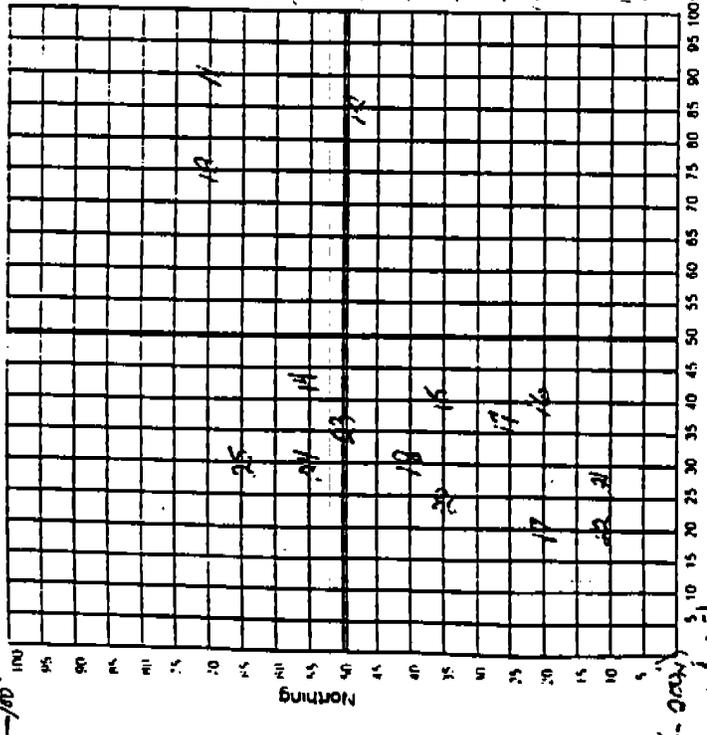


NUMBERED CONTINUED PAGE " 1 OF 12



Quadrant	
3	4
1	2

SECTION: 2-B

GRID: B

REMARKS:

- #11- LARGE PIECE OF FRAG - SIDE OF MASSIVE ROUNDS.
- #12- MANY PIECES OF FRAG. IN THE GRAVEL SURFACE DOWN TO 5"
- #13- 6' x 5' x 1/4" STEEL BAR IN GRAVEL
- #14- 10' x 5' x 1/4" STEEL PLATE AND (2) 18" LENGTHS OF REBAR.
- #15- A LARGE FRAG. PIECE AT 6" DEPTH IN GRAVEL.

REFERENCE PT EACH INCREMENT LINE EQUALS 5 FEET

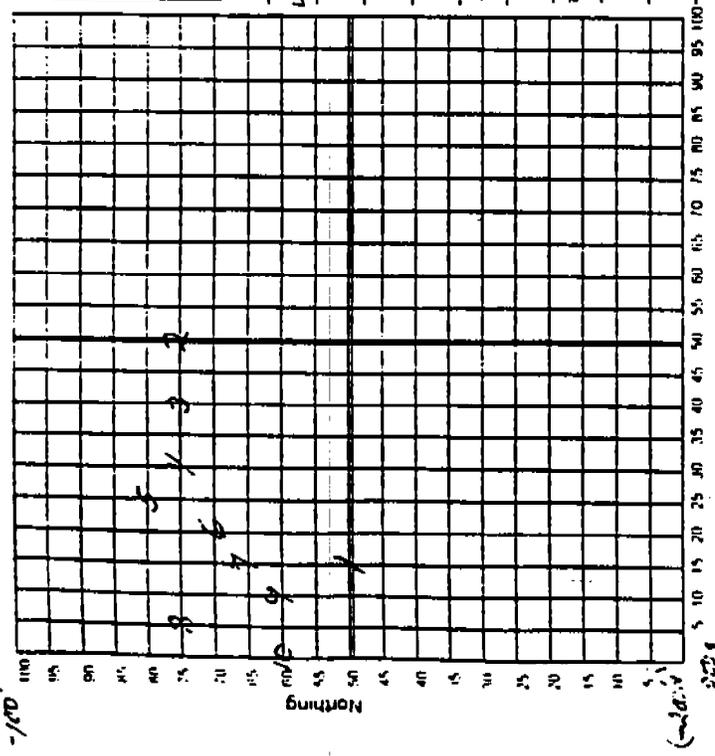
- #16- (2) LARGE PIECES OF FRAG, 8" DOWN IN SOIL & GRAVEL MIX
- #17- 2' LONG REBAR LYING FLAT AT 6" DEPTH.
- #18- 16' x 2" LONG PIECE OF FRAG. AT 6" DEPTH
- #19- 4' x 2' HEAVY GAUGE STEEL PLATE LYING FLAT AT 6" DEPTH. REMOVED AND LOST SIGNAL
- #20- 7' STEEL ROD WITH BAR. REMOVED AND LOST SIGNAL AT 6"
- #21- SINGLE LARGE PIECE OF FRAG. REMOVED AT 6" AND SIGNAL LOST.
- #22- THE TOP 3" SURFACE WAS REMOVED AND THE SIGNAL IS WITH THE MOVED SURFACE. SOIL AND TOP SMALL TO SEPARATE.
- #23- (2) LONG STRANDS OF HEAVY GAUGE WIRE AND SIGNAL LOST IN THE RETURN.
- #24- A LARGE PIECE OF FRAG AT 6" WAS REMOVED & SIGNAL LOST
- #25- MANY PIECES OF LARGE FRAG. REMOVED WITH SIGNALS FROM SURROUNDINGS

Date	Section	Coordinates	QPM	UXO	Condition (Live/Inert)	Depth
7/6	4	190.00 130.00	10	φ	LARGE FRAG.	8"
"	2	185.00 135.00	1	φ	MANY PIECES OF FRAG.	6-8"
"	4	195.00 130.00	15	φ	NAVY BAR	6"
"	3	145.00 145.00	10	φ	STEEL PLATE & REBAR	8"
"	11	165.00 165.00	1/2	φ	LARGE PIECE	6"
"	1	135.00 190.00	2	φ	LARGE FRAG.	8"
"	1	135.00 155.00	2	φ	REBAR	3"
"	1	150.00 160.00	1	φ	10" LONG REBAR	6"
"	1	190.00 190.00	10	φ	PLATE	1"
"	1	125.00 165.00	1/4	φ	STEEL	3"
19 AUG	1	135.00 189.00	2	φ	LARGE PIECE OF FRAG.	4"
"	1	120.00 189.00	N/A	φ	TOP SURF MATERIAL	3"
"	1	135.00 150.00	1/8	φ	3 STRANDS OF WIRE	2-4"
"	3	130.00 145.00	1/2	φ	LARGE FRAG. PIECE	8"
"	3	130.00 135.00	20	φ	MANY PIECES OF FRAG.	12"

TOTAL φ LIVE/UXO

TOTAL φ INERT UXO

(DISTANCE IN FEET)



REFERENCE PT EACH INCREMENT LINE EQUALS 5 FEET

Quadrant	
3	4
1	2

SECTION: 3-B

GRID: B

REMARKS:

#1 - 3' x 8" HEAVY GAUGE STEEL
 PLATE ON SLOPE

#2 - HEAVY METAL BRACING @ 20' 16"

#3 - HEAVY METAL BRACING @ 10' 16"

#4 - 2' METAL BRG ON SLOPE IN BRUSH

#5 - SHEET PIECE OF REBAR AT ABOUT 2" BY FENCE.

#6 - STEEL PLATE IN BRUSH

#7 - HEAVY GAUGE

#8 - LARGE PIECES OF FRAG. @ 10' 16" AND 2' LENGTH OF REBAR IN

IN BASE OF SLOPE

#9 - 10' LENGTH OF STEEL PIPE BY FENCE AT @ 6" NETH ON SLOPE

#10 - LARGE PIECES OF FRAG. IN SLOPE

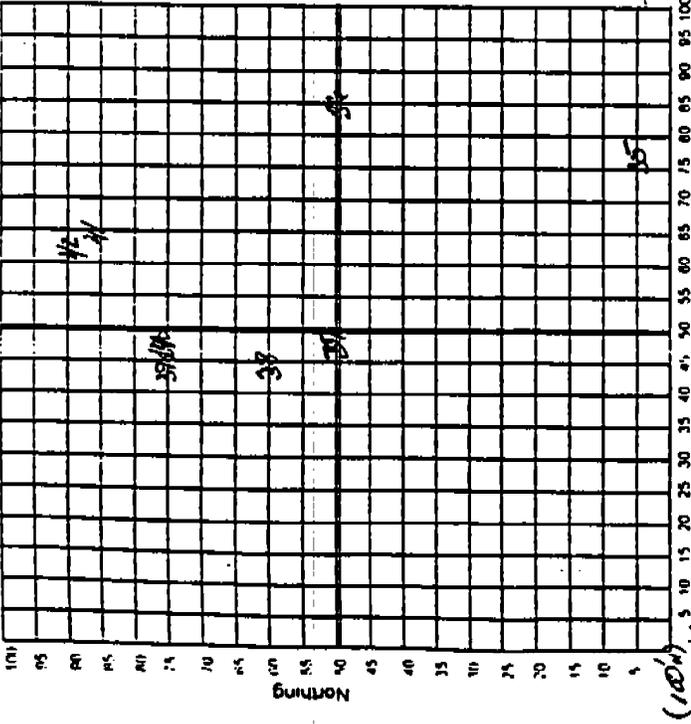
#11 - SOME AS #9

Date	Section	Coordinates	UXO	Condition (Livestock)	Depth
'76	QUAD				
'76	AUG	215.00 150.00	5	STEEL PLATE	12"
"	"	250.00 125.00	15	METAL BRACES	12"
"	"	240.00 135.00	15	METAL GRATES	12"
"	"	260.00 125.00	2	METAL BAR	0"
"	"	255.00 120.00	1	METAL OF REBAR	2"
"	"	260.00 130.00	5	STEEL PLATE	0"
"	"	255.00 135.00	10	LARGE FRAG. PIPE	8'-12"
"	"	205.00 125.00	10	10' STEEL PIPE	6"
"	"	210.00 140.00	1/4	LARGE FRAG.	8"
"	"	200.00 140.00	1	LARGE FRAG.	8"

TOTAL ϕ LIVES UXO

TOTAL ϕ INERT UXO

LINEAR DISTANCES (CENTIMETERS)



Easting
REFERENCE PT EACH INCREMENT LINE EQUALS 5 FEET

3	4
1	2

SECTION: 1/B

GRID: E

REMARKS:

#35-(2) 10' LONG STRANDS OF BARBED WIRE ON SURFACE IN GRASS.

#36-(1) 12" STRAND OF BARBED WIRE RE-MOVED AT 6"

#37-12" STRAND OF BARBED WIRE ON SURFACE

#38-METAL 3" DIA CAN ENDS RE-MOVED AT 1"

#39-40-@1/2" STRANDS OF BARBED WIRE ON SURFACE IN THE GRASS.

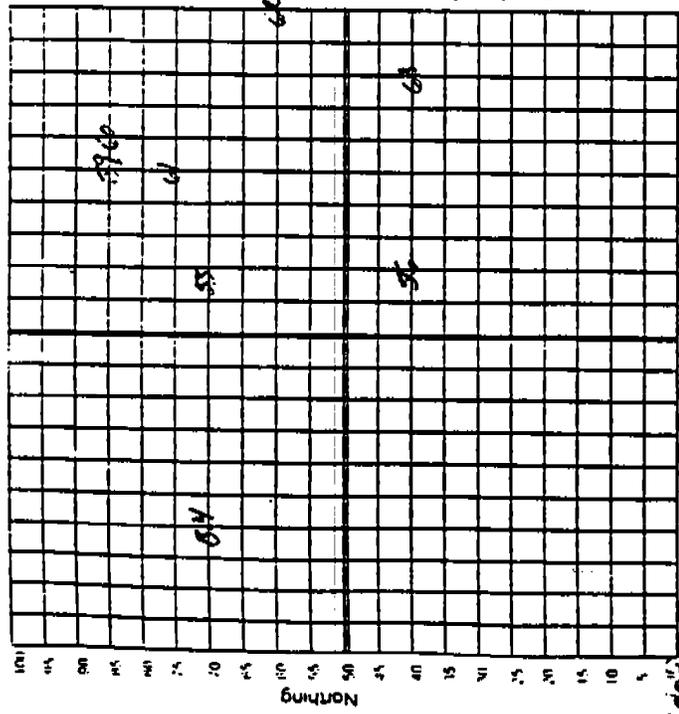
#41-NAIL ON SURFACE

#42-DOOR LOCK HANDLE FACE PLATE REMOVED AT 1"

Date	Section	Coordinates	WT lbs	UXO	Condition (live/inert)	Depth
'96 AUG 2	QUAD 2	77.00 05.00	<1/8	Φ	GRASS WIRE	0"
"	2	85.00 150.00	<1/8	Φ	BARBED WIRE	6"
"	1	47.00 150.00	<1/8	Φ	BARBED WIRE	0"
"	3	45.00 160.00	<1/8	Φ	CAN ENDS	1"
4	3	45.00 175.00	<1/8	Φ	BARBED WIRE	0"
"	3	48.00 175.00	<1/8	Φ	BARBED WIRE	0"
"	4	65.00 185.00	<1/8	Φ	NAIL	0"
"	4	64.00 188.00	<1/8	Φ	DOOR LOCK HANDLE FACE PLATE	1"

TOTAL ϕ LIVE UXO
TOTAL ϕ INERT UXO

(100 ft. divisions with 100 ft. grid)



Date	Section	Coordinates N E S W	Qty	UXO	Condition (Live/Inert)	Depth
1960 20 AUG	3	120.00 70.00	1/4	φ	1" ROHS	4"
"	4	158.00 70.00	1/8	φ	COAT HANGER	0"
"	2	160 30.00	1/8	φ	SAPPHIRE GLASS	1"
22 AUG	4	170.00 80.00	1/8	φ	VEH CHROME TRIM	4"
22 AUG	4	175.00 80.00	1/4	φ	HEAVY GAUGE WIRE	4"
22 AUG	4	175.00 70.00	1/4	φ	VEH CHROME TRIM/WIRE	4"
22 AUG	4	300.00 60.00	1/2	φ	ALUMINUM SHIF FRAMES	1"
22 AUG	2	170.00 40.00	1/4	φ	PIPE	1"

#57-1/8" STEEL ROD LAYING FLAT AT
AT @ 4"

#55-COAT HANGER ON SURFACE OF
N/S DIET ROAD IN GRASS.

#56-8" PIECE OF BARBED WIRE AT
@ 1" IN N/S DIET ROAD

#54-18" PIECE OF VEH. CHROME
TRIM. REMOVED AT @ 4"

#60-18" PIECES OF HEAVY GAUGE
WIRE LAYING FLAT AT @ 4" DEPTH

#61-5" PIECE OF CHROME VEH.

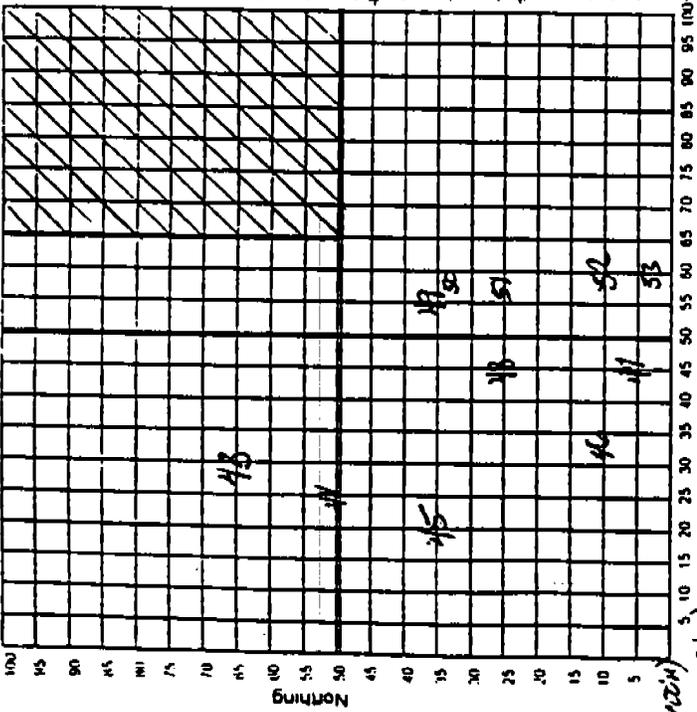
TRIM & 2' PIECE OF HEAVY GAUGE WIRE.
#62-2) 3 SECTIONS OF BALT TO HANG SHELVES.
#63-6" LENGTH OF 1/2" PIPE 170LWA AT 1"

(00 ft) 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100
Northing

Easting
REFERENCE PT. EACH INCREMENT LINE EQUALS 5 FEET

TOTAL φ φ
LIVE UXO
INERT UXO

(NON-LISTED CONTACTS)



3	4
1	2

SECTION: 2B

GRID: E

REMARKS:

#43 - 10" METAL TUBE REMOVED AT

#44 - SMALL 2" WIRE STRANDS MIXED WITH TO SURFACE.

