY QUALIFIED MEDICAL PERSONNEL. GET MEDICAL ATTENTION IMMEDIATELY.

ORGANS

- EYES
- SKIN
- RESPIRATORY SYSTEM
- MUCOUS MEMBRANES
- CENTRAL NERVOUS SYSTEM

STATUS OF REGULATORY ENFORCEMENT

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 FEDERAL REGULATIONS  
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OSHA STANDARD 1910.1200 HAZARD COMMUNICATION

REQUIRES CHEMICAL MANUFACTURERS AND IMPORTERS TO ASSESS THE HAZARDS OF CHEMICALS WHICH THEY PRODUCE OR IMPORT, AND ALL EMPLOYERS TO PROVIDE INFORMATION TO THEIR EMPLOYEES CONCERNING HAZARDOUS CHEMICALS BY MEANS OF A HAZARDOUS COMMUNICATION PROGRAM, LABELS AND OTHER FORMS OF WARNING, MATERIAL SAFETY DATA SHEETS, AND INFORMATION AND TRAINING. REQUIRES DISTRIBUTORS TO TRANSMIT REQUIRED INFORMATION TO EMPLOYERS.

OSHA STANDARD 29CFR1910.1000 AIR CONTAMINANTS

# METHYL ETHYL KETONE

<p>Common Synonyms: MEK, 2-Butanone, Ethyl methyl ketone</p> <p>Liquid</p> <p>Colorless</p> <p>Sweet odor</p> <p>Floats and mixes with water. Flammable, irritating vapor is produced.</p>	
<p>Stop discharge if possible. Keep people away. Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapor. Avoid contact with liquid and vapor. Soak and remove discharged material. Notify local health and pollution control agencies.</p>	
<p><b>Fire</b></p>	<p><b>FLAMMABLE.</b> Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemical, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.</p>
<p><b>Exposure</b></p>	<p><b>CALL FOR MEDICAL AID.</b></p> <p><b>VAPOR</b> Irritating to eyes, nose and throat. If inhaled, will cause nausea, vomiting, headache, dizziness, difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.</p> <p><b>LIQUID</b> Will burn eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.</p>
<p><b>Water Pollution</b></p>	<p>Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>
<p><b>1. RESPONSE TO DISCHARGE</b> (See Response Methods Handbook) Issue warning-high flammability. Disperse and flush.</p>	<p><b>2. LABEL</b> 2.1 Category: Flammable liquid 2.2 Class: 3</p>
<p><b>3. CHEMICAL DESIGNATIONS</b> 3.1 CG Compatibility Class: Ketone 3.2 Formula: <math>CH_3COCH_2CH_3</math> 3.3 HMT/UN Designations: 3.2/1193 3.4 DOT ID No.: 1193 3.5 CAS Registry No.: 78-93-3</p>	<p><b>4. OBSERVABLE CHARACTERISTICS</b> 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Like acetone; pleasant; pungent</p>
<p><b>5. HEALTH HAZARDS</b></p> <p>5.1 Personal Protective Equipment: Organic canister or air pack; plastic gloves; goggles or face shield. 5.2 Symptoms Following Exposure: Liquid causes eye burn. Vapor irritates eyes, nose, and throat; can cause headache, dizziness, nausea, weakness, and loss of consciousness. 5.3 Treatment of Exposure: <b>INHALATION:</b> remove victim to fresh air; if breathing is irregular or has stopped, start resuscitation and administer oxygen. <b>EYES:</b> wash with plenty of water for at least 15 min. and call physician. 5.4 Threshold Limit Value: 200 ppm 5.5 Short Term Inhalation Limit: 290 mg/m<sup>3</sup> for 60 min. 5.6 Toxicity by Ingestion: Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg (rat) 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight stinging of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause stinging and reddening of the skin. 5.10 Odor Threshold: 10 ppm 5.11 IDLH Value: Data not available</p>	

<p><b>6. FIRE HAZARDS</b></p> <p>6.1 Flash Point: 20°F C.C.; 27°F O.C. 6.2 Flammable Limits in Air: 1.8%-11.5% 6.3 Fire Extinguishing Agents: Alcohol foam, dry chemical, or carbon dioxide 6.4 Fire Extinguishing Agents that to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: 961°F 6.8 Electrical Hazard: Class I, Group D 6.9 Burning Rate: 4.1 mm/min. 6.10 Adiabatic Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available</p>	<p><b>10. HAZARD ASSESSMENT CODE</b> (See Hazard Assessment Handbook) <b>A-P-Q-R-S</b></p>
<p><b>7. CHEMICAL REACTIVITY</b></p> <p>7.1 Reactivity With Water: No reaction 7.2 Reactivity with Common Metals: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: 18</p>	<p><b>11. HAZARD CLASSIFICATIONS</b></p> <p>11.1 Code of Federal Regulations: Flammable liquid 11.2 NAS Hazard Rating for Bulk Water Transportation: Category Rating Fire _____ 3 Health _____ Vapor Irritant _____ 1 Liquid or Solid Irritant _____ 1 Poisons _____ 2 Water Pollution _____ Human Toxicity _____ 2 Aquatic Toxicity _____ 1 Aesthetic Effect _____ 1 Reactivity _____ Other Chemicals _____ 2 Water _____ 0 Self Reaction _____ 0</p> <p>11.3 NFPA Hazard Classification: Category Classification Health Hazard (Blue) _____ 1 Flammability (Red) _____ 3 Reactivity (Yellow) _____ 0</p>
<p><b>8. WATER POLLUTION</b></p> <p>8.1 Aquatic Toxicity: 5640 mg/148 hr/bugfish/TL/fresh water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 214%, 5 days 8.4 Food Chain Concentration Potential: None</p>	<p><b>12. PHYSICAL AND CHEMICAL PROPERTIES</b></p> <p>12.1 Physical State at 15°C and 1 atm: Liquid 12.2 Molecular Weight: 72.11 12.3 Boiling Point at 1 atm: 175.3°F = 79.6°C = 352.6°K 12.4 Freezing Point: -122.3°F = -86.3°C = 186.9°K 12.5 Critical Temperature: 504.5°F = 262.5°C = 535.7°K 12.6 Critical Pressure: 803 psia = 41.0 atm = 4.15 MPa/m<sup>2</sup> 12.7 Specific Gravity: 0.806 at 20°C (liquid) 12.8 Liquid Surface Tension: Not pertinent 12.9 Liquid Water Interfacial Tension: Not pertinent 12.10 Vapor (Gas) Specific Gravity: 2.5 12.11 Ratio of Specific Heats of Vapor (Gas): 1.075 12.12 Latent Heat of Vaporization: 191 Btu/lb = 108 cal/g = 4.4 x 10<sup>4</sup> J/kg 12.13 Heat of Combustion: -12,460 Btu/lb = -7491 cal/g = -313.6 x 10<sup>3</sup> J/g 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: (aq) -9 Btu/lb = -5 cal/g = -0.2 x 10<sup>4</sup> J/kg 12.16 Heat of Polymerization: Not pertinent 12.25 Heat of Fusion: Data not available 12.26 Limiting Value: Data not available 12.27 Reid Vapor Pressure: 3.5 psia</p>
<p><b>9. SHIPPING INFORMATION</b></p> <p>9.1 Grades of Purity: 99.5+ % 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Open (flame arrester) or pressure-vacuum</p>	<p><b>NOTES</b></p>

<b>MEK</b>	<b>METHYL ETHYL KETONE</b>
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12.17 SATURATED LIQUID DENSITY		12.18 LIQUID HEAT CAPACITY		12.19 LIQUID THERMAL CONDUCTIVITY		12.20 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit-inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	51.460	-35	.501	10	1.073		N O T  P E R T I N E N T
40	51.280	-30	.502	15	1.068		
45	51.110	-25	.503	20	1.063		
50	50.940	-20	.504	25	1.058		
55	50.760	-15	.505	30	1.053		
60	50.590	-10	.507	35	1.048		
65	50.420	-5	.508	40	1.043		
70	50.240	0	.509	45	1.038		
75	50.070	5	.510	50	1.033		
80	49.900	10	.511	55	1.028		
85	49.720	15	.512	60	1.023		
90	49.550	20	.513	65	1.018		
95	49.380	25	.514	70	1.013		
100	49.200	30	.516	75	1.008		
105	49.030	35	.517	80	1.003		
110	48.860	40	.518	85	.998		
115	48.680	45	.519	90	.993		
120	48.510	50	.520	95	.988		
		55	.521	100	.983		
		60	.522	105	.978		
		65	.523				
		70	.524				
		75	.526				
		80	.527				
		85	.528				
		90	.529				

12.21 SOLUBILITY IN WATER		12.22 SATURATED VAPOR PRESSURE		12.23 SATURATED VAPOR DENSITY		12.24 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68.02	27.000	0	.148	0	.00216	0	.352
		10	.216	10	.00310	25	.368
		20	.310	20	.00435	50	.384
		30	.437	30	.00599	75	.399
		40	.604	40	.00812	100	.414
		50	.823	50	.01085	125	.429
		60	1.104	60	.01427	150	.444
		70	1.461	70	.01853	175	.458
		80	1.909	80	.02376	200	.472
		90	2.465	90	.03012	225	.486
		100	3.147	100	.03778	250	.500
		110	3.977	110	.04690	275	.513
		120	4.977	120	.05768	300	.526
		130	6.171	130	.07030	325	.538
		140	7.586	140	.08498	350	.551
		150	9.250	150	.10190	375	.563
		160	11.190	160	.12130	400	.575
		170	13.450	170	.14350	425	.586
		180	16.050	180	.16850	450	.598
		190	19.030	190	.19670	475	.609
		200	22.420	200	.22830	500	.620
		210	26.270	210	.26350	525	.630
		220	30.610	220	.30250	550	.640
		230	35.480	230	.34560	575	.650
		240	40.930	240	.39290	600	.660