#45 - BARBED WIRE IN TO 1" LAYER

#46 - VEH. BATTERY TOP FRAME IN GRASS

#47 - AIR FILTER FOR DIESEL

#48 - 15" STEEL PIPE LAYING FOR AT @ 4"

#49 - 12" PIPE OF CHROME VEH. TRIM

#50 - 8" HOOKED STEEL BAR REMOVED AT @ 1" (AREA IS DIET ROAD)

#51 - 6" PIECES OF BARBED WIRE REMOVED AT @ 1" FROM N/6 DIET ROAD.

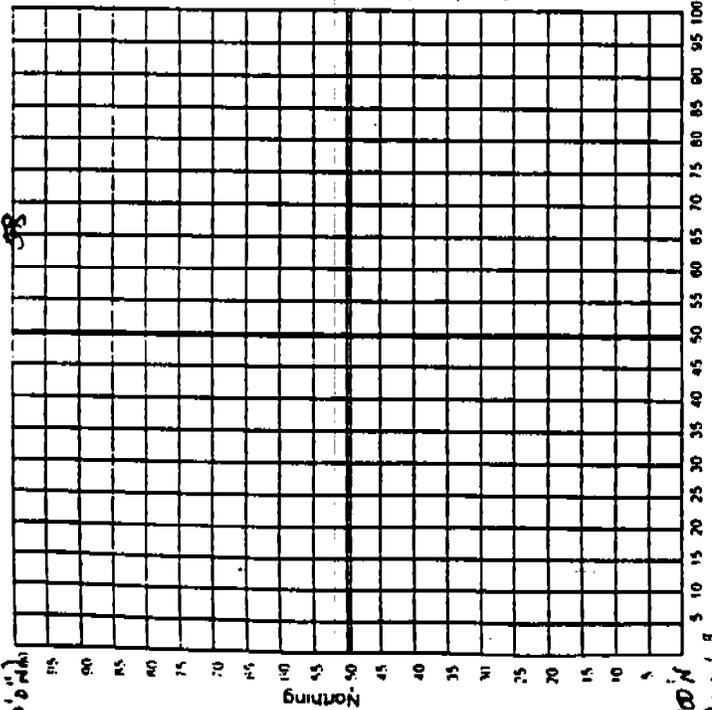
#52 - 3' LENGTH OF CHROME VEH. TRIM REMOVED AT @ 4" (DIRT ROAD)

#53 - (2) PIECES OF 5" WIRE REMOVED AT @ 4" FROM N/6 DIET ROAD

ITEM #	Date	Sheet	Coordinates	SP#	UXO	Condition (Live/Inert)	Depth
43	1962 AUG 20	3	135.00 135.00	1/4	Φ	METAL TUBE @ 10"	1"
44	1962 AUG 20	3	135.00 150.00	1/8	Φ	WIRE STRANDS	0"
45	1962 AUG 20	1	135.00 135.00	1/8	Φ	BARBED WIRE	1"
46	1962 AUG 20	1	135.00 135.00	1/4	Φ	VEH. BATT FRAME	0"
47	1962 AUG 20	1	135.00 135.00	2	Φ	DIESEL AIR FILTER	1"
48	1962 AUG 20	1	135.00 135.00	1	Φ	15" STEEL PIPE	1"
49	1962 AUG 20	2	135.00 135.00	1/8	Φ	CHROME VEH TRIM	1"
50	1962 AUG 20	2	135.00 135.00	1	Φ	8" STEEL BAR	1"
51	1962 AUG 20	2	135.00 135.00	1/8	Φ	BARBED WIRE	1"
52	1962 AUG 20	2	135.00 135.00	1/8	Φ	3" PIECE OF VEH. TRIM	4"
53	1962 AUG 20	2	135.00 135.00	1/8	Φ	WIRE	4"

TOTAL ϕ LIVE UXO
 TOTAL ϕ INERT UXO

- THIS AREA IS A CONCENTRATION OF CONCRETE, REBAR & BARB WIRE. THE AREA APPEARS TO BE AN OLD FOUNDATION THAT HAS BROKEN-UP.



100 N
 95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5

0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100

Easting

REFERENCE PT EACH INCREMENT LINE EQUALS 5 FEET

Quadrant SECTION: | A

GRID: 0

REMARKS:

#58 - 1/2 FLOW BLADE REMOVED
 FROM 8" DEPTH

PLM #

58

Date 1964

21 AUG

Section QUAD

4

Coordinates

X = 12
 Y = N
 65.00
 0.00

UXO

3

Condition (Live/Inert)

FLOW BLADE

Depth

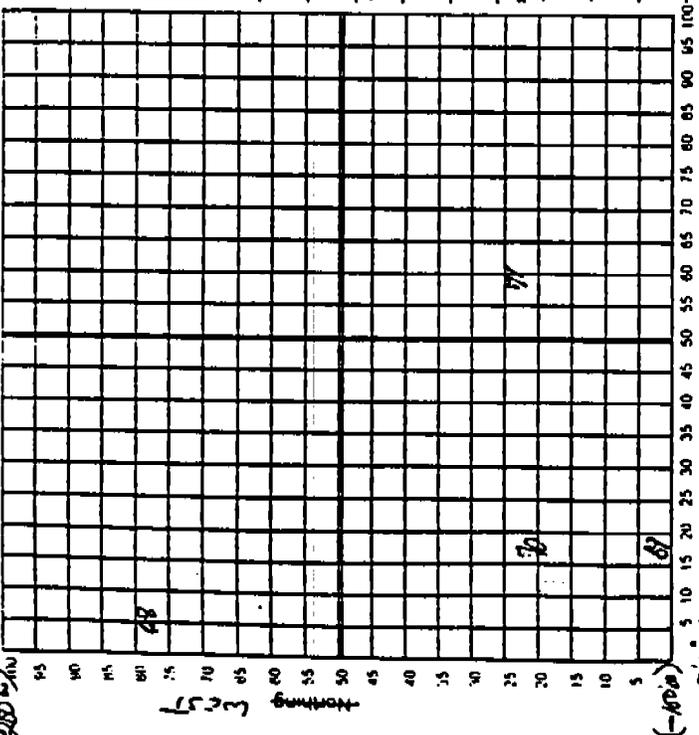
8"

TOTAL ϕ LIVE UXO

TOTAL ϕ INERT UXO

(NON-LIST CONTACTS)

(NORTH →)

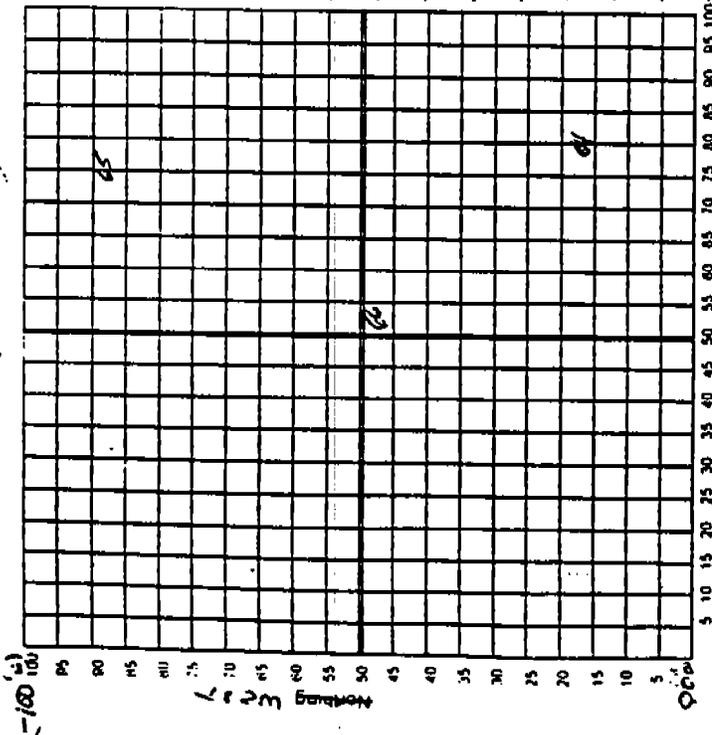


RM #	Date	Section	Coordinates	UXO	Condition (Live/Inert)	Depth
128	27 AUG	3	-175200 -102200	1/2	FRAGS 105 75mm BARR WIRE	1"
129	29 AUG	1	-175200 -102200	1/2	FRAG	2"
130	29 AUG	2	-175200 -102200	1/2	BARR WIRE	2"

TOTAL ϕ LIVE UXO
 TOTAL ϕ INERT UXO

(NON-LIST CONTRACTS)

(NORTH →)



— Easting, NORTHING
REFERENCE PT. EACH INCREMENT LINE EQUALS 5 FEET

Quadrant		SECTION: 2A	ITM #
3	4	GRID: P	64
1	2	REMARKS:	65
			66

#64 - FRAG OF 37mm H2. (AA) PRO.
BADLY FROM DEMOLITION

#65 - POSSIBLE 75mm FRAG OF
A CANNISTER ROUND.

#66 - FRAG. OF POSS 105mm H.E.
FROM ROSS, DEMOLITION

Date	Section	Coordinates	QTY	UXO	Condition (Livelihood)	Depth
29 AUG '96	2	-16.000 150.000	1/4	φ	FRAG.	1"
29 AUG '96	4	-158.000 175.000	1/2	φ	FRAG.	0"
29 AUG '96	2	-149.000 149.000	1/2	φ	FRAG.	1"
		-150.000 149.000				

TOTAL φ LIVES 0
TOTAL φ INERT 0

APPENDIX E

**ESTIMATING ORDNANCE PENETRATION
INTO EARTH**

Estimating Ordnance Penetration into Earth

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Category: Case Studies

ABSTRACT

USAESCH is currently engaged in projects which require detection and removal of buried ordnance. It is desirable to have an estimate of the expected depth of the ordnance.

Several methods for estimating the penetration of ordnance into earth have been investigated. Each method has distinct advantages and disadvantages. Methods are compared for required detail of input information, time required for calculation and resulting depths.

Comparison of these methods shows that one method is preferable. This method, based on an equation from TM 5-855-1 dated November 1986 [1], is outlined and an example is discussed.

A database of recovery depths from at least 13 project sites has been compiled. Actual recovery depths are compared to estimated penetration depths.

INTRODUCTION

The USAESCH is currently engaged in projects which require detection and removal of buried ordnance. It is desirable to have an estimate of the expected depth of the ordnance. This expected depth is required as part of the site specific analysis required by paragraph C.4.c. of Chapter 12 of DoD 6055.9-STD, "DoD Ammunition and Explosives Safety Standards" [2].

Several methods for estimating the penetration of ordnance into earth have been investigated. Each method has distinct advantages and disadvantages. Methods are compared for required detail of input information, time required for calculation and resulting depths.

First, an equation developed by the U.S. Army Engineering Waterways Experiment Station (WES) for determining fragment penetration into earth is evaluated. In this analysis, the fragment is assumed to be a complete ordnance item. The munition information that is required to use the WES equation is the weight of the ordnance item and the striking velocity of the ordnance item. Since the striking velocity depends on many variables (charge used, firing angle, and distance traveled), a maximum velocity is assumed. Conservatively, the velocity will not exceed the muzzle velocity with the maximum charge.

As a check of the WES equation, the penetration of several munitions into sand have been determined using a hydrocode analysis. The results using the HULL hydrocode [3] have been compared to the results using the WES equation.

PENCRV3D [4], computer software developed at WES, was evaluated as a means of predicting ordnance ground penetration depths. This evaluation is discussed in depth in "Evaluation of PENCRV3D for Determination of Ordnance Ground Penetration" by Douglas Grant and Michelle Crull [5]. The results of this analysis are compared to the results of the WES equation and the hydrocode analysis.

Finally, results from a database of actual recovery depths are compared to the results of the previous computations. A complete discussion of this database is given in "Ordnance and Explosives Recovery Depth" by Jason Adams [6].

PENETRATION ANALYSIS

U.S. ARMY ENGINEERING WATERWAYS EXPERIMENT STATION (WES) EQUATION

An equation developed by WES provided fragment penetration prediction for soils ranging from clay to dry sand. This equation is provided in TM 5-855-1 dated November 1986 [1]. For the purpose of ordnance penetration analysis, the fragment is assumed to be the ordnance item. The striking velocity of the ordnance item is dependent on the propellant charge used in firing the item, the firing angle and the distance traveled. Since these factors are generally unknown on an ordnance and explosives (OE) site, a conservative value of the muzzle velocity at the maximum charge is used. The ordnance is assumed to strike normal to the ground surface.

The equation is given as:

$$t_p = 1.975W_f^{(1/3)}k_p \log\left(1 + 4.65\left(\frac{V_s}{10^3}\right)^2\right)$$

where t_p = penetration depth (in)
 W_f = fragment weight (oz)
 k_p = constant depending on soil type (see Table 1)
 V_s = striking velocity (feet per second)

Table 1: Soil Penetration Constants

Soil Type	$k_p(\text{in}/\text{oz}^{1/3})$
Limestone	0.775
Sandy Soil	5.29
Soil Containing Vegetation	6.95
Clay Soil	10.6

Several ordnance items that have been found on various OE sites have been used to evaluate the WES equation. These items with their weight and muzzle velocity are listed in Table 2.

Table 2: Ordnance Weight and Velocity

Ordnance Item	Weight (lb)	Muzzle Velocity (ft/sec)
---------------	-------------	--------------------------

155 mm M107	96.75	2244
105 mm M1	33.95	1550 (charge 7)
75 mm M48	14.6	1250
40 mm M822	5.5	1100
37 mm M63	1.61	2650
2.36" Rocket	3.4	265

The resulting depths of penetration using the WES equation are shown in Table 3.

Table 3: Depths of Penetration of Ordnance into Soil

Ordnance Item	Depth of Penetration (ft)			
	Limestone	Sand	Soil Containing Vegetation	Clay
155 mm M107	2.0	14.0	18.4	28.0
105 mm M1	1.1	7.7	10.1	15.4
75 mm M48	0.7	4.9	6.5	9.9
40 mm M822	0.5	3.2	4.2	6.4
37 mm M63	0.6	3.9	5.2	7.9
2.36" Rocket	0.1	0.4	0.5	0.8

HYDROCODE ANALYSIS

The HULL hydrocode [3] was originally designed and coded by R.E. Durrett and D.A. Matuska in 1972 at the Air Force Weapons Laboratory (AFWL) for simulation of nuclear weapons effects. The OTI*HULL code is currently being maintained by Dan Matuska, John Osborne and Ned Piburn of Orlando Technology, Inc. of Shalimar, Florida. HULL is a system of programs that solves two and three dimensional, multi-material, multi-phase dynamic continuum mechanics problems in Eulerian and/or Lagrangian frameworks. In the HULL hydrocode, continuum mechanics equations describe the behavior of continuous media by applying the principles of conservation of mass, momentum and energy from a macroscopic point of view. An equation of state is employed to relate pressure, density and internal energy. In addition, a constitutive equation describes the relationship between stress and strain, work hardening and thermal softening. The conservation equations, being non-linear, coupled, partial differential equations with no closed form solution, must be solved numerically.