# p-DICHLOROBENZENE

<p><b>Common Synonyms</b></p> <p>Paradichlorobenzene Dichloride Paradi Parador Paranoch Sarcoschlor</p>	<p><b>Solid crystals</b></p> <p>White to clear</p> <p>Morbide odor</p>	<p>Sinks in water.</p>	
<p>Avoid contact with solid. Call fire department. Isolate and remove discharged material. Notify local health and pollution control agencies.</p>			
<b>Fire</b>	<p>Combustible. <b>POISONOUS GASES ARE PRODUCED IN FIRE.</b> Wear goggles and self-contained breathing apparatus. Extinguish with water, dry chemical, foam, or carbon dioxide. Cool exposed containers with water.</p>		
<b>Exposure</b>	<p>CALL FOR MEDICAL AID.</p> <p><b>SOLID</b> Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.</p>		
<b>Water Pollution</b>	<p>HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>		
<p><b>1. RESPONSE TO DISCHARGE</b> (See Response Methods Handbook) Issue warning-water contaminant Should be removed Chemical and physical treatment</p>		<p><b>2. LABEL</b></p> <p>2.1 Category: None 2.2 Class: Not pertinent</p>	
<p><b>3. CHEMICAL DESIGNATIONS</b></p> <p>3.1 CO Compatibility Class: Halogenated hydrocarbon 3.2 Formula: p-C<sub>6</sub>H<sub>4</sub>Cl<sub>2</sub> 3.3 IMO/UN Designation: 8.0/1582 3.4 DOT ID No.: 1582 3.5 CAS Registry No.: 108-46-7</p>		<p><b>4. OBSERVABLE CHARACTERISTICS</b></p> <p>4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: Aromatic</p>	
<p><b>5. HEALTH HAZARDS</b></p> <p>5.1 Personal Protective Equipment: Full face mask fitted with organic vapor canister for concentrations over 75 ppm; clean protective clothing; eye protection. 5.2 Symptoms Following Exposure: <b>INHALATION:</b> Irritation of upper respiratory tract; over-exposure may cause depression and injury to liver and kidney. <b>EYE CONTACT:</b> pain and mild irritation. 5.3 Treatment of Exposure: <b>INHALATION:</b> If any ill effects develop, remove patient to fresh air and get medical attention. If breathing stops, give artificial respiration. <b>EYES:</b> flush with plenty of water and get medical attention if ill effects develop. <b>SKIN AND INGESTION:</b> no problem likely. 5.4 Threshold Limit Value: 75 ppm 5.5 Short Term Inhalation Limit: 50 ppm for 80 min. 5.6 Toxicity by Ingestion: Grade 2, LD<sub>50</sub> = 0.5 to 5 g/kg 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smearing and reddening of the skin. 5.10 Odor Threshold: 15-30 ppm 5.11 IDLH Value: 1,000 ppm</p>			
<p>OSHA STEL = 110 ppm</p>			

<p><b>6. FIRE HAZARDS</b></p> <p>6.1 Flash Point: 186°F O.C.; 130°F C.C. 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Water, foam, carbon dioxide or dry chemical. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Vapors are irritating. Toxic chlorine, hydrogen chloride, and phosgene gases may be generated in fire. 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: 1.3 mm/min. (approx.) 6.10 Adiabatic Flame Temperature: Data not available</p> <p style="text-align: right;"><i>(Continued)</i></p>	<p><b>14. HAZARD ASSESSMENT CODE</b> (See Hazard Assessment Handbook)</p> <p style="text-align: center;"><b>8</b></p>
<p><b>7. CHEMICAL REACTIVITY</b></p> <p>7.1 Reactivity With Water: No reaction 7.2 Reactivity with Common Metals: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: 36</p>	<p><b>11. HAZARD CLASSIFICATIONS</b></p> <p>11.1 Code of Federal Regulations: OSHA 11.2 NIOSH Hazard Rating for Bulk Water Transportation: Not listed 11.3 NFPA Hazard Classification: Category Classification Health Hazard (Blue) ..... 2 Flammability (Red) ..... 2 Reactivity (Yellow) ..... 0</p>
<p><b>8. WATER POLLUTION</b></p> <p>8.1 Aquatic Toxicity: 50 ppm/1 fish/96hr/fresh water 880 mg/1/48 hr/rainbow trout/TL<sub>50</sub>/fresh water *No time interval specified 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Feed Chain Concentration Potential: Data not available</p>	<p><b>12. PHYSICAL AND CHEMICAL PROPERTIES</b></p> <p>12.1 Physical State at 15°C and 1 atm: Solid 12.2 Molecular Weight: 147.01 12.3 Boiling Point at 1 atm: 345.6°F = 174.2°C = 447.4°K 12.4 Freezing Point: 130°F = 53°C = 328°K 12.5 Critical Temperature: Not pertinent 12.6 Critical Pressure: Not pertinent 12.7 Specific Gravity: 1.458 at 20°C (solid) 12.8 Liquid Surface Tension: Not pertinent 12.9 Liquid Water Interfacial Tension: Not pertinent 12.10 Vapor (Gas) Specific Gravity: Not pertinent 12.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 12.12 Latent Heat of Vaporization: Not pertinent 12.13 Heat of Combustion: Not pertinent 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.25 Heat of Fusion: 29.07 cal/g 12.26 Limiting Value: Data not available 12.27 Reid Vapor Pressure: Data not available</p>
<p><b>9. SHIPPING INFORMATION</b></p> <p>9.1 Grades of Purity: Solid: 5 grades, chemical purity close to 100%. Liquid: 1-2% orthodichlorobenzene. 9.2 Storage Temperature: Data not available 9.3 Inert Atmospheric: Data not available 9.4 Venting: Data not available</p>	
<p><b>6. FIRE HAZARDS (Continued)</b></p> <p>6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available</p>	

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## p-DICHLOROBENZE

OC-00136-03.05-04/26/93

12.17 SATURATED LIQUID DENSITY		12.18 LIQUID HEAT CAPACITY		12.19 LIQUID THERMAL CONDUCTIVITY		12.20 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit- inch per hour- square foot-F	Temperature (degrees F)	Centipoise
	NOT PERTINENT		NOT PERTINENT	136	.757		NOT PERTINENT
				138	.756		
				140	.755		
				142	.754		
				144	.753		
				146	.752		
				148	.751		
				150	.750		
				152	.749		
				154	.748		
				156	.747		
				158	.746		
				160	.745		
				162	.744		
				164	.743		
				166	.742		
				168	.741		
				170	.739		
				172	.738		
				174	.737		
				176	.736		
				178	.735		
				180	.734		
				182	.733		
				184	.732		
				186	.731		

12.21 SOLUBILITY IN WATER		12.22 SATURATED VAPOR PRESSURE		12.23 SATURATED VAPOR DENSITY		12.24 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77.02	.008		NOT PERTINENT		NOT PERTINENT		NOT PERTINENT

# NAPHTHALENE

<p><b>Common Synonyms</b> Naphthalen Tar camphor</p>	<p><b>Solid</b>      <b>Colorless</b>      <b>Mothballs odor</b></p> <p>Solidifies and floats or sinks in water.</p>
<p>Stop discharge if possible. Keep people away. Call fire department. Avoid contact with liquid and solid. Isolate and remove discharged material. Notify local health and pollution control agencies.</p>	
<p><b>Fire</b></p>	<p>Combustible. Wear goggles and self-contained breathing apparatus. Extinguish with water, foam, dry chemical or carbon dioxide. Cool exposed containers with water.</p>
<p><b>Exposure</b></p>	<p><b>CALL FOR MEDICAL AID.</b></p> <p><b>SOLID OR LIQUID</b> Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. <b>IF IN EYES</b>, hold eyelids open and flush with plenty of water.</p>
<p><b>Water Pollution</b></p>	<p><b>HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.</b> Fouling to shrimps. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>
<p><b>1. RESPONSE TO DISCHARGE</b> (See Response Methods Handbook) Should be removed Chemical and physical treatment</p>	<p><b>2. LABEL</b> 2.1 Category: None 2.2 Class: Not pertinent</p>
<p><b>3. CHEMICAL DESIGNATIONS</b></p> <p>3.1 <b>CG Compatibility Class:</b> Aromatic Hydrocarbon 3.2 <b>Formula:</b> C<sub>10</sub>H<sub>8</sub> 3.3 <b>BRQ/UN Designation:</b> 4.1/2304 3.4 <b>DOT ID No.:</b> 2304 3.5 <b>CAS Registry No.:</b> 91-20-3</p>	<p><b>4. OBSERVABLE CHARACTERISTICS</b></p> <p>4.1 <b>Physical State (as shipped):</b> Molten solid 4.2 <b>Color:</b> Colorless 4.3 <b>Odor:</b> Coal tar; moth balls</p>
<p><b>5. HEALTH HAZARDS</b></p>	
<p>5.1 <b>Personal Protective Equipment:</b> U.S. Bureau of Mines approved organic vapor canister unit (USBM Type B); rubber gloves; chemical safety goggles; face shield; coveralls and/or rubber apron; rubber shoes or boots. 5.2 <b>Symptoms Following Exposure:</b> Vapors or fumes are irritating to eyes, nose, and throat and may cause headaches, dizziness, nausea, etc. Solid may be irritating to skin. 5.3 <b>Treatment of Exposure:</b> <b>INHALATION:</b> remove to fresh air. <b>SKIN OR EYES:</b> flush immediately with plenty of water for at least 15 min.; remove contaminated clothing immediately; call a physician. 5.4 <b>Threshold Limit Value:</b> 10 ppm 5.5 <b>Short Term Inhalation Limit:</b> 15 ppm for 5 min. 5.6 <b>Toxicity by Ingestion:</b> Grade 2; oral rat LD<sub>50</sub> = 1780 mg/kg 5.7 <b>Late Toxicity:</b> Data not available 5.8 <b>Vapor (Gas) Irritant Characteristics:</b> Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary. 5.9 <b>Liquid or Solid Irritant Characteristics:</b> Hot liquid can cause severe burn. The solid may irritate the skin. 5.10 <b>Odor Threshold:</b> 0.000008 ppm 5.11 <b>IDLH Value:</b> 500 ppm</p>	
<p><b>OSHA STEL = 100 ppm</b></p>	