The first stage in the numerical solution is to discretize the region of solution. This is done by creating a mesh of points in the solution region and expressing the spatial and temporal derivatives in the governing equations as finite difference algorithms. By doing this, the set of governing partial differential equations becomes a set of algebraic equations that are solved for each value of time throughout the computational mesh. Results from this analysis can be plotted as material "moves" through the mesh as a function of time.

Hydrocode calculations can provide a good deal of insight and detailed information about the physical processes which are occurring during high-speed impacts. The ability to trace the time history of various points of interest and to plot snapshots of the impact at various time intervals

allows one to perform the most highly "instrumented" test possible at a fraction of the cost of conventional testing.

The depth of penetration into sand of the six ordnance items listed in Table 2 was calculated using the HULL hydrocode. In order to perform the hydrocode analysis, the geometry, weight and striking velocity of the ordnance item must be defined. Also the equations of state of the ordnance case and the soil must be defined. As a conservative estimate, the ordnance was assumed to strike normal to the ground surface. The variation in velocity with time and the depth of penetration with time for the 155 mm, the 105 mm, the 75 mm, the 40 mm, and the 37 mm are shown in Figures 1 through 5, respectively. The results from the hydrocode analysis are listed in Table 4.

Table 4: Penetration Depths in Sand Using Hydrocode Analysis

Ordnance Item	Depth using Hydrocode Analysis (ft)
155 mm M107	16.8
105 mm M1	9.4
75 mm M48	5.7
40 mm M822	2.9
37 mm M63	4.1
2.36" Rocket	0.46

PENCRV3D ANALYSIS

PENCRV3D [4] is a computer program developed for predicting projectile penetration into curvilinear geologic/structural targets. The program was developed under the hardened structures research program at WES. PENCRV3D predicts the trajectory and other response characteristics such as the yaw, pitch, and roll angles and their respective rates of change in three dimensional (3D) space as a function of time. The program uses a differential area force law (DAFL) formulation to solve the six equations used in describing the 3D motion. Using this method, the projectile is divided into a finite number of differential rectangular elements. The resulting stress on each element is calculated and applied at the center of the area of the element at a series of discrete time steps. Element discretization is user-definable through the input deck as is the target definition. PENCRV3D also allows the definition of multiple target layers in the model definition. Particularly attractive is the fact that the model has been validated using actual test data.

Use of PENCRV3D requires the definition of the ordnance geometry (shape, length, thicknesses, diameters, etc.), the striking angle, and the striking velocity as well as the soil parameters. A study has been completed to determine the sensitivity of the PENCRV3D model to variations in the ordnance center of gravity, striking angle, striking velocity and target soil type. The 155 mm M107 projectile was used for this study.

For comparison with the other methods discussed, the geometric model of 155 mm M107 projectile that is included in the PENCRV3D user's manual was used. This model has the center of gravity located at 18.299 inches from the nose tip. A striking angle of 30 degrees from

horizontal and a striking velocity of 705 feet per second were used. PENCVR3D has a database of soil definitions varying numerically from 2 for well-cemented sand to 50 for wet clay. A soil index number of 5 was used for medium dense, medium or coarse sand. The maximum depth of penetration calculated using PENCVR3D for this model is 3 feet.

ORDNANCE AND EXPLOSIVES RECOVERY DEPTH DATABASE

USAESCH has developed a database of recovered OE items from Formerly Used Defense Sites (FUDS) and Base Realignment and Closure (BRAC) projects. Information on the identification of the item, the actual map coordinates at which it was found, and the actual depth to the top of the item is collected for each OE item recovered. All information collected has been compiled into a database. Four of the categories that can be used to sort information are OE category (projectile, rocket, bomb, etc.), OE item identification, recovery depth in inches, and status of OE item (fired or buried).

The ordnance and explosives recovery depth database contains the information from more than 13 project sites. Information from all recovered OE items is entered into the database. This information includes whether the item was fired or buried, a description of the item, the recovery depth and the soil type. Soil type was added to the list of information required after the database was started so this information is not available for all items. Only fired items are considered for the purposes of this discussion. For the munitions considered the information in Table 5 is available.

When looking at the recovery depth information in Table 5, it should be noted that these are the depths at which the items were recovered. This is not necessarily the penetration depth. These depths may have been influenced by several factors including cut or fill of the soil in the area, frost heave, or tilling for agricultural purposes.

Table 5: Ordnance and Explosives Recovery Depth Database Information

Ordnance Item	Number of Items in Database	Soil Type	Range of Recovery Depths (ft)
155 mm M116 Smoke	23	Sand	0.3 - 3.0
155 mm M107 HE	1	Sand	2.0
105 mm M1 HE	2	Not Available	0 - 0.5
105 mm M84 Smoke	17	Sand	0.5 - 3.2
105 mm M314 Illum	5	Sand	1.1 - 3.0
75 mm AP-T	2	Loam	0.3 - 0.7
75 mm AP-T	4	Silty Sand & Clay	0.5 - 4.0

75 mm French Mk IV	5	Sand	0
75 mm M48	2	Loam	0 - 0.7
75 mm M48	5	Not Available	0.1 - 1.0
75 mm M48	3	Sand	0 - 1.2
75 mm M309A1	7	Sand	0.5 - 2.0
75 mm Practice	5	Not Available	0.3 - 1.0
75 mm Shrapnel Mk I	58	Sand	0 - 2.5
2.36" Rocket	18	Alluvium, Sand, Clay & Silt	0 - 0.5
2.36" Rocket	2173	Silty Sand & Clay	0 - 1.5
2.36" Rocket	75	Sand	0 - 4.0

COMPARISON OF DEPTHS

Since the hydrocode analysis is based on first principles of physics, these depths will be used as the baseline to which the other analytical depths will be compared. Table 6 shows the comparison between the depths of penetration into sand calculated using the hydrocode analysis and the WES equation. In both of these analyses, it was assumed that the 155 mm M107 projectile strikes normal to the ground surface at a velocity of 2244 feet per second. The calculated depths are greater than the recovery depths except for the 2.36" rocket.

Table 6: Penetration Depths in Sand Using Hydrocode Analysis and WES Equation

Ordnance Item	Depth using Hydrocode Analysis (ft)	Depth using WES Equation (ft)	Percent Difference Between Calculated Results
155 mm M107	16.8	14.0	16.7
105 mm M1	9.4	7.7	18.1
75 mm M48	5.7	4.9	14.0
40 mm	2.9	3.2	10.3
37 mm M63	4.1	3.9	4.9
2.36" Rocket	0.46	0.4	13.0

A PENCRV3D analysis assuming that the ordnance item strikes at an angle of 30 degrees from the ground surface at a velocity of 705 feet per second returns a maximum depth of penetration into sand of 3 feet. A hydrocode analysis of this case yields a penetration depth of 1.5 feet (see Figures 6 and 7). Examination of the recovery depths of 155 mm projectiles (see Table 6) shows that the recovered 155 mm projectiles were located at depths varying between 0.3 feet and 3.0 feet. Keeping in mind that the recovery depth may not correspond to the depth of penetration, it is not possible at this time to assess which analysis, PENCRV3D or hydrocode, yields the correct solution.

COMPARISON OF REQUIRED INPUT DATA

The WES equation requires three items of input data: ordnance weight, ordnance striking velocity, and soil penetrability constant. If there is any information available on the ordnance

item, the weight is included in this information. In this analysis, the striking velocity is assumed to be the muzzle velocity. This information is sometimes more difficult to obtain than the weight but it is usually available. The soil penetrability constants are listed in Table 1.

The hydrocode analysis requires more information than the WES equation. The geometry of the ordnance item is required. This includes the shape, the length, and the diameter. Ideally, a detailed production drawing of the item should be used. Such drawings can be difficult to obtain. Equations of state are needed for both the ordnance material and the soil. There are equations of state available for most common materials and soil from hydrocode experts if the appropriate ones are not included with the software utilized. The striking velocity and angle must be defined. In absence of any other information about this data, muzzle velocity and an angle normal to the surface will produce the most conservative (deepest) penetration depths.

The input required for the PENCVR3D analysis is similar to that required by the hydrocode analysis. A detailed production drawing of the item is essential in order to calculate the center of gravity of the ordnance item. Angle of entry and striking velocity must be defined. Again, muzzle velocity and an angle normal to the surface may be used to produce conservative results. A soil penetrability index must be defined. There is a table of typical values of this index included in the PENCVR3D users' manual.

Of these three analysis methods, the WES equation requires the least input data. This input data is also the most readily available data. The hydrocode analysis and the PENCVR3D analysis require comparable input data. Frequently, especially for the older ordnance items no longer in service, the data required by the hydrocode analysis and the PENCVR3D analysis are not available.

COMPARISON OF TIME AND EXPERTISE REQUIRED FOR ANALYSIS

The WES equation takes minimal time and expertise to use. The time required is directly related to the availability of data. Also, the only expertise required is that needed to obtain the data.

The hydrocode analysis requires a substantial amount of time and expertise. In addition to the time and expertise required to obtain the larger amounts of data, it takes both time and expertise to set up the hydrocode model. Computation time depends on several factors including hydrocode program used, size of model, computing efficiency of the computer used, and type of analysis (2D or 3D). Also to be considered is the cost of the software and the necessary computer if they are not already available.

The PENCVR3D analysis requires a larger amount of time and more expertise than the WES equation but less than the hydrocode analysis. The search for data requires the same amount of time and expertise as that required by the hydrocode analysis. Also, it is necessary to compute the center of gravity of the item from the production drawing if it is not available as a data item on the ordnance. This software is available to U.S. Government agencies and their contractors and NATO Government agencies from WES. It can be run on a personal computer under Windows 95 or Windows NT.

CONCLUSIONS

Several methods for calculating ordnance penetration into the ground have been discussed. On OE sites there are several unknowns that will affect the ordnance penetration: relative location of firing point and striking point (distance and elevation), topography between firing point and striking point at time of firing, propellant charge used, and soil condition (wet or dry). Also, since OE sites often have older munitions that are no longer in service, it can be difficult to obtain information about the munition (geometry, location of center of gravity, etc.).

The goal in calculating a penetration depth is to determine the maximum depth at which the ordnance item might expect to be recovered. The WES equation yields a conservative penetration depth and requires the least amount of data, time and expertise. Therefore, this calculation method should be used first.

If a more detailed analysis is desired then PENCVR3D or a hydrocode analysis may be used. However, it should be noted that there is not much to be gained by using one of these analysis method unless a trajectory analysis is performed to determine striking velocity and angle.

As more data is entered into the database minimum, maximum and average recovery depths can be found. However, this database doesn't tell what has happened to the munition between time of firing and time of recovery. For example, has soil been added or removed above the item and how much has frost heave affected the item? This database provides good historical data and may be used in the future to predict a range of depths at which an item might expect to be recovered.

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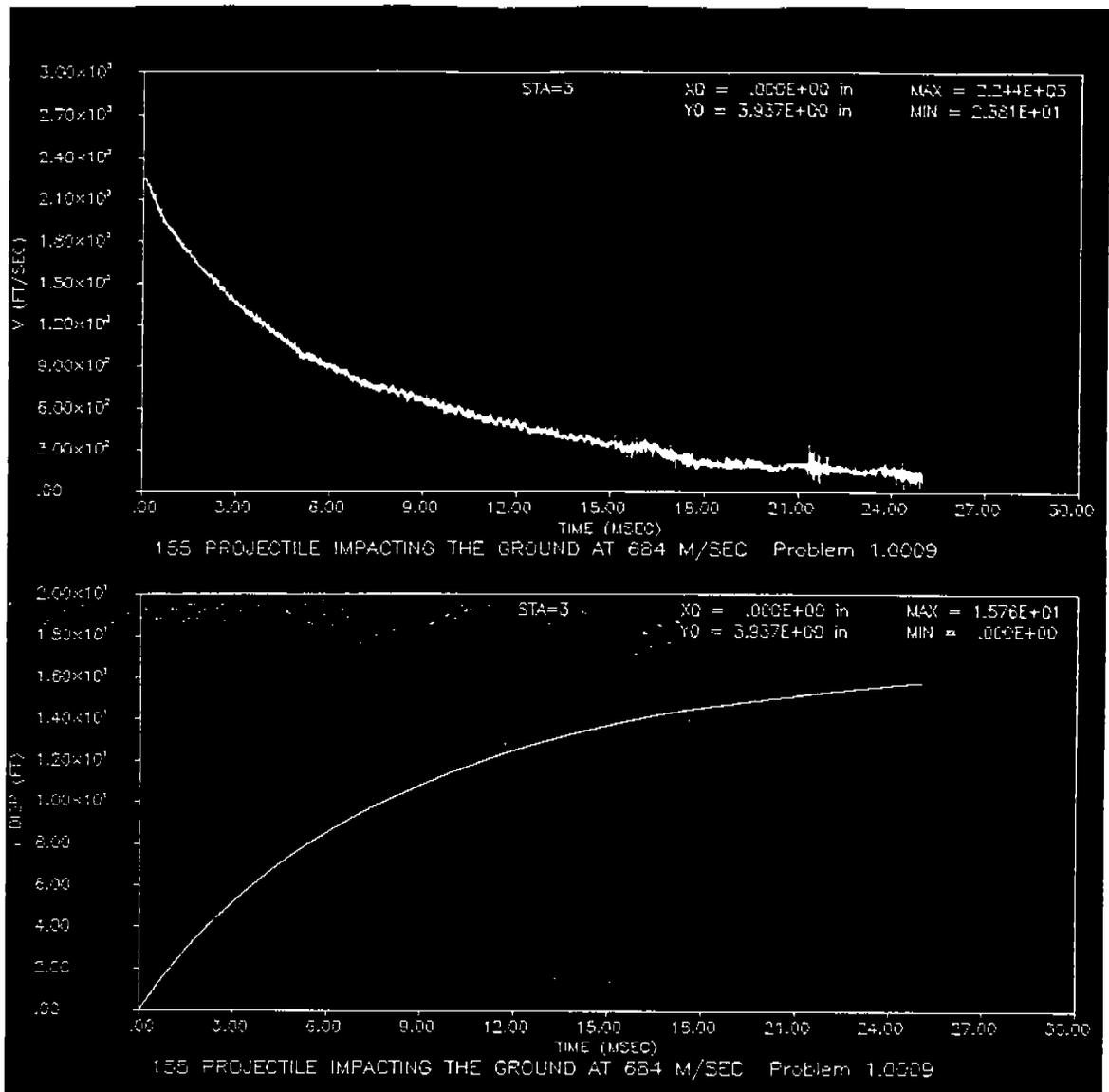


Figure 1. Variation of Velocity and Depth with Time for 155 mm M107 Impacting Sand