<p><b>6. FIRE HAZARDS</b></p> <p>6.1 <b>Flash Point:</b> 174°F C.C.; 190°F O.C. 6.2 <b>Flammable Limits in Air:</b> 0.9%-5.9% 6.3 <b>Fire Extinguishing Agents:</b> Water fog, carbon dioxide, dry chemical, or foam 6.4 <b>Fire Extinguishing Agents Not to be Used:</b> Not pertinent 6.5 <b>Special Hazards of Combustion Products:</b> Toxic vapors given off in a fire. 6.6 <b>Behavior in Fire:</b> Not pertinent 6.7 <b>Ignition Temperature:</b> 979°F 6.8 <b>Electrical Hazard:</b> Not pertinent 6.9 <b>Burning Rate:</b> 4.3 mm/min. 6.10 <b>Adiabatic Flame Temperature:</b> Data not available 6.11 <b>Stoichiometric Air to Fuel Ratio:</b> Data not available 6.12 <b>Flame Temperature:</b> Data not available</p>	<p><b>18. HAZARD ASSESSMENT CODE</b> (See Hazard Assessment Handbook) <b>A-T-U-X</b></p>																																				
<p><b>7. CHEMICAL REACTIVITY</b></p> <p>7.1 <b>Reactivity With Water:</b> Molten naphthalene softens and foams in contact with water. No chemical reaction is involved. 7.2 <b>Reactivity with Common Materials:</b> None 7.3 <b>Stability During Transport:</b> Stable 7.4 <b>Neutralizing Agents for Acids and Caustics:</b> Not pertinent 7.5 <b>Polymerization:</b> Not pertinent 7.6 <b>Inhibitor of Polymerization:</b> Not pertinent 7.7 <b>Molar Ratio (Reactant to Product):</b> Data not available 7.8 <b>Reactivity Group:</b> 32</p>	<p><b>11. HAZARD CLASSIFICATIONS</b></p> <p>11.1 <b>Code of Federal Regulation:</b> ORM-A 11.2 <b>NAS Hazard Rating for Bulk Water Transportation:</b></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Category</th> <th style="text-align: left;">Rating</th> </tr> </thead> <tbody> <tr> <td>Fire.....</td> <td>1</td> </tr> <tr> <td>Health.....</td> <td>1</td> </tr> <tr> <td>Vapor Irritant.....</td> <td>2</td> </tr> <tr> <td>Liquid or Solid Irritant.....</td> <td>1</td> </tr> <tr> <td>Poisons.....</td> <td>2</td> </tr> <tr> <td>Water Pollution.....</td> <td>1</td> </tr> <tr> <td>Human Toxicity.....</td> <td>3</td> </tr> <tr> <td>Aquatic Toxicity.....</td> <td>3</td> </tr> <tr> <td>Aesthetic Effect.....</td> <td>3</td> </tr> <tr> <td>Reactivity.....</td> <td>0</td> </tr> <tr> <td>Other Chemicals.....</td> <td>1</td> </tr> <tr> <td>Water.....</td> <td>0</td> </tr> <tr> <td>Self Reaction.....</td> <td>0</td> </tr> </tbody> </table> <p>11.3 <b>NFPA Hazard Classification:</b></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Category</th> <th style="text-align: left;">Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue).....</td> <td>2</td> </tr> <tr> <td>Flammability (Red).....</td> <td>2</td> </tr> <tr> <td>Reactivity (Yellow).....</td> <td>0</td> </tr> </tbody> </table>	Category	Rating	Fire.....	1	Health.....	1	Vapor Irritant.....	2	Liquid or Solid Irritant.....	1	Poisons.....	2	Water Pollution.....	1	Human Toxicity.....	3	Aquatic Toxicity.....	3	Aesthetic Effect.....	3	Reactivity.....	0	Other Chemicals.....	1	Water.....	0	Self Reaction.....	0	Category	Classification	Health Hazard (Blue).....	2	Flammability (Red).....	2	Reactivity (Yellow).....	0
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<p><b>8. WATER POLLUTION</b></p> <p>8.1 <b>Aquatic Toxicity:</b> 150 mg/l/96 hr/sunfish/TL<sub>50</sub>/fresh water 1.8 ppm/72 hr/fingering salmon/critical/ salt water 8.2 <b>Waterfowl Toxicity:</b> Data not available 8.3 <b>Biological Oxygen Demand (BOD):</b> (theor.) 56.5%, 8 days 8.4 <b>Food Chain Concentration Potential:</b> None</p>	<p><b>12. PHYSICAL AND CHEMICAL PROPERTIES</b></p> <p>12.1 <b>Physical State at 16°C and 1 atm:</b> Solid 12.2 <b>Molecular Weight:</b> 128.18 12.3 <b>Boiling Point at 1 atm:</b> 424°F = 218°C = 491°K 12.4 <b>Freezing Point:</b> 176.4°F = 80.2°C = 353.4°K 12.5 <b>Critical Temperature:</b> 587.4°F = 475.2°C = 748.4°K 12.6 <b>Critical Pressure:</b> 588 psia = 40.9 atm = 4.05 MN/m<sup>2</sup> 12.7 <b>Specific Gravity:</b> 1.145 at 20°C (solid) 12.8 <b>Liquid Surface Tension:</b> 31.8 dynes/cm = 0.0318 N/m at 100°C 12.9 <b>Liquid Water Interfacial Tension:</b> Data not available 12.10 <b>Vapor (Gas) Specific Gravity:</b> Not pertinent 12.11 <b>Ratio of Specific Heats of Vapor (Gas):</b> 1.068 12.12 <b>Latent Heat of Vaporization:</b> 145 Btu/lb = 80.7 cal/g = 3.38 X 10<sup>4</sup> J/kg 12.13 <b>Heat of Combustion:</b> -18,720 Btu/lb = -4287 cal/g = -388.8 X 10<sup>4</sup> J/kg 12.14 <b>Heat of Decomposition:</b> Not pertinent 12.15 <b>Heat of Solution:</b> Not pertinent 12.16 <b>Heat of Polymerization:</b> Not pertinent 12.25 <b>Heat of Fusion:</b> 35.06 cal/g 12.26 <b>Limiting Value:</b> Data not available 12.27 <b>Relief Vapor Pressure:</b> Low</p>																																				
<p><b>9. SHIPPING INFORMATION</b></p> <p>9.1 <b>Grade or Purity:</b> Pure; crude: 95% Pure; mp = 176°F Crude: mp = 165-178°F 9.2 <b>Storage Temperature:</b> Elevated 9.3 <b>Inert Atmosphere:</b> No requirement 9.4 <b>Venting:</b> Open (flame arrester) or pressure-vacuum</p>																																					
<p><b>NOTES</b></p>																																					

<b>NTM</b>	<b>NAPHTHALENE</b>
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12.17 SATURATED LIQUID DENSITY		12.18 LIQUID HEAT CAPACITY		12.19 LIQUID THERMAL CONDUCTIVITY		12.20 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot (estimate)	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit-inch per hour- square foot-F (estimate)	Temperature (degrees F)	Centipoise
177	69.290	180	.382	177	.901	180	.837
178	69.290	200	.391	178	.901	185	.784
179	69.290	220	.401	179	.901	190	.735
180	69.290	240	.410	180	.901	195	.690
181	69.290	260	.419	181	.901	200	.648
182	69.290	280	.429	182	.901	205	.609
183	69.290	300	.438	183	.901	210	.573
184	69.290	320	.447	184	.901	215	.540
185	69.290	340	.457	185	.901	220	.509
186	69.290	360	.466	186	.901	225	.480
187	69.290	380	.475	187	.901	230	.454
188	69.290	400	.485	188	.901	235	.429
189	69.290	420	.494	189	.901	240	.406
190	69.290			190	.901	245	.384
191	69.290			191	.901	250	.364
192	69.290			192	.901	255	.345
193	69.290			193	.901	260	.327
						265	.311
						270	.295
						275	.281
						280	.267
						285	.254
						290	.242
						295	.231
						300	.221
						305	.210

12.21 SOLUBILITY IN WATER		12.22 SATURATED VAPOR PRESSURE		12.23 SATURATED VAPOR DENSITY		12.24 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68.02	.300	180	.148	180	.00276	0	.207
		200	.254	200	.00460	25	.220
		220	.420	220	.00739	50	.233
		240	.670	240	.01143	75	.246
		260	1.032	260	.01713	100	.259
		280	1.544	280	.02493	125	.271
		300	2.250	300	.03537	150	.283
		320	3.200	320	.04901	175	.295
		340	4.453	340	.06650	200	.307
		360	6.075	360	.08850	225	.318
		380	8.138	380	.11570	250	.330
		400	10.720	400	.14890	275	.340
		420	13.910	420	.18890	300	.351
		440	17.810	440	.23630	325	.362
		460	22.490	460	.29210	350	.372
		480	28.080	480	.35680	375	.382
						400	.391
						425	.401
						450	.410
						475	.419
						500	.428
						525	.436
						550	.445
						575	.453
						600	.460