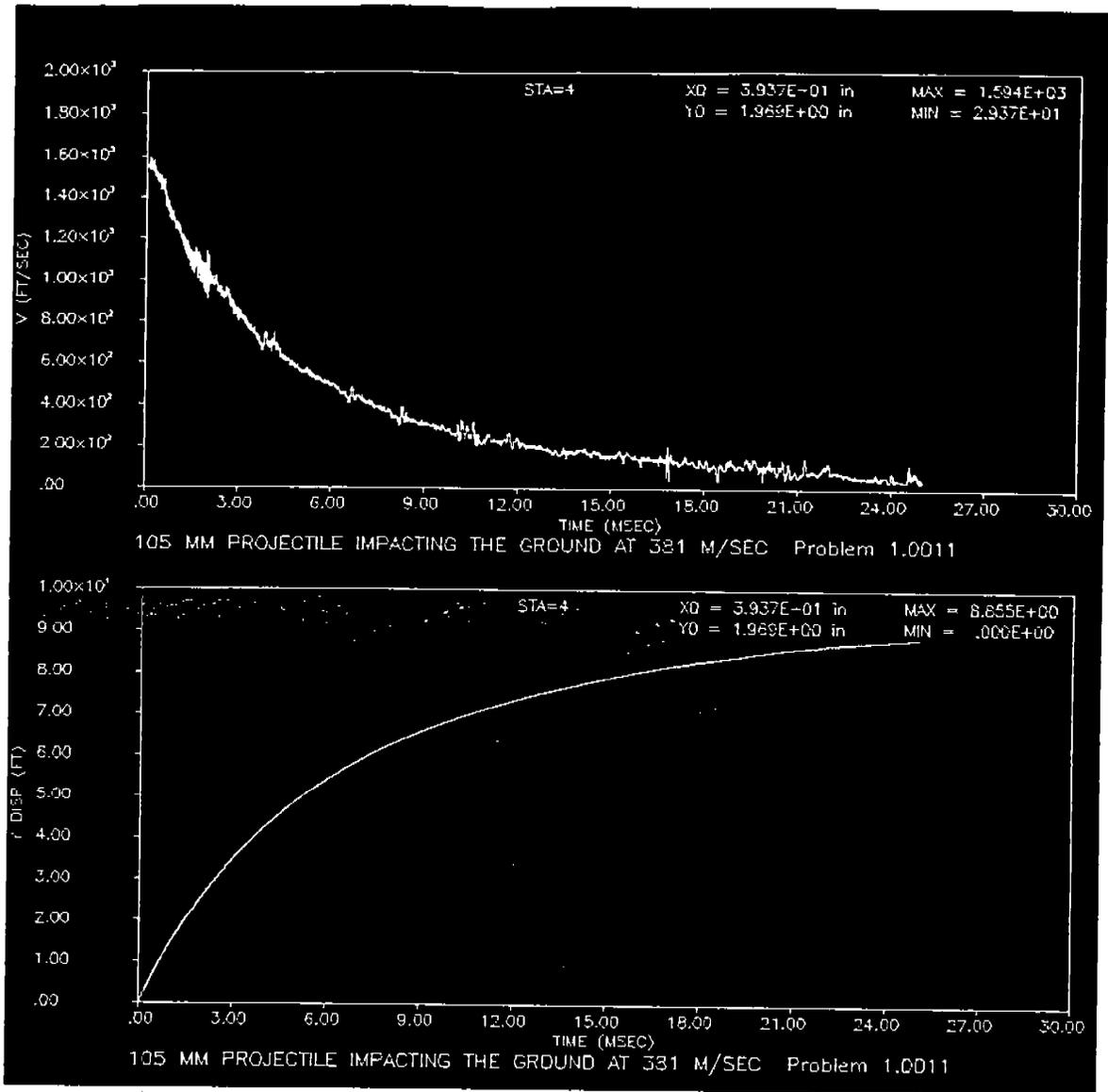


Figure 2. Variation of Velocity and Depth with Time for 105 mm M1 Impacting Sand

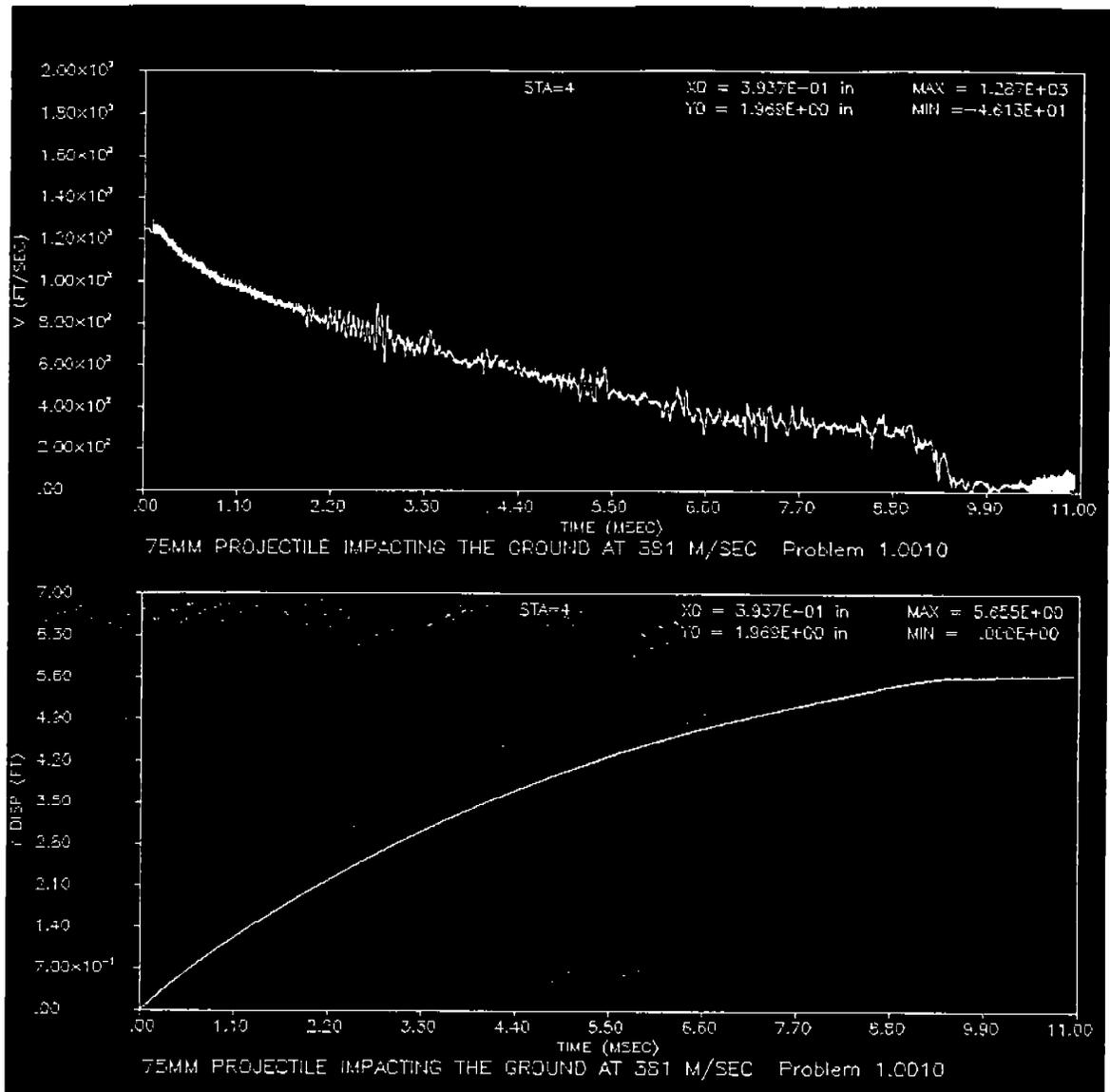


Figure 3. Variation of Velocity and Depth with Time for 75 mm M48 Impacting Sand

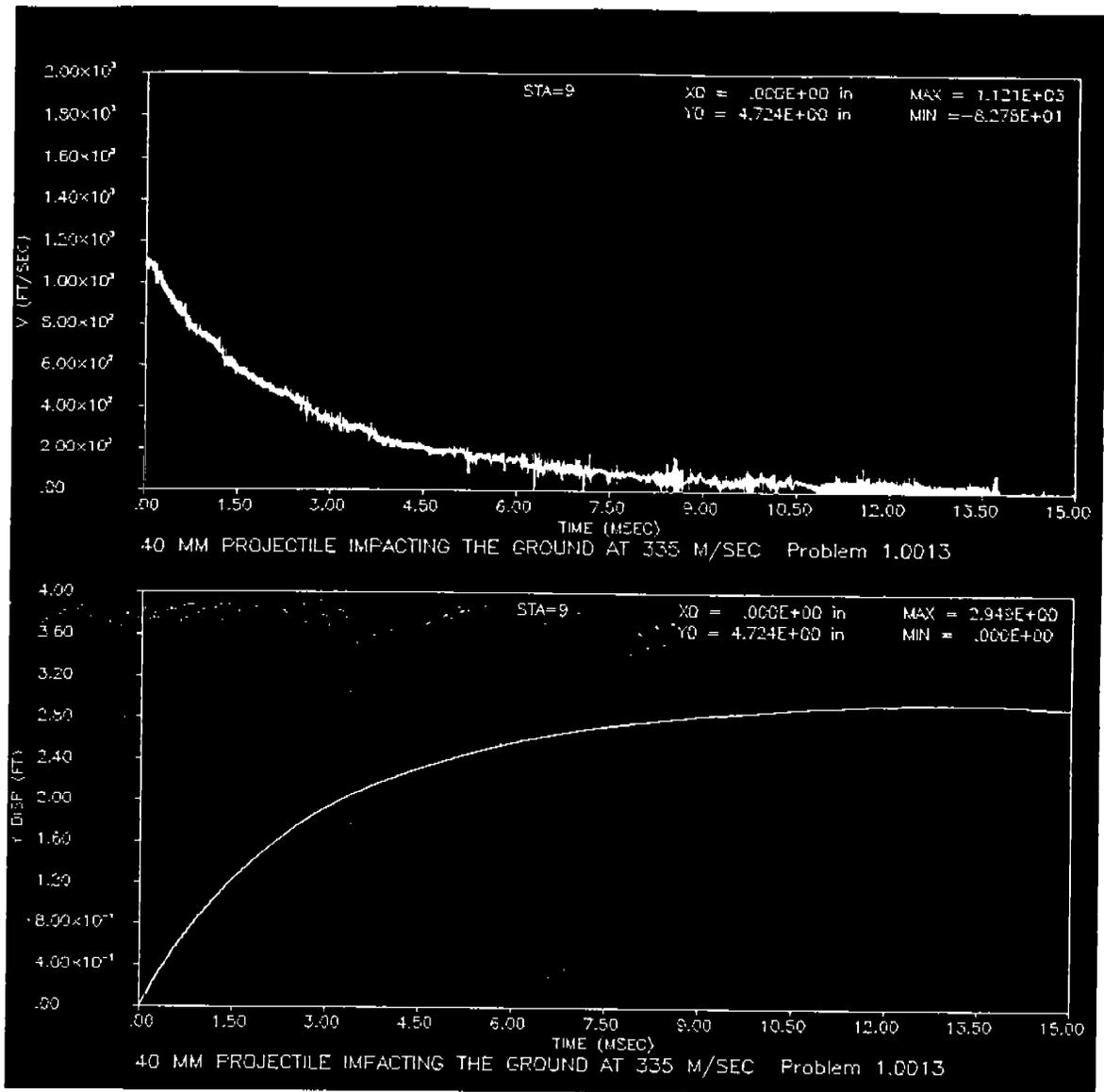


Figure 4. Variation of Velocity and Depth with Time for 40 mm M822 Impacting Sand

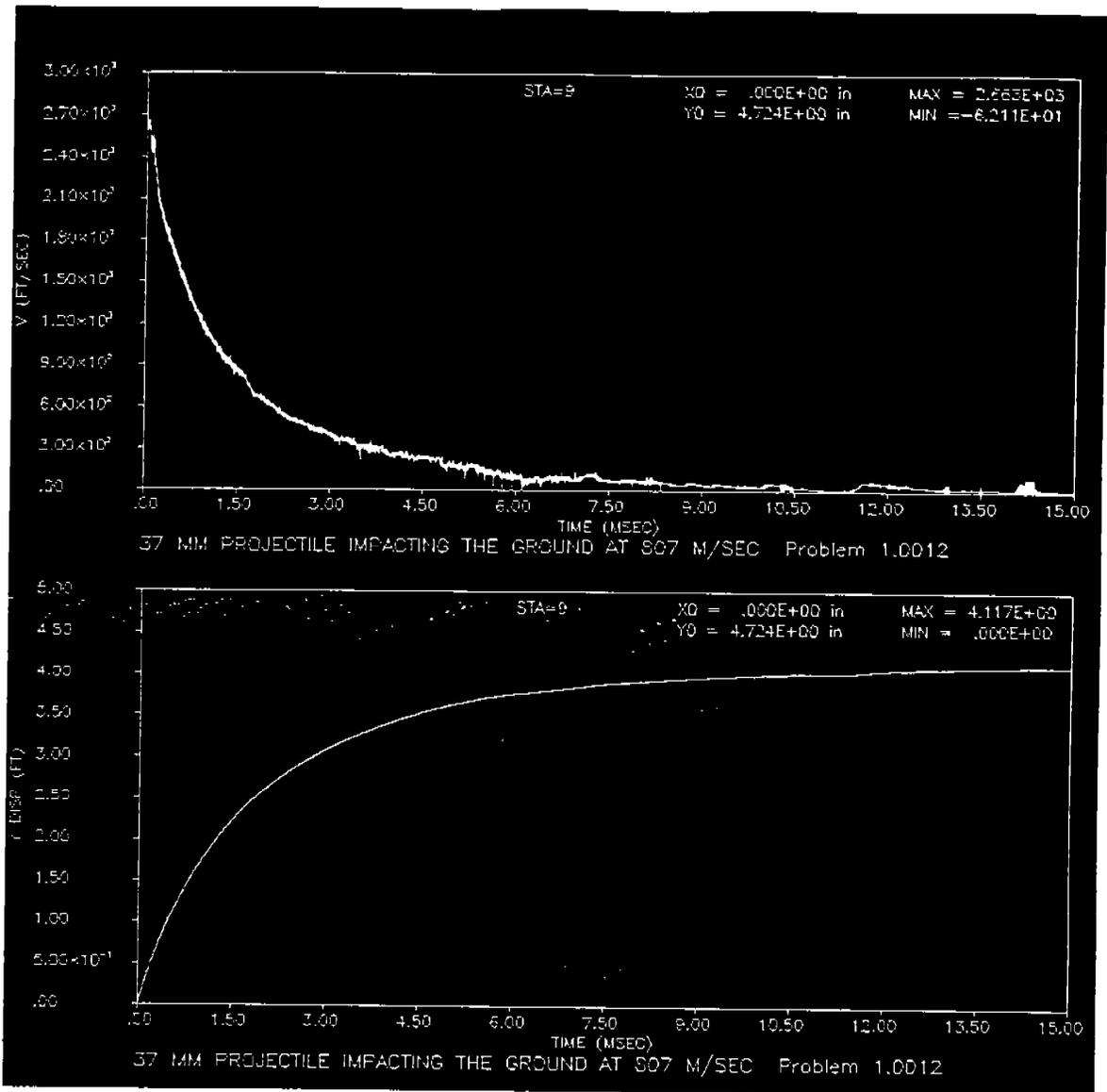


Figure 5. Variation of Velocity and Depth with Time for 37 mm M63 Impacting Sand

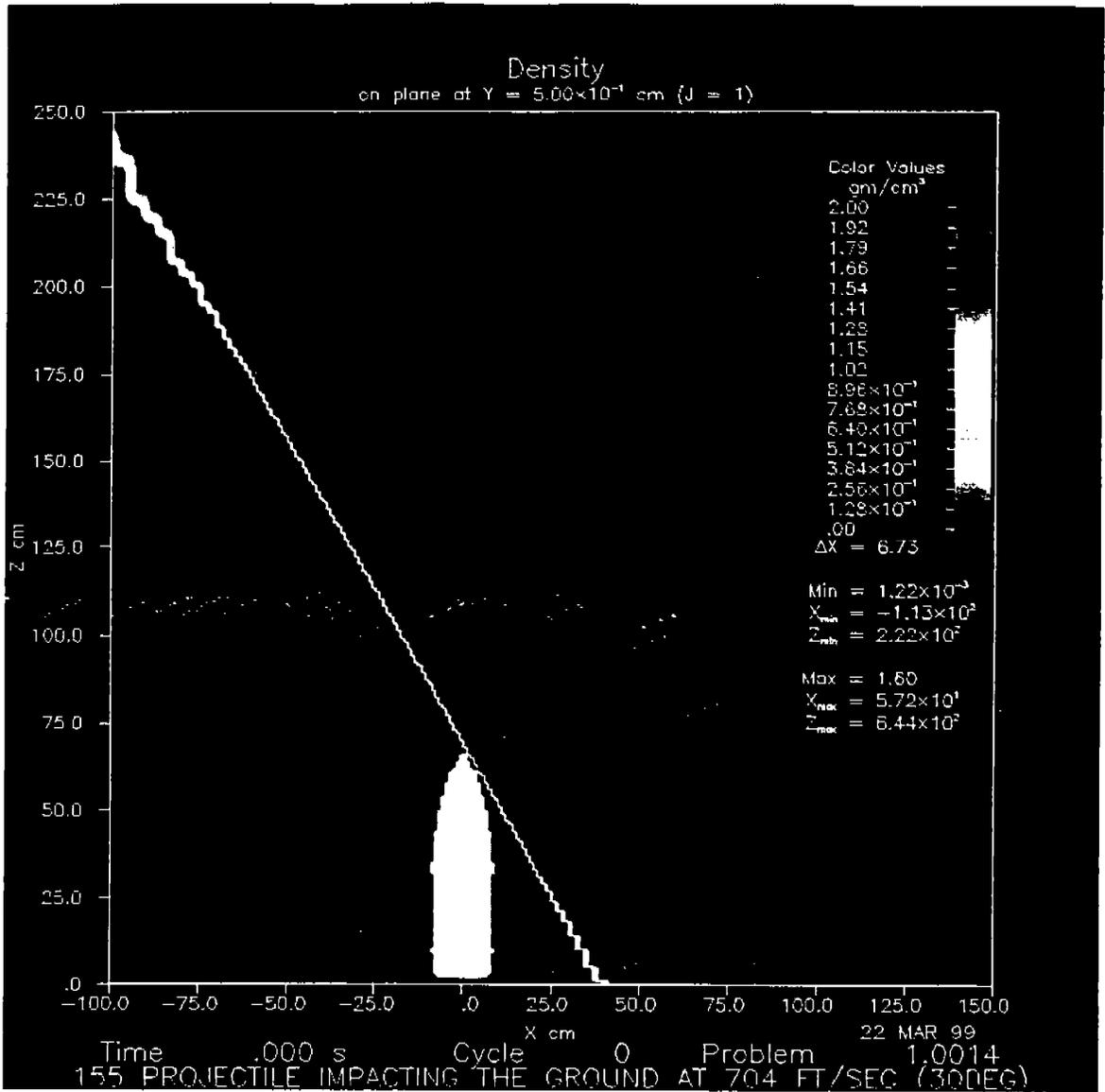


Figure 6. Hydrocode Model of 155 mm M107 Impacting Ground at 30 degrees at 704 ft/sec