# GASOLINES: AUTOMOTIVE (<4.23g lead/gal)

GAT

<p><b>Common Synonyms</b> Motor spirit Petrol</p>	<p><b>Weight</b> liquid Colorless to pale brown or pink Gasoline odor</p>	<p>Floats on water. Flammable, irritating vapor is produced.</p>
<p>Stop discharge if possible. Keep people away. Shut off ignition sources and call fire department. Stay upwind and use water spray to knock down vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.</p>		
<b>Fire</b>	<p><b>FLAMMABLE.</b> Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemical foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.</p>	
<b>Exposure</b>	<p><b>CALL FOR MEDICAL AID</b></p> <p><b>VAPOR</b> Irritating to eyes, nose and throat. If inhaled, will cause dizziness, headache, difficult breathing or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.</p> <p><b>LIQUID</b> Irritating to skin and eyes. If swallowed, will cause nausea or vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. If IN EYES, hold eyelids open and flush with plenty of water. If SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. <b>DO NOT INDUCE VOMITING.</b></p>	
<b>Water Pollution</b>	<p><b>HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.</b> Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>	
<p><b>1. RESPONSE TO DISCHARGE</b> (See Response Methods Handbook) Issue warning-high flammability Evacuate area Disperse and flush</p>	<p><b>2. LABEL</b> 2.1 Category: Flammable liquid 2.2 Class: 3</p>	
<p><b>3. CHEMICAL DESIGNATIONS</b> 3.1 CQ Compatibility Class: Miscellaneous Hydrocarbon Mixtures 3.2 Formula: (Mixture of hydrocarbons) 3.3 IMDG/UN Designators: 3.1/1203 3.4 DOT ID No.: 1203 3.5 CAS Registry No.: Data not available</p>	<p><b>4. OBSERVABLE CHARACTERISTICS</b> 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless to brown 4.3 Odor: Gasoline</p>	
<p><b>5. HEALTH HAZARDS</b></p>		
<p>5.1 Personal Protective Equipment: Protective goggles, gloves. 5.2 Symptoms Following Exposure: Irritation of mucous membranes and stimulation followed by depression of central nervous system. Breathing of vapor may also cause dizziness, headache, and incoordination or, in more severe cases, anesthesia, coma, and respiratory arrest. If liquid enters lungs, it will cause severe irritation, coughing, gagging, pulmonary edema, and, later, signs of bronchopneumonia and pneumonia. Swallowing may cause irregular heartbeat. 5.3 Treatment of Exposure: <b>INHALATION:</b> maintain respiration and administer oxygen; encourage bed rest if liquid is in lungs. <b>INGESTION:</b> do NOT induce vomiting; stomach should be lavaged (by doctor) if appreciable quantity is swallowed. <b>EYES:</b> wash with copious quantity of water. <b>SKIN:</b> wipe off and wash with soap and water. 5.4 Threshold Limit Value: 300 ppm 5.5 Short Term Inhalation Limits: 500 ppm for 30 min. 5.6 Toxicity by Ingestion: Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg. 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight stinging of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause stinging and reddening of the skin. 5.10 Odor Threshold: 0.25 ppm 5.11 IDLN Values: Data not available</p>		