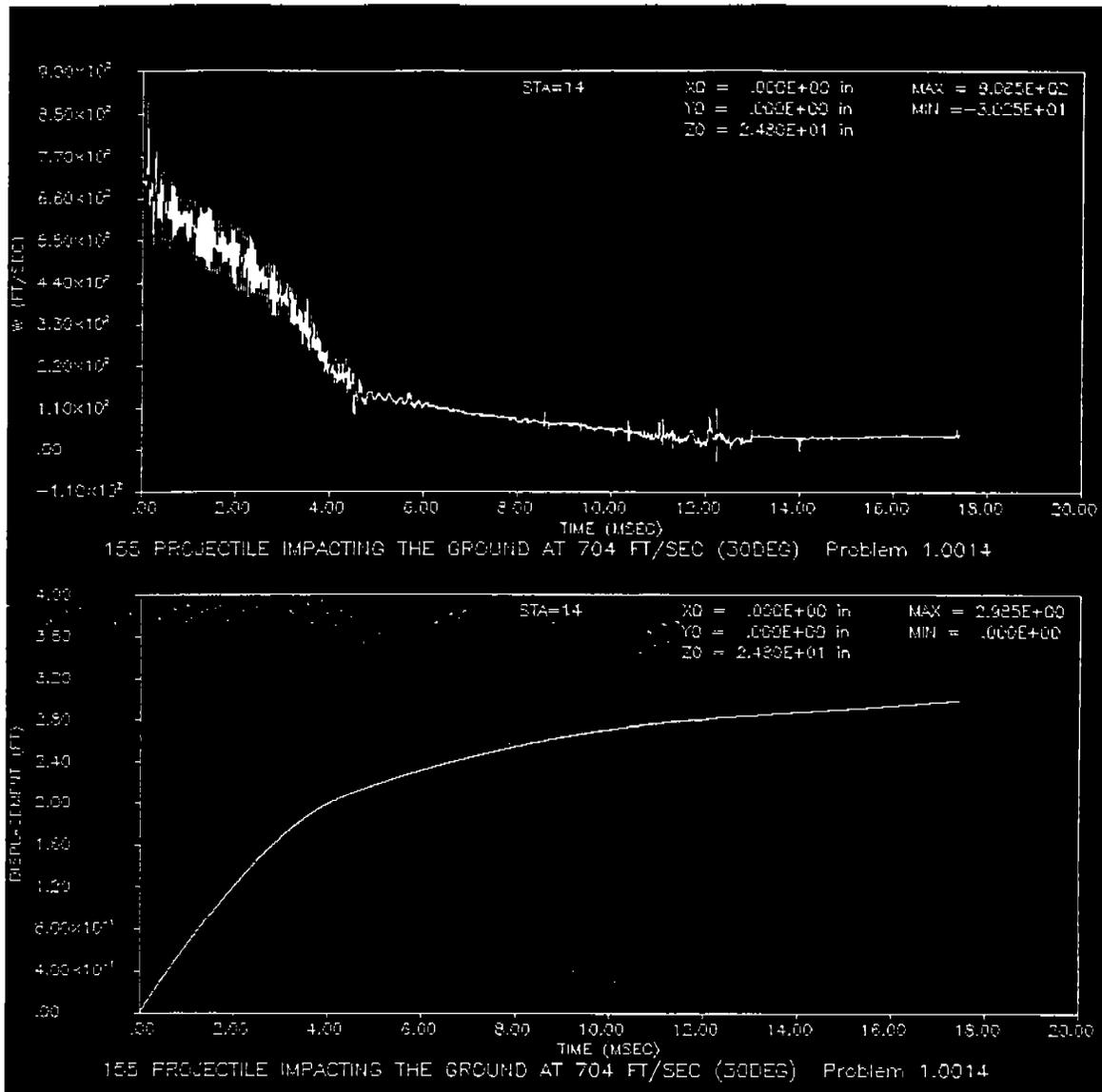


Figure 7. Variation of Velocity and Depth with Time for 155 mm M107 Impacting Sand at 30 degrees at 704 ft/sec

APPENDIX F

**ORDNANCE AND EXPLOSIVES
SITE-SPECIFIC SAFETY AND HEALTH PLAN**

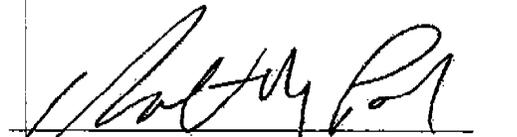
Site-Specific Safety and Health Plan

Tourtelot Cleanup Project

REVIEWED AND APPROVED BY:


Henry M. Morris
Project Engineer

2-15-02
Date


Robert M. Poll, CIH, CSP
Western Region Health and Safety Manager

02/06/02
Date

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APPENDIX F

ORDNANCE AND EXPLOSIVES SITE-SPECIFIC SAFETY AND HEALTH PLAN

1.1 INTRODUCTION

The provisions of this Ordnance and Explosives (OE) Site-Specific Safety and Health Plan (OE SSHP) are mandatory for all personnel involved in any OE activities at the Tourtelot Project Site. This OE SSHP provides the specification for the minimum acceptable requirements for all subcontractor organizations, and notification OE, chemical, and physical hazards expected to be associated with the Earth Tech-managed activities addressed in this document.

Operational changes to the OE SSHP that could affect the health and/or safety of site personnel, the community, or the environment will not be made without prior approval of the Earth Tech Project Manager (PM), the Earth Tech Health and Safety Officer (HSO), the U.S. Army Corps of Engineers (USACE), and the Department of Toxic Substances Control (DTSC). In the event of a conflict between this Plan and federal, state, or local regulations, the more stringent requirement will apply.

This OE SSHP addresses only activities related to the identification and removal of OE-related items at the Project Site. Additional remedial activities related to the cleanup of chemical effects at the site are addressed in the Tourtelot Cleanup Project Site Site-Specific Safety and Health Plan, Benicia, California (Earth Tech, Inc., 2000), and the Addendum I Tourtelot Cleanup Project Site-Specific Safety and Health Plan, Benicia, California (Earth Tech, Inc., 2001).

1.2 POLICY STATEMENT

It is the policy of Earth Tech to provide a safe and healthful work environment for all of its employees. Earth Tech considers no phase of operations or administration to be of greater importance than injury and illness prevention. Safety takes precedence over expediency or shortcuts. At Earth Tech, we believe every accident and every injury is avoidable. We will take every reasonable step to reduce the possibility of injury, illness, or accident.

This OE SSHP presents procedures to be employed during all, on-site, work activities for the remediation of OE. The practices and procedures presented in the OE SSHP are mandatory for all Earth Tech employees (and subcontractors) while they are engaged in work operations for the remediation of OE at the Project Site. Earth Tech also requires that all visitors to areas under its control abide by these procedures.

1.3 APPLICABILITY

This OE SSHP addresses all applicable OE SSHP elements as presented in Title 8 of the California Code of Regulations (CCR) Section 5192 (b). The applicable elements include those items that are identified as part of the Work Activity Description (Section 1.5) or as potential workplace hazards that may be encountered during the performance of planned work activities. Any elements not discussed in the OE SSHP have been determined to be inapplicable to planned work activities or to present no significant worker hazards, and have therefore been omitted for clarity. Specifically, elements addressed in 8 CCR Section 5192 (b) that are not addressed in this Plan include:

- Radiation - No radiation hazards will be associated with this project
- Lighting - No OE related work will be conducted beyond normal daylight hours
- Confined Spaces - No confined space hazards are associated with this project
- Spill Response - No hazardous materials in reportable quantities will be imported or produced during this project.

1.4 REFERENCES

This OE SSHP complies with applicable Occupational Safety and Health Administration (OSHA), Environmental Protection Agency (EPA), and California Occupational Safety and Health Administration (Ca/OSHA) regulations, and standards developed for the Project Site. This OE SSHP follows the requirements found in the following documents:

- Title 29 of the Code of Federal Regulations (CFR), Part 1910 (1910), OSHA
- 8 CCR, Chapter 4, Subchapter 4 (Construction Safety Orders) and Subchapter 7 (General Industry Safety Orders)
- USACE Engineering Manual 385-1-1, Safety and Health Requirements Manual, September 1996
- The State of California, Proposition 65, Community Right-to-Know.

1.5 WORK ACTIVITY DESCRIPTION

The Tourtelot OE Remediation will investigate, detect, identify, and remove OE, OE scrap, and non-OE metallic debris from the Project Site as described in

Chapter 2.0 of the OE RDD. Project Site OE remediation will consist of five significant coordinated field activities, including:

- Surface preparation
- Point clearance of all detectable anomalies across the entire Project Site, including appropriate disposal of any OE, OE scrap, and non-OE items
- Homogenization and excavation of trinitrotoluene (TNT)-affected soil from the TNT Strips
- Areawide clearance to assure clearance of OE from areas that are planned for future residential use in the South and North Valleys and on the Ridge
- Grading to provide 14 feet of clean crushed bedrock below final site grades in future residential areas of the property.

The Project Site includes a number of smaller sites depicted on Figure 2-1 of the OE RDD.

The features of these areas are described in detail in Chapter 1.0 of the OE RDD. To facilitate prioritization of the OE remediation and the sequencing of associated tasks, the Project Site was divided into sectors. Figure 2-1 of the OE RDD presents the sector boundaries and significant features within each sector. Table 2-1 of the OE RDD presents a descriptions of each sector.

1.6 SURFACE PREPARATION

1.6.1 Surface Preparation

1.6.1.1 *Vegetation Clearance.*

To prepare the Project Site for surface clearance activities and geophysical mapping, the area will be cleared of vegetation to a height of 6 inches or less to enhance ground visibility and facilitate site access. Approximately 165 acres of the vegetation will be removed by mechanical means. Tractor-supported mowers will be used to clear vegetation from the portion of the wetlands that is accessible to vehicle-supported equipment. The remaining 55 acres of the Project Site (including the jurisdictional wetlands) may be cleared by personnel using hand-held gas-powered weed cutters equipped with spark suppression systems (see Section 4.3, OE RDD).

1.6.1.2 Soil Stockpiles.

All previously stockpiled construction debris from the Project Site will be removed during the surface preparation phase, including construction debris from Unit D-1, the Ridge, and the North Valley stockpiles (Figure 2-2 of the OE RDD). The soils mixed in with the construction debris will remain at each stockpile location until they can be point cleared for OE. Following the point clearance of stockpile soils, the soil will either be moved and stockpiled in Sector 10B and/or Sector 10A or will be loaded into trucks and taken to a suitable landfill for disposal. Stockpiles #1, #2, and #3 in the North Valley will be transported to a landfill for disposal.

1.6.1.3 Fencing.

Any fencing on the interior of the Project Site will be removed during the site preparation. Exterior fencing will also be temporarily removed (and replaced as soon as possible) to facilitate geophysical mapping around the borders of the site.

1.6.1.4 Surveying of Grids.

Survey crews will lay out a 100-foot by 100-foot grid pattern on the entire Project Site using corner stakes to indicate grid corners. The grid system will allow geophysical and OE surface and subsurface clearance crews to accurately track their progress as they locate and clear OE, OE scrap, and non-OE metallic debris from the Project Site.

1.6.1.5 Road Grading and Maintenance.

Performance of OE remedial activities may require installation and/or maintenance of construction roads, to allow access by non-off road vehicles. Due to the potential to encounter OE during this work, the road grading will only be permitted in areas where surface clearance and joint clearance activities have been completed (see Section 1.7).

After each construction road is completed, an additional point clearance will be performed using the methods in Section 1.7.1.3, to ensure that no OE is present on the roads. A re-clearance will be required at any time re-grading of a road causes the removal of more than 6 inches of surface material.

1.7 ORDNANCE AND EXPLOSIVES REMEDIATION

OE remediation will be accomplished through detection and removal of metallic anomaly sources from the Project Site through clearance activities that include OE surface clearance, geophysical investigation and mapping, and OE subsurface clearance. QA/QC verification will include geophysical remapping of the entire Project Site and, as necessary, further OE subsurface clearance activities. The

final remediation step will be an areawide clearance of soils within future residential areas that contained or have the potential for containing OE below the surface scans. Areawide clearance will be completed using an iterative process of geophysically scanning, marking, and removing anomaly sources from soil lifts until no OE or OE scrap is encountered in two consecutive lifts.

1.7.1 Ordnance and Explosives Point Clearance

1.7.1.1 Surface Clearance.

OE surface clearance activities involve a systematic search of the ground surface visually and with hand-held geophysical search equipment using a walking sweep line to clear each grid of OE, OE scrap, and non-OE surface metallic debris.

The OE crew will identify each item as potential OE, OE scrap, or non-OE metallic items. Potential OE items will be left where found for inspection by the demolition crew. OE, OE scrap, and non-OE metallic items will be identified and handled as described in Chapter 4.0 of the OE RDD. OE scrap and non-OE metallic debris will be placed at the southwest corner of the grid in which it was found for subsequent collection and disposal as appropriate.

1.7.1.2 Geophysical Investigation and Mapping.

Geophysical performance verification tests will be performed to ensure that the instrumentation meets the performance objectives, as specified in Chapter 4.0 of the OE RDD. Geophysical data will be collected using electromagnetic (EM) instrumentation, specifically, a Multisensor Towed Array Detection System (MTADS). Where the towed array cannot be used (mainly on the steeper terrain and in portions of the South Valley wetlands), a dual-sensor, hand-towed, portable geophysical detector will be used (man-portable adjunct [MPA] MTADS). Approximately 70 percent of the Project Site will be mapped with towed array equipment; 30 percent of the Project Site will be mapped with portable equipment. Other hand-held geophysical equipment may be used to allow efficient scanning of fill material and stockpiles. Further detail regarding the use of the geophysical equipment at the site is presented in Chapter 4.0 of the OE RDD.

Geophysical and location data from a Global Positioning System (GPS) will be digitally collected and post-processed to identify anomaly locations. Identified anomaly locations will be recovered in the field using real-time kinematic (RTK) GPS instrumentation and marked for subsequent intrusive investigations.

1.7.1.3 Ordnance and Explosives Subsurface Clearance.

OE subsurface clearance includes:

- Excavation and identification of geophysical anomalies
- Removal of anomalies
- Disposal of OE and OE scrap.

Each marked location will be excavated to identify the source of the anomaly. OE dig teams will perform excavations using hand tools to uncover anomaly sources at depths between the ground surface and approximately 2 feet below ground surface (bgs), and a backhoe for anomaly sources deeper than 2 feet bgs. Anomaly sources will be categorized as OE, OE scrap, or non-OE metallic debris. A detailed description of each recovered anomaly will be recorded. All discovered OE will be explosively destroyed. The procedures for OE and OE scrap disposal are described in Chapter 4.0 of the OE RDD.

1.7.1.4 Point Clearance of Stockpiles #1, #2, #3; Ridge Stockpiles #1 through #9; North Valley Stockpiles; Stockpiles in Unit D-1 Area; Fill Areas in Sector 8; and Sector 2.

As part of point clearance activities, soil remaining from debris piles in Unit D-1 Stockpiles #1, #2, and #3, and Ridge Stockpiles #1 through #9, will be point cleared in lifts. Heavy equipment will be used to spread out the soil. The spread out stockpiles will be scanned with MPA MTADS. After scanning and removing the anomaly sources in soils from Stockpiles #1, #2, and #3, the soil will be disposed of at a suitable off-site landfill. Ridge stockpile soils and soil remaining from the stockpile in Unit D-1 will either be temporarily stored in Sector 10A or 10B or will be hauled to a suitable landfill for disposal.

Areas of the Project Site where on-site soils have been used as fill, including the Unit D-1 fill areas in Piercy Court (Sector 2) and the fill on the bottom of the North Valley (Sector 8) will be point cleared in 1-foot lifts. Each lift will be scanned with MPA MTADS geophysical equipment, and all identified anomalies will be removed and, as necessary, OE items will be disposed of. Heavy equipment will be used to remove each lift of fill soils. Point clearance will continue in lifts until all the fill material has been removed.

Excavated materials will be temporarily stored in Sector 10B until the North Valley has been prepared to accept fill soils.

1.7.1.5 Quality Assurance/Quality Control Verification.

A quality assurance (QA)/quality control (QC) check of the detection and removal efficiency of the point clearance process will be performed by re-mapping the entire site, recovering and investigating any newly discovered anomalies, and categorizing the anomaly sources. Any anomalies found during the re-mapping will be excavated as described above. After the mapping/intrusive investigation

activities are complete, a QC evaluation will be performed and documented, as outlined in Chapter 6.0 of the OE RDD.

1.7.1.5.1 Remediation of TNT-Affected Soil.

TNT-affected soils with TNT at concentration greater than 10 percent will be homogenized to a depth of 2 feet bgs or deeper, as necessary. These TNT-affected soils are located in the portion of the strips that are devoid of vegetation. The homogenization process is described in Section 4.12.3.1 of the OE RDD.

1.7.1.5.2 Areawide Clearance.

The areawide clearance activities on the Project Site will commence upon completion of OE point clearance, evaluation of OE site data, and completion of non-OE remediation activities on a grid-by-grid basis, and will include:

- Preparation of the North Valley to accept fill from the site.
- Removal of soils in future residential areas that are suspected of at one time containing OE or within 200 feet of an OE outlier. These soils will be placed as engineered fill in the bottom of the North Valley.

Areawide clearance areas will be divided into 100-foot by 100-foot grids and OE clearance procedures performed following the same task sequence as for point clearance (geophysical investigation, reacquisition, or excavation/removal). Following removal of any anomaly sources, a lift thickness that is 6 inches less than the reliable scan depth will be excavated. The excavated soils will be laid out in 8-inch lifts in the bottom of the North Valley and QC scanned. This process will then be repeated for the area being cleared, until bedrock is reached or two successive lifts show no evidence of OE or OE scrap in any of the geophysics evaluations. Detailed tasks associated with each of these activities are discussed in Chapter 4.0 of the OE RDD.

1.8 HEALTH AND SAFETY RESPONSIBILITIES

Project Site activities will be performed by Earth Tech and subcontractor personnel. The following assignments of health and safety-related responsibilities have been designated accordingly. Resumes of the project health and safety organization have been included in Appendix J of the OE RDD. The organizational structure for the OE SSHP is shown on Figure 7-1 in the OE RDD.

1.8.1 All Earth Tech Personnel

Each person is responsible for his/her own health and safety, for completing tasks in a safe manner, and for reporting any unsafe acts or conditions to his/her

supervisor and/or the Site Safety Officer (SSO). All personnel are responsible for continuous adherence to these health and safety procedures and the procedures presented in Attachment A during the performance of their work. No person may work in a manner that conflicts with the letter or intent of safety and environmental precautions expressed in these procedures. After due warnings, Earth Tech will dismiss from the site any person who violates safety procedures. Earth Tech employees are subject to progressive discipline and may be terminated for blatant or continued violations. All on-site personnel will be trained in accordance with requirements specified in this document.

1.8.2 Project Engineer

The Project Engineer (PE) is ultimately responsible for ensuring that all project activities are completed in accordance with requirements set forth in the OE SSHP. The PE will confer with the designated HSO on all matters affecting health and safety. Other responsibilities include:

- Requiring a prompt and thorough investigation of all accidents
- Scheduling an Accident Review Board within 10 days of an injury involving a Workers' Compensation claim or OSHA recordability, or any accident with more than a \$500 loss.

1.8.3 Project Manager

The PM has overall management authority for ensuring that all project activities are completed in accordance with requirements set forth in this plan. The PM will confer with the designated HSO on all matters affecting health and safety. Other health and safety-related duties of the PM include:

- Reading and becoming familiar with the OE SSHP
- Requiring a prompt and thorough investigation of all accidents
- Scheduling an Accident Review Board within 10 days of an injury involving a workers' compensation claim or OSHA recordability, or any accident with more than a \$500 loss
- Providing day-to-day management of site work activities.

The PM is responsible for notifying all federal, state and local government and community organizations as specified in the OE RDD. The Valero plant is a minimum of 1,125 feet from the Project Site boundaries. The PM will notify the Valero Health and Safety Department prior to initiating site activities and provide contact numbers for Valero to use in the event of an accident at the refinery site.

1.8.4 Health and Safety Officer

The designated HSO is responsible for overseeing all aspects of the site safety program and for preparing the OE SSHP, site-specific safety guidance documents, or addenda to this plan. The HSO will be the designated Certified Industrial Hygienist (C.I.H.) overseeing all aspects of the site safety program, as well as preparing any site-specific safety guidance documents or addenda related to changes in site conditions or operations. The HSO does not report to the PM and is separately accountable to Earth Tech senior management for site health and safety. The HSO will act as the sole contact to all regulatory agencies on matters of safety and health. The HSO's other responsibilities include:

- General health and safety program administration
- Through consultation and periodic site visits, will oversee the SSO in developing site-specific employee/community emergency response plans, as required, based on expected hazards
- Determining the level of personal protection required
- Updating equipment or procedures based on information obtained during site operations
- Establishing air monitoring parameters, as specified in Section 4.2 of OE RDD, based on expected contaminants.

1.8.5 Ordnance and Explosives Safety Manager

The Ordnance and Explosives Safety Manager (OESM) will be appointed by the PM to be principally responsible for execution of all OE operations for field activities. The OESM will have knowledge of all requirements mandated by OSHA, USACE, EPA, 8 CCR, and Earth Tech's Corporate Environmental, Health and Safety Program. The OESM will be directly responsible to the PM.

The OESM is responsible for the implementation of the OE SSHP and will provide overall direction of the project OE functions for field activities. The OESM, or his/her designee, will interface with the SSO on OE safety functions of the project and will coordinate activities with the PM. In addition, the OESM will, as necessary, perform audits, surveillance, document reviews, and other OE safety functions as required to determine the continued effectiveness of the OE SSHP. The OESM will, as necessary, audit compliance with the OE SSHP and will perform OE safety reviews of selected project tasks. Other responsibilities will include, but will not be limited to:

- Developing and implementing corrective action plans to eliminate or mitigate hazards associated with OE

- Providing the OE safety portions of training sessions or briefings for site and visitor personnel
- Ensuring the proper use of personal protective equipment (PPE)
- Ensuring that all OE-related site operations are conducted in accordance with this document and with other relevant safety and health regulations and standards.

1.8.6 Unexploded Ordnance Personnel General Qualifications and Responsibilities

Earth Tech will utilize a Senior Unexploded Ordnance (UXO) Supervisor (SUXOS), SSO, and UXO technicians to provide the UXO safety support for all site OE activities including OE handling and disposal tasks as required for this project. The SUXOS and the SSO will be accountable to the HSO through the OE Safety Manager for the safe performance of all work activities.

All UXO-qualified personnel must meet the OSHA training and medical surveillance requirements as outlined in the hazardous waste operations (HAZWOPER) standard, found in 29 CFR Part 1910,120(e) and (f), as well as USACE Manual EM 385-1-1, Section 28. The positions listed below shall be responsible for the safe conduct of the OE tasks performed in support of the OE RDD.

1.8.6.1 Senior UXO Supervisor.

The SUXOS will manage the on-site manpower and equipment necessary to safely conduct the OE portion of the site operations, as well as the safety and health responsibilities listed below:

- Review and become familiar with the OE RDD, and ensure that all OE safety concerns are adequately addressed and controlled
- Provide the OE safety portion of training sessions or safety briefings
- Ensure that all OE-related site operations are conducted in accordance with this document and all other relevant safety and health regulations and standards
- Directly interface with, and relay safety and health concerns to, the Earth Tech SSO.

1.8.6.2 Site Safety Officer.

The SSO is the OE SSO, and is responsible for performing the routine duties for health and safety, and will coordinate any necessary assistance from the

designated HSO. The SSO shall be OE-qualified, as described in Section 7.2.4.5 of the OE RDD. The SSO will administer the OE SSHP and the applicable site-specific safety guidance document. Additional SSO responsibilities include:

- Reading and becoming familiar with the OE SSHP
- Enforcing the requirements of the OE SSHP and other applicable safety requirements
- Conducting daily site health and safety inspections.
- Stopping work, if necessary, to prevent injury or illness and ensure personal and environmental health and safety
- Determining evacuation routes, and establishing/posting local emergency contact telephone numbers
- Ensuring that all applicable site personnel and visitors have received the proper training and medical monitoring before entering any controlled areas
- Presenting any tailgate safety meeting and maintaining appropriate training documentation/attendance records
- Implementing air monitoring according to directives in the OE SSHP
- Implementing changes in health and safety procedures as directed by the HSO and/or approved addenda to the OE SSHP.

The SSO/OE SSO will be Karl Goehring.

1.8.6.3 UXO Supervisor (UXO Technician III).

The UXO Supervisor assigned to this project will be responsible for implementing and enforcing the OE safety and health requirements of the OE SSHP with his/her team.

1.8.6.4 UXO Technician (UXO Technician II).

The UXO Technicians assigned to this project will have the responsibility for safely conducting site operations as directed by the UXO Supervisor or SUXOS. The UXO Technicians will also comply with the OE SSHP. The UXO Technicians will immediately report the observance of any conditions that may present a known or potential hazard to site personnel.

1.8.7 Subcontractors

Each subcontractor's management will provide qualified employees and allocate sufficient time, materials, and equipment to safely complete assigned tasks. In particular, each subcontractor is responsible for equipping its personnel with any required PPE. All on-site employees of each subcontractor must meet the training and medical monitoring requirements set forth in the OE SSHP. Work operations performed by these subcontractors will be under the control of Earth Tech, who is responsible for oversight of work activities to ensure that all requirements specified in the OE SSHP are observed. Each subcontractor is expected to operate in accordance with its own unique safety policies and procedures, to ensure that hazards associated with the performance of the work activities are properly controlled.

Hazards not listed in the OE SSHP but known to any subcontractor, or known to be associated with a subcontractor's services, must be identified and addressed to the Earth Tech PM or SSO prior to commencement of work operations. The SSO or authorized representative has the authority to halt any subcontractor operations, and to remove any subcontractor or subcontractor employee from the site for failure to comply with established health and safety procedures or for operating in an unsafe manner. Procedures to mitigate hazards not listed must be approved by Earth Tech, USACE, and DTSC.

Attachment B provides Earth Tech's *General Safety Rules for Contractors*, which will be observed by all subcontractor organizations.

1.8.8 On-site Personnel and Visitors

All personnel working for Earth Tech and its subcontractors and all visitors to active exclusion zones or controlled areas are required to read and acknowledge their understanding of the OE SSHP. All personnel are expected to abide by the requirements of the OE SSHP and cooperate with site supervision to ensure a safe and healthful work site. Any personnel that are not members of the Earth Tech project team or members of the subcontractor team will be considered visitors. Visitors to the site will comply with the general requirements listed below. The Earth Tech SSO and SUXOS will be notified of the nature and duration of the visit. Personnel must immediately report any of the following to the PM:

- Accidents and injuries, regardless of severity
- Unexpected or uncontrolled releases of any hazardous substances
- Any symptoms of exposure to a hazardous substance
- Any unsafe or malfunctioning equipment

- Any changes to site conditions that may affect the health or safety of project personnel
- When any non-essential personnel are in a designated OE area, all OE operations shall cease until the visitor has departed the area
- If an unauthorized visitor attempts to enter a work area, all OE and non-OE work in that area shall cease and the Earth Tech SUXOS and SSO will be notified immediately.

1.9 HAZARD ASSESSMENT

Planned activities for the site can be divided into five primary activities:

- Surface preparation
- Point clearance of all detectable anomalies across the entire Project Site, including appropriate disposal of any OE, OE scrap, and non-OE items
- Homogenization and excavation of trinitrotoluene (TNT)-affected soil from the TNT Strips
- Areawide clearance to assure clearance of OE from areas that are planned for future residential use in the South and North Valleys and on the Ridge
- Grading to provide 14 feet of clean crushed bedrock below final site grades in future residential areas of the property.

Several individual work tasks are associated with each of these categories, the hazards of which are analyzed below and in Attachment A.

Potential hazards associated with the overall work activities include, but are not limited to:

- Explosive hazards due to OE.
- Explosive hazards due to soils containing explosive compounds in excess of 10 percent.
- Exposure to environmental contaminants (metals, polynuclear aromatic hydrocarbons [PAHs], and dioxins/furans). Table 2-1 provides the contaminants of concern by location and concentration range. Volatile chemicals are not anticipated to be found on this site.
- Hazardous noise (from heavy equipment).

- Slip, trip, and fall hazards.
- Heat stress, especially when wearing chemically protective clothing.
- Biological hazards from animals, insects, and plants.
- Cleaning and decontamination of equipment.

Note: Soil containing TNT in excess of 10 percent is considered to be OE in accordance with ER-1110-1-8153. Personnel should avoid contact with soils containing an excess of 10 percent TNT. Figure 1-4 of the OE RDD shows the location of TNT strips where such soils may be encountered. Spark, flame, and heat-producing items and activities are not permitted in these areas. TNT is also a shock-sensitive contaminant.

Note: The PM or SSO will inform all personnel prior to entering the Project Site of the potential health effects associated with the use of the medication "Viagra" on a site with explosive constituents. Personnel using the medication Viagra are required to wear Modified Level D PPE at all times while on site. Health hazards due to dermal absorption of explosives while taking Viagra can cause severe illness and death. All personnel are required to wear at least Modified Level D PPE while performing sampling activities to prevent contact with explosive constituents.

Note: Soil containing TNT in excess of 10 percent cannot be shipped. Soil in excess of 10 percent must be treated on site to reduce the TNT content.

1.9.1 Task Hazard Assessment

The following is a description of the hazards determined to be associated with each identified work task to be performed for surface preparation, point clearance, homogenization and excavation of TNT-affected soil, areawide clearance, and grading. Attachment C provides a hazard analysis of the specific tasks associated with each major activity of the OE RDD.

For work activities occurring outside the TNT Strips and other chemically impacted areas, there are no significant worker exposure hazards from chemical materials. This work will be performed in accordance with the requirements in the Activity Hazard Analyses found in Appendix C.

In the TNT Strips, workers may become significantly exposed to TNT through inhalation, skin contact, absorption, or ingestion. This work will be performed following the exposure control requirements and monitoring procedures specified in the non-OE SSHP Addendum I for remediation of chemically affected soils, and in Section 4.2 of the OE RDD.