<p><b>6. FIRE HAZARDS</b></p> <p>6.1 Flash Point: -35°F C.C. 6.2 Flammable Limits in Air: 1.4%-7.4% 6.3 Fire Extinguishing Agents: Foam, carbon dioxide, dry chemical 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: None 6.6 Behavior in Fire: Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back. 6.7 Ignition Temperature: 853°F 6.8 Electrical Hazard: Class I, Group D 6.9 Burning Rate: 4 mm/min. 6.10 Adiabatic Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available</p> <p><b>7. CHEMICAL REACTIVITY</b></p> <p>7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: 3</p> <p><b>8. WATER POLLUTION</b></p> <p>8.1 Aquatic Toxicity: 80 ppm/24 hr/juvenile American shad/TL<sub>50</sub>/fresh water 81 mg/1/24 hr/juvenile American shad/TL<sub>50</sub>/salt water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 8%, 5 days 8.4 Food Chain Concentration Potential: None</p> <p><b>9. SHIPPING INFORMATION</b></p> <p>9.1 Grades of Purity: Various octane ratings; military specifications 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Open flame arrester or pressure-relief</p>	<p><b>10. HAZARD ASSESSMENT CODE</b> (See Hazard Assessment Handbook) A-T4-U-V-W</p> <p><b>11. HAZARD CLASSIFICATIONS</b></p> <p>11.1 Code of Federal Regulations: Flammable liquid 11.2 NAS Hazard Rating for Bulk Water Transportation:</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Category</th> <th style="text-align: left;">Rating</th> </tr> </thead> <tbody> <tr> <td>Fire.....</td> <td>3</td> </tr> <tr> <td>Health.....</td> <td></td> </tr> <tr> <td>Vapor Irritant.....</td> <td>1</td> </tr> <tr> <td>Liquid or Solid Irritant.....</td> <td>1</td> </tr> <tr> <td>Poisons.....</td> <td>2</td> </tr> <tr> <td>Water Pollution.....</td> <td></td> </tr> <tr> <td>Human Toxicity.....</td> <td>1</td> </tr> <tr> <td>Aquatic Toxicity.....</td> <td>2</td> </tr> <tr> <td>Aesthetic Effect.....</td> <td>2</td> </tr> <tr> <td>Reactivity.....</td> <td></td> </tr> <tr> <td>Other Chemicals.....</td> <td>0</td> </tr> <tr> <td>Water.....</td> <td>0</td> </tr> <tr> <td>Salt Reaction.....</td> <td>0</td> </tr> </tbody> </table> <p>11.3 NFPA Hazard Classification:</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Category</th> <th style="text-align: left;">Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue).....</td> <td>1</td> </tr> <tr> <td>Flammability (Red).....</td> <td>3</td> </tr> <tr> <td>Reactivity (Yellow).....</td> <td>0</td> </tr> </tbody> </table> <p><b>12. PHYSICAL AND CHEMICAL PROPERTIES</b></p> <p>12.1 Physical State at 15°C and 1 atm: Liquid 12.2 Molecular Weight: Not pertinent 12.3 Boiling Point at 1 atm: 140-190°F = 60-188°C = 333-472°K 12.4 Freezing Point: Not pertinent 12.5 Critical Temperature: Not pertinent 12.6 Critical Pressure: Not pertinent 12.7 Specific Gravity: 0.721 at 20°C (liquid) 12.8 Liquid Surface Tension: 19-23 dynes/cm = 0.019-0.023 N/m at 20°C 12.9 Liquid Water Interfacial Tension: 49-51 dynes/cm = 0.049-0.051 N/m at 20°C 12.10 Vapor (Gas) Specific Gravity: 3.4 12.11 Ratio of Specific Heats of Vapor (Gas): (see) 1.054 12.12 Latent Heat of Vaporization: 130-150 Btu/lb = 71-81 cal/g = 3.0 - 3.4 X 10<sup>5</sup> J/kg 12.13 Heat of Combustion: -18,720 Btu/lb = -10,400 cal/g = 435.1 X 10<sup>3</sup> J/kg 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.25 Heat of Fusion: Data not available 12.26 Limiting Value: Data not available 12.27 Reid Vapor Pressure: 7.4 psia</p>	Category	Rating	Fire.....	3	Health.....		Vapor Irritant.....	1	Liquid or Solid Irritant.....	1	Poisons.....	2	Water Pollution.....		Human Toxicity.....	1	Aquatic Toxicity.....	2	Aesthetic Effect.....	2	Reactivity.....		Other Chemicals.....	0	Water.....	0	Salt Reaction.....	0	Category	Classification	Health Hazard (Blue).....	1	Flammability (Red).....	3	Reactivity (Yellow).....	0
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12.17 SATURATED LIQUID DENSITY		12.18 LIQUID HEAT CAPACITY		12.19 LIQUID THERMAL CONDUCTIVITY		12.20 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit-inch per hour- square foot-F (estimate)	Temperature (degrees F)	Centipoise
45	46.270	10	.459	40	.909	46	.521
50	46.130	15	.462	50	.900	48	.514
55	46.000	20	.464	60	.891	50	.507
60	45.850	25	.467	70	.883	52	.500
65	45.710	30	.470	80	.874	54	.494
70	45.560	35	.472	90	.865	56	.487
75	45.400	40	.475	100	.856	58	.481
80	45.240	45	.478	110	.847	60	.475
85	45.060	50	.480	120	.838	62	.469
90	44.910	55	.483	130	.829	64	.463
95	44.750	60	.486	140	.821	66	.457
100	44.570	65	.488	150	.812	68	.451
105	44.390	70	.491	160	.803	70	.446
110	44.210	75	.494	170	.794	72	.440
115	44.030	80	.496	180	.785	74	.435
		85	.499	190	.776	76	.430
		90	.502			78	.424
		95	.504			80	.419
		100	.507			82	.414
		105	.510			84	.410
						86	.405
						88	.400
						90	.396
						92	.391
						94	.387
						96	.382

12.21 SOLUBILITY IN WATER		12.22 SATURATED VAPOR PRESSURE		12.23 SATURATED VAPOR DENSITY		12.24 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B L E		D A T A  N O T  A V A I L A B L E		N O T  P E R T I N E N T		D A T A  N O T  A V A I L A B L E