In other chemically impacted areas, workers may become significantly exposed via skin contact or ingestion; however, inhalation will not present a significant hazard. This work will also be performed following exposure control requirements and monitoring procedures specified in the non-OE SSHP Addendum I for remediation of chemically affected soils, and Section 4.2 of the OE RDD.

To prevent inhalation hazards, dust control measures will be used as necessary for all sampling, removal, and remedial activities. Additionally, monitoring for dust will be performed in accordance with the specifications in Section 4.2 of the OE RDD.

In evaluating the task hazards, it is anticipated that site personnel wearing the required PPE will not come into direct contact with significant amounts of contaminated soil or water that would present a skin contact hazard. Task hazard analyses (THAs) designed to meet USACE and DTSC requirements are presented in Attachment C. Table 1 provides a list of the potential contaminants for each site to be remediated, and the appropriate PPE for work at each site. It should be noted, however, that Level D PPE is appropriate for all work to be performed on site, except for remediation of the unvegetated portions of the TNT Strips. Modified Level D PPE will be required for work at this site.

Grid staking, vegetation removal, and fence installation and removal will be performed with an OE escort.

In the event of inclement weather (rain or snow), the SSO will determine when field operations must cease. In the event of an electrical storm within 5 miles of the Project Site, all activities will cease, and all field personnel will report to the Command Post for further instruction.

Manual OE excavations will be performed by OE-qualified persons only. Mechanical OE excavations will be performed by a heavy equipment operator under the direction of an OE-qualified person.

1.9.1.1 Site Reconnaissance.

This work includes delineation and staking of work area boundaries, identification of subsurface structure locations, and similar work. Because site reconnaissance is a nonintrusive activity, it provides little potential for the release or contact with contaminated materials, and OE. An OE escort will lead the vegetation removal operation in accordance with the procedures described in the OE RDD.

The primary hazards associated with this work are the potential for encountering OE, and slip, trip, and fall hazards due to the presence of unprepared walking surfaces. Other hazards that may be encountered include heat stress and sunburn. To protect against these hazards, the following requirements should be met:

- Do not touch, move, or disturb any material or equipment that is unidentifiable.
- Watch carefully where you walk. Do not step in shadows until you are sure of your footing. Shadows may hide pits, holes, or other areas of unstable footing.
- Carefully choose your footholds when crossing rocky, vegetation-covered, uneven, or loose ground surfaces.
- Stay within site of your buddy.

1.9.1.2 Vegetation Removal.

Prior to field activities, it will be necessary to remove surface vegetation across the site. This will be accomplished using both manual methods (hand-held, manual and gas-powered tools) and by mechanical means (tractor-towed Model 60 Brush Cat mulching mower and/or Model 120 Rhino mulching mower). The Project Site will be cleared of vegetation to a height of 6 inches or less. The majority of the vegetation will be removed by mechanical means, either with a brush hog or a flailing machine pulled behind a track-mounted dozer. OE personnel will be required to escort the vegetation removal teams during this task in accordance with the procedures in Chapter 4.0 of the OE RDD. Areas that cannot be accessed by mechanical equipment will be cleared by crews using gas-powered weed cutters (equipped with spark suppression systems). Because vegetation removal is a nonintrusive activity, it provides little potential for the release or contact with contaminated materials or OE. The primary hazards associated with this activity include the potential for contacting OE, eye, and skin hazards from flying objects from the cutting of vegetation, noise, and slip, trip, and fall hazards due to unprepared walking surfaces. Personnel may also encounter dangerous plants (see Section 1.11.10), and should wear long-sleeved clothing and work gloves, as appropriate. The use of powered cutting equipment also presents some danger to the operators due to the sharp cutting surfaces, and some power equipment may present a noise exposure hazard. Only experienced operators shall be permitted to operate powered equipment. Use of leather work gloves and eye protection (and hearing protection where necessary) will be required of personnel performing vegetation removal activities. Other hazards include weather-related hazards and dangerous animals and plants.

- Do not touch, move, or disturb any material or equipment that is not identifiable.
- Watch carefully where you walk. Do not step into shadows until you are sure of your footing. Shadows may hide pits, holes, or other areas of unstable footing.

- Follow the instruction and path of the OE escort.
- Wear appropriate PPE (Level D, see Section 1.12.2), leather palm working gloves and hearing protection.

1.9.1.3 Fence Removal and Installation.

The fencing subcontractor will remove all interior fencing and remove and replace all fencing in concert with the geophysical mapping teams. At the end of each work day, temporary fencing will be used to close any breaches in the perimeter fence. The OE escort will be required for replacement of fencing. The primary hazards associated with this activity include potential contact with OE, lifting, and sharp metal objects. Additional hazards include slip, trip, and fall hazards due to unprepared walking surfaces, weather-related hazards, and dangerous animals and plants.

- Install fence posts only where the OE escort has determined the location to be free of anomalies.
- Watch carefully where you walk. Do not step into shadows until you are sure of your footing. Shadows may hide pits, holes, or other areas of unstable footing.
- Follow the instruction and path of the OE escort.
- Wear appropriate PPE (Level D, see Section 1.12.1), leather palm working gloves, and hearing protection.

1.9.1.4 Location and Marking of Search Grids.

Surveyors will install semipermanent markers (36-inch survey stakes) in lines at 100-foot intervals. Qualified UXO personnel will be required to escort the surveyors during this task in accordance with procedures in Chapter 4.0 of the OE RDD. The OE escorts will visually check the surface along the paths the surveyors use to transit the property for OE and check the subsurface area (using a White Pulse Induction metal detector) where the stakes will be driven for anomalies. The location of anomalies will be avoided by a safe distance (24-36 inches) during installation of survey stakes. Any discovered OE will be marked and reported to the SUXOS and PM for recording and disposal disposition. The primary hazards associated with this activity is potential OE contact. Additional hazards include slip, trip, and fall hazards due to unprepared walking surfaces, weather-related hazards, and dangerous animals and plants.

- Do not touch, move, or disturb any material or equipment that is not identifiable.

- Install markers only after the OE escort has determined the location to be free of anomalies.
- Watch carefully where you walk. Do not step into shadows until you are sure of your footing. Shadows may hide pits, holes, or other areas of unstable footing.
- Follow the instruction and path of the OE escort.
- Wear appropriate PPE (Level D, see Section 1.12.1).

1.9.1.5 Ordnance and Explosives Surface Clearance.

Once grids have been established throughout the Project Site, an OE surface clearance will be conducted. OE crews will use magnetometers and visual search methods to clear the area of OE, recognizable OE scrap, and metallic surface debris that would impact subsurface mapping. OE items will be flagged for disposal operations. The primary hazards associated with this activity include potential contact with OE, lifting, and sharp metal objects. Additional hazards include slip, trip, and fall hazards due to unprepared walking surfaces, weather-related hazards, and dangerous animals and plants.

- Only OE personnel will perform this activity.
- Do not touch any potential OE. All potential OE will be flagged for the Disposal Team.
- Install flags only after the location has been determined to be free of anomalies.
- Watch carefully where you walk. Do not step into shadows until you are sure of your footing. Shadows may hide pits, holes, or other areas of unstable footing.
- Wear appropriate PPE (Level D, see Section 1.12.1).

1.9.1.6 Geophysical Detection, Mapping, and Anomaly Reacquisition.

Geophysical detection, mapping, and anomaly reacquisition are associated with point and areawide clearance activities. The primary hazards of the nonintrusive geophysical detection are associated with the possible, detonation of OE items due to mechanical disturbance of fuzed, armed OE. There is a minor risk of detonation of OE with the interaction of electronic fusing devices due to interaction with EM fields produced by geophysical instruments. To prevent this, care will be taken during collection of geophysical data to insure no intrusive actions occur (e.g. digging to remove rocks or vegetation). Although the project area will have

been surface cleared of OE, there will always be the possibility of near-surface items being uncovered by either natural or man-made events. The geophysical team (and all personnel on-site) will be continuously vigilant to ensure no accidental disturbance of on-site exposed OE occurs. Additionally all use of geophysical instrumentation will be in accordance with Section 1.11.7 guidelines.

Additional hazards include slip, trip, and fall hazards due to unprepared walking surfaces, weather-related hazards, and dangerous animals and plants.

- Watch carefully where you walk. Do not step in shadows until you are sure of your footing. Shadows may hide pits, holes, or other areas of unstable footing.
- Install flags only after the location has been determined to be free of anomalies.
- Wear appropriate PPE (Level D, see Section 1.12.1).

1.9.1.7 OE Subsurface Clearance.

During any subsurface clearances, a minimum separation distance (MSD) will be enforced (see Section 4.1) OE RDD. OE subsurface tasks are associated with point and areawide clearance. Near-surface anomaly sources are those that are partially exposed or suspected to be within 1 foot of the surface and that can be excavated using hand tools. These anomalies will be excavated by carefully removing the earth overburden using a hand shovel/trowel or other small digging implement. Throughout the excavation the UXO Technicians will use a site-tested detection instrumentation to check and verify the proximity of the anomaly. The primary hazards associated with this activity include potential contact with OE, lifting, and sharp metal objects. Additional hazards include noise, slip, trip, and fall hazards due to unprepared walking surfaces, weather-related hazards, and dangerous animals and plants.

Subsurface anomalies are those caused by sources that are more deeply buried or that may require excavation using heavy equipment (e.g., backhoe). For these excavations, an UXO Supervisor will coordinate equipment requirements with the SUXOS. Prior to the arrival of the heavy equipment, the UXO Supervisor will ensure that a cleared entrance and egress path is available for the heavy equipment. Heavy equipment or manual digging tools will be used to excavate the earth overburden in 6-inch lifts. After each lift, the anomaly location will be redefined with a site-tested metal detector and the anomaly source exploratively sought using hand tools. This process will continue until the source of the anomaly has been uncovered and identified.

When a UXO Technician is checking backhoe excavations for suspected OE-source proximity, the backhoe bucket will be placed on the ground, away from the

excavation, and the operator will keep his/her hands clear of the operating controls. The backhoe operator will resume excavation operations only after the UXO Technician is clear of the excavation and outside of the bucket swing area.

- All excavations will be performed in accordance with standard OE excavation procedures outlined in the OE RDD.
- All excavations will be performed by OE personnel, with the exception of heavy equipment excavation, which will be performed under the direction of the UXO Supervisor.
- Watch carefully where you walk. Do not step into shadows until you are sure of your footing. Shadows may hide pits, holes, or other areas of unstable footing.
- Wear appropriate PPE (Modified Level D, see Section 1.12.2).

1.9.1.8 Backfill.

After the anomalies have been removed and the excavation has been verified to be free of anomalies the excavation will be backfilled using hand shovels or heavy equipment. The backfilled soil will be hand tamped and leveled to approximate existing ground contours. The primary hazards associated with this activity is lifting. Additional hazards include noise, slip, trip, and fall hazards due to unprepared walking surfaces, weather-related hazards, and dangerous animals and plants.

- Watch carefully where you walk. Do not step into shadows until you are sure of your footing. Shadows may hide pits, holes, or other areas of unstable footing.
- Wear appropriate PPE (Level D, see Section 1.12.1).

1.9.1.9 OE Scrap and Metallic Debris Disposal.

OE scrap and metallic debris disposal tasks are associated with surface, point and areawide clearances.

During operations, OE scrap and metallic debris will be placed at the southwestern corner of each grid adjacent to the grid stake. The OE scrap collected during field activities will be stored in a lockable storage shelter that will be locked at the close of each business day. The primary hazards associated with this activity include potential contact with OE, lifting, and sharp metal objects. Additional hazards include slip, trip, and fall hazards due to unprepared walking surfaces, weather-related hazards, and dangerous animals and plants.

- All OE scrap and metallic debris will be inspected by the UXO Supervisor prior to leaving the grid.
- Watch carefully where you walk. Do not step into shadows until you are sure of your footing. Shadows may hide pits, holes, or other areas of unstable footing.
- Wear appropriate PPE (Level D, see Section 1.12.1).

1.9.1.10 OE Identification and Disposal.

Upon finding a potential OE item, a disposal team consisting of the SUXOS, SSO and a UXO Supervisor will positively identify the item. The disposal team will determine if the item is safe to move. Safe to move and blown-in-place (BIP) items will be handled in accordance with the OE RDD. Prior to handling OE, an MSD will be established. The primary hazards associated with this activity include contact with OE, explosives handling, fragmentation, lifting, and sharp metal objects hazards. Additional hazards include slip, trip, and fall hazards due to unprepared walking surfaces, weather-related hazards, and dangerous animals and plants.

- All OE will be identified by the disposal team prior to moving or BIP.
- The MSD will be established, and residential/business relocation will be administered as specified in Minimum Separation Area Notification and Implementation Plan (MSAP) (see OE RDD Appendix C).
- All OE disposal activities will be performed by UXO personnel only. OE teams will maintain a minimum separation distance of 200 feet.
- All non-OE personnel will be outside of the MSD during all disposal activities.
- Disposal activities will be performed in accordance with the OE RDD.
- Watch carefully where you walk. Do not step into shadows until you are sure of your footing. Shadows may hide pits, holes, or other areas of unstable footing.
- Wear appropriate PPE (Level D, see Section 1.12.1).

1.9.1.11 Homogenization, Excavation, Stockpiling, and Transporting of TNT-Contaminated Soils.

Homogenization, excavation, stockpiling and transporting of TNT-contaminated soils will be conducted in accordance with Section 2.12 of the OE RDD. During

TNT Strip homogenization activities, an MSD will be established. Due to the explosive potential of soils containing TNT at concentrations of 10 percent or greater within the TNT Strips, the strips will be homogenized before excavation, stockpiling, or transporting of the contaminated soils takes place.

- All work will be conducted in strict accordance with this OE SSHP.
- During the homogenization of TNT-affected soil, all mobile equipment will be rubber-tired.
- Equipment utilized during homogenization, excavation, and material-handling will have smooth-lipped buckets.
- Equipment used to homogenize and excavate explosives-affected soils will have sealed bearings and shielded electrical junction boxes. Equipment will also be decontaminated routinely to prevent the buildup of dust.
- Application of spray water for dust control and reducing the potential for ignition or detonation will be applied at TNT-affected soil handling points. The criteria for success of the dust control efforts shall be the absence of visible airborne dust and the confirmation that the quantity of dust at the perimeter of the Project Site is below action levels, based on PM₁₀ sampling (see Addendum 1, Section 7.2). Pre-wetting of excavation areas will be of primary concern, followed by additional wetting at other locations, such as the staging area, as required. A full-time water truck will be dedicated to the TNT Strips area.
- All vehicles (trucks) utilized to transport TNT-affected soils will use bottom dump gate tarps, or equal, to negate soil spillage.
- Stationary equipment in close contact with TNT-affected soils (e.g., high-pressure steam cleaners, trailers) will be grounded.
- Fuel will be stored outside the MSD. Fuel trucks will not enter the MSD. Fuel will either be provided in 5-gallon safety can or by a hose that will be passed across the MSD boundary to refuel heavy equipment as necessary. During refueling operations, any equipment that will be moved outside the MSD (including fuel containers and fuel hoses) will be decontaminated if it comes in contact with the ground.
- Wear appropriate PPE (Level D, see Section 1.12.1).

1.9.1.12 Equipment Decontamination.

Equipment used in the excavation of OE will require decontamination prior to leaving the Project Site. Only portions of the equipment contacting subsurface

soils will require cleaning, which can be accomplished using physical removal methods including brush removal, wiping, and/or use of a steam cleaner unit.

This task presents no significant inhalation or skin exposure hazards. However, personnel should be trained in the use of the steam cleaner, which has exposed, hot surfaces during use. The pressurized hot water stream can cause significant physical and thermal injury if sprayed on exposed skin; consequently, personnel not involved in clean-up should not be present in any work area where a steam cleaner is in use.

To provide further protection, personnel will use the Level D ensemble (Section 1.13), modified by the use of a face shield and chemically protective nitrile gloves.

1.9.1.13 Management/Handling of Derived Waste.

Work activities will generate decontamination fluids, waste PPE and decontamination materials, and excess sediment. Waste will be containerized and placed into drums. Handling of waste presents a minimal potential for skin contact; inhalation is not expected to present a hazard.

1.9.1.14 Unanticipated Work Activities.

Where work activities are identified that are not addressed in the OE SSHP, appropriate safety documentation and procedures will be implemented. Prior to initiation of work activities, any subcontractor organization tasked with performance of such work will submit a work procedure document that presents appropriate safety procedures applicable to the specific work activities to be undertaken. Submitted safety procedures will be reviewed for adequacy and compliance with applicable regulatory requirements and the requirements presented in the OE SSHP. Work will not be initiated until this review is completed and any identified deficiencies corrected.

1.10 GENERAL HEALTH AND SAFETY PROGRAMS

All Earth Tech and subcontractor personnel performing work in controlled areas of the Project Site will be qualified as HAZWOPER workers. Accordingly, the requirements outlined in the following subsections will apply for all personnel performing any controlled-area work operations. The controlled area includes all areas within the Project Site except the Project Site office and the access road leading the Project Office.

1.10.1 Medical Screening and Health Surveillance

All Earth Tech and subcontractor personnel will have completed a HAZWOPER physical exam in accordance with the requirements of Earth Tech Health and Safety Procedure HS601, Medical Surveillance (Attachment D), which conforms to the requirements of 8 CCR Section 5192(f). Each person's most current exam will have been completed within the previous 365 days, and based on those exam results, each person will be medically authorized to perform HAZWOPER activities and wear approved respiratory protection by an occupational physician. The minimum medical screening will include a complete physical examination and may also include additional tests (e.g., CBC with Differential, chest X-rays, nitrogen/nitrate) as deemed necessary by the physician. A Pulmonary Function Test will be performed for all personnel who may be required to utilize respiratory protection.

1.10.2 Training Requirements

All personnel on site will meet the following training requirements.

1.10.2.1 General Training Requirements.

All field personnel and visitors involved with site activities will have completed the necessary HAZWOPER training requirements as specified in Earth Tech Health and Safety Procedure HS301, HAZWOPER Training and Refresher (Attachment E), which conforms to the provisions established in 8 CCR Section 5192(e)(2) and (e)(3) (40-hour or 24-hour initial training), 8 CCR Section 5192(e)(8) (annual refresher training), and 8 CCR Section 5192(e)(4) (supervisor training). General and daily site workers engaged in hazardous substance removal or other activities that expose or potentially expose workers to hazardous substances and health hazards shall receive a minimum of 40 hours of off-site instruction, and a minimum of 3 days actual field experience under the direct supervision of a trained, experienced supervisor.

Workers that are on site only for an occasional, specific, limited task (such as, but not limited to, land surveying, fence installation/removal, or geophysical surveying) will receive a minimum of 24 hours of off-site instruction, and a minimum of 1 day of actual field experience under the direct supervision of a trained, experienced supervisor. Proof of training will be maintained on site for all personnel. Outlines of 40-hour Hazardous Waste Operations, cardiopulmonary resuscitation (CPR)/First Aid, and Explosive Ordnance Disposal (EOD) (UXO) Training are included in Attachment F.

1.10.2.2 Initial Orientation Training.

Prior to the start of on-site activities, all Earth Tech and subcontractor personnel will attend a site safety/orientation briefing, to be conducted by the SSO. This training will address all elements of the site health and safety program (as presented in the OE SSHP and referenced Earth Tech and regulatory health and safety requirements). This training will also include instruction in:

- Toxic and physical hazards associated with OE and identified environmental chemicals of concern (COCs)
- Anticipated exposure hazards (as determined based on analysis of work operations and site chemical concentrations)
- Requirements and rationale used in the selection of safety equipment
- On-site monitoring procedures
- Decontamination procedures
- Care and use of selected PPE
- Emergency Notification and Response Procedures.

The training content and a list of all attendees will be documented and maintained with the project files.

Worker personnel initially assigned to the site after work operations have commenced will be provided with orientation training by the SSO that will address the above requirements. All visitors to the site (personnel not assigned to work on site) will be provided with an abbreviated version of this training, along with specific orientation as to the hazards present on site at the time of the visit and any applicable safety requirements (e.g., escorts).

1.10.2.3 Tailgate Safety Briefings.

A tailgate safety briefing will be conducted at the start of each work day. The SSO will conduct the tailgate safety briefings and will review and discuss the health and safety issues associated with the day's planned work activities, problems encountered, and modifications to existing procedures. Documentation of the tailgate safety briefings will be accomplished by using the Tailgate Safety Briefing Sign-in Log, a copy of which is included in Attachment G. The SSO will maintain copies of all tailgate safety briefing sign-in logs in the project files. All field personnel associated with each day's project activities are required to attend these meetings.

1.10.2.4 Hazard Communication Training.

Section 1.10 provides information concerning physical and environmental hazards that are expected to be encountered during the planned work operations. Material Safety Data Sheets (MSDSs) for COCs are in Attachment H. In addition, any organization wishing to bring any hazardous material onto any Earth Tech-controlled work site must first provide a copy of the item's MSDS to the SSO for approval and filing (the SSO will maintain copies of all MSDSs on site). In accordance with the requirements of 8 CCR Section 5194, all personnel will be briefed on the hazards of any product they use and will be aware of and have access to all MSDSs.

1.10.3 General Site Safety Rules

The following general requirements apply to all on-site activities (including work occurring outside controlled work areas).

1.10.3.1 Smoking, Eating, and Drinking.

Smoking, eating, and drinking will not be permitted except in specifically designated areas of the site, which shall be outside any designated exclusion zones or other designated work areas. Field workers will perform proper decontamination procedures when leaving an exclusion zone prior to eating or drinking. Consumption of alcoholic beverages is prohibited everywhere on the Project Site.

1.10.3.2 Site Awareness.

Site personnel will be familiar with the physical characteristics and requirements of the work site, including ongoing activities of other personnel at the Project Site, that may affect their work area. Personnel will also be aware of:

- Emergency procedures and evacuation assembly points
- Locations of protective and emergency equipment and relevant first-aid procedures.

The number of personnel and equipment in work areas should be minimized, consistent with site operations.

1.10.3.3 Buddy System.

All on-site personnel will operate using the two-man concept (buddy system). All personnel will operate in teams of two or more (a single-man entry into any controlled work area is prohibited); team members will maintain visual contact with

each other at all times. Team members must observe each other and should be alert for signs of heat stress or toxic exposure.

1.10.3.4 Fire Prevention.

Open flames, smoking, and other sources of ignition are not authorized at any designated fieldwork area. Smoking will be permitted only in designated areas. Prior to commencement of the field investigation, Earth Tech will notify the appropriate local fire agencies and departments of specific work areas and activities.

1.10.3.5 Housekeeping.

During site activities, work areas will be continuously policed for identification of excess trash and unnecessary debris. Excess debris and trash will be collected and stored in an appropriate container (e.g., plastic trash bags, garbage can, roll-off bin) prior to disposal. At no time will debris or trash be intermingled with waste PPE or contaminated materials. Anyone observed disposing of contaminated material or PPE with municipal wastes will be removed from the site.

1.10.3.6 Personal Hygiene.

At a minimum, an adequate supply of personal hygiene equipment will be available for use by site personnel. Personal hygiene items will include the following:

Water Supply

A water supply meeting the following requirements will be utilized:

Potable Water. An adequate supply of potable water will be available for field personnel consumption. Potable water can be provided in the form of water bottles, canteens, water coolers, or drinking fountains. Where drinking fountains are not available, individual-use cups will be provided as well as adequate disposal containers. Potable water containers will be properly identified in order to distinguish them from nonpotable water sources.

Nonpotable Water. Nonpotable water may be used for handwashing and cleaning activities but will not be used for drinking purposes.

Toilet Facilities

Approximately four portable toilet facilities will be provided, (three for men and one for women). These facilities will be cleaned and maintained on a regular schedule.

Washing Facilities

Employees will be provided with washing facilities (e.g., buckets with water and Alconox) at each work location. Water and hand soap (or a similar substance) will be used by each employee upon exiting any controlled work area, prior to breaks, and at the end of daily work activities.

1.10.3.7 Drum Handling.

Where containers of a capacity greater than 10 gallons are used for containerizing chemical products or waste materials, their handling will be accomplished in accordance with the following:

- When not in use, drums/containers will be covered with a tight-fitting lid.
- At the conclusion of each work shift, all drums/containers will be placed in the designated storage area. This area will be identified prior to the start of work activities and properly indicated on site plans/diagrams. Information pertaining to the location of storage areas and their contents will be properly conveyed to all personnel and appropriately annotated in the site logs.
- Mechanical or powered drum handling equipment will be used to move drums/containers. Manual handling of the drums leads to musculo-skeletal injuries and will be avoided to the extent possible.

1.10.3.8 Spill Response.

Spill Prevention

All vessels containing liquid waste will be secondarily contained in a container capable of holding 110 percent of the contents of the primary container, excepting the secondary containment for 55-gallon drums, which will be a container holding four drums that can contain 90 gallons. These vessels will include decontamination water in 5-gallon buckets or 55-gallon drums.

Spill Control

In the event that spill prevention is unsuccessful, spill and discharge containment/control procedures will be implemented. These procedures address decontamination procedure waste, as well as drum and container handling, opening, sampling, shipping, and transport. Spill control material, such as absorbent paper and solids (vermiculite, or other noncombustible absorbent), drums (55-gallon U.S. Department of Transportation 17-E or 17-H), shovels, brooms, and personal PPE to clean up spills will be available with each field crew.

The material used to contain the spill will be placed in Department of Transportation (DOT)-approved waste containers and will be characterized and properly disposed of. If the spill or discharge is reportable and/or human health or the environment are threatened, the National Response Center, the DTSC, and the USACE will be notified as soon as possible.

Spill Control Measures

If a spill occurs, the following actions be taken by Earth Tech:

- Notify the SSO immediately.
- Take immediate measures to control and contain the spill within the site boundaries including the following actions:
 - Isolate and contain spill areas
 - Deny entry to unauthorized personnel
 - Do not allow anyone to touch spilled material
 - Stay upwind; keep out of low areas
 - Keep combustibles away from the spilled material
 - Use water spray to reduce vapors and dust, as needed
 - Take samples for analysis to determine that cleanup is adequate
 - Other actions, as needed.

Solid Spills. Earth Tech will remove and place contaminated materials into dry containers and cover. The container is to be labeled, and its contents are to be disposed of appropriately.

Liquid Spills. The contractor will absorb all liquid spills with sand, clean fill, or noncombustible absorbent material and dispose of the absorbent/spill mixture in the manner specified under decontamination material disposal guidelines.

Discharges

For liquid discharges, Earth Tech will immediately identify the source point of discharge and take measures to eliminate further spills. The discharged material will be absorbed with sand, clean fill, or noncombustible absorbent material and disposed of in the manner specified under decontamination material disposal guidelines. If a discharge of any material that is stored in drums or holding tanks occurs, the following actions will be taken by Earth Tech to reduce potential migration to adjacent properties:

- Notify the SSO.
- Take immediate measures to control the discharge within the site boundaries or beyond the site boundaries, if necessary. These will include the following actions:
 - Contain and eliminate the discharge, if possible
 - Remove or retrieve any discharged liquids, if possible
 - Isolate the hazardous area and deny entry to unauthorized personnel
 - Other actions, as needed.

Notification of Spills and Discharges

If a spill occurs and people or the environment are threatened, Earth Tech will immediately notify the SSO and implement spill and discharge control. The Hazardous Waste Manifest will be signed by authorized personnel of the client. A Spill Report will be provided to the SSO no later than 7 days after the initial report, which will include but be limited to:

- Description of the material spilled including identify, quantity, and a copy of the waste disposal manifest
 - Exact time and location of the spill and description of the area involved
 - Containment procedures utilized
 - Description of the cleanup procedures employed at the site, including disposal of spill residue.

Determination if the spill is reported to the U.S. EPA and/or state and the date upon which the report to the appropriate agency was made, as well as the name of the agency representative who accepted the report. The client will be responsible for making the determination of whether or not a report to regulatory agencies is necessary; however, Earth Tech may be required to file the report.

1.10.3.9 Heat Stress Prevention.

Heat stress can be a significant field site hazard, especially for workers wearing protective clothing. Depending on the ambient conditions and the work being performed, heat stress can occur very rapidly, within as little as 15 minutes. Site

personnel will be instructed in the identification of a heat stress victim, the first-aid treatment procedures for the victim, and the prevention of heat stress casualties.

Workers should be encouraged to immediately report any difficulties or heat-related problems that they may experience or observe in fellow workers. Supervisors should use such information to alter the work-break schedule to accommodate such problems. During breaks, workers should be encouraged to drink plenty of water or other liquids to replace lost fluids and to help cool off. Should any worker exhibit signs of severe heat distress, such as profuse sweating, extreme confusion and irritability, or pale, clammy skin, that worker should be relieved of all duties at once and made to rest in a cool location and drink plenty of water. Anyone exhibiting symptoms of heat stroke (red, dry skin, or unconsciousness) should be taken immediately to the nearest medical facility, and steps should be taken to cool the person during transportation (e.g., clothing removal, wet the skin, air conditioning). Severe heat stress (heat stroke) is a life-threatening condition that must be treated by Kaiser Permanente Medical Center (see Figure 1).

Heat Stress Monitoring

The prevention of heat stress-related accidents/illnesses is best performed through continuous observation of employees and routine heat stress awareness training activities. Heat stress monitoring can be accomplished using one of the techniques discussed in the following paragraphs.

Any results obtained from monitoring techniques should be used as guidance only. To properly mitigate the effects of heat stress, it is necessary to establish a work routine that incorporates adequate rest periods to allow workers to remove protective clothing, drink fluids (vital when extreme sweating is occurring), rest, and recover. The frequency and length of such work breaks must be determined by the individual work location supervisor based upon factors such as the ambient temperature and sunshine, the amount of physical labor being performed, the physical condition of the workers, and protective clothing being used. While heat stress measurement techniques provide guidance in optimizing this routine, breaks must always be sufficient to prevent workers from manifesting symptoms of heat stress, regardless of monitoring results.

Heat-Related Illnesses

The following guidance can be used in the identification and treatment of heat related illness.

Heat Stress. The mildest form of heat-related illness. Victims exhibit irritability, lethargy, and significant sweating. The victim may complain of headache or

nausea. This is the initial stage of overheating, and prompt action at this point may prevent more severe heat-related illness from occurring.

First Aid: Provide the victim with a work break during which he/she may relax, remove any excess protective clothing, and drink cool fluids. If an air conditioned spot is available, this is an ideal break location. Once the victim shows improvement, he/she may resume working; however, the work pace should be moderated to prevent recurrence of the symptoms.

Heat Exhaustion. Usually begins with muscular weakness, dizziness, nausea, and a staggering gait. Vomiting is frequent. The bowels may move involuntarily. The victim may become very pale, with clammy skin, and he or she may perspire profusely. The pulse may become weak and fast; breathing may become shallow. The victim may faint unless he/she lies down.

First Aid: Immediately remove the victim from the work area into a shady or cool area with good air circulation (avoid drafts or sudden chilling). Remove all protective outer wear. Call a physician. Treat the victim for shock. (Make the victim lie down, raise his or her feet 6-12 inches, and keep him or her warm, but loosen all clothing.) If the victim is conscious, it may be helpful to give him or her sips of water. Transport victim to a medical facility as soon as possible.

Heat Stroke. This is the most serious of heat illness, and represents the collapse of the body's cooling mechanisms. As a result, body temperatures often rise to between 105 degrees (°)-110° Fahrenheit (F). As the victim progresses toward heat stroke, symptoms such as headache, dizziness, nausea, and oppression can be noted, and the skin is observed to be dry, red, and hot. Sudden collapse and loss of consciousness follows quickly, and death is imminent if exposure continues. Heat stroke can occur suddenly.

First Aid: Immediately evacuate the victim to a cool and shady area. Remove all protective outer wear and all personal clothing. Lay the victim on his or her back with the head and shoulders slightly elevated. Apply cold wet towels, ice bags, etc., to the head, armpits, and thighs. Sponge off the bare skin with cool water or rubbing alcohol, if available, or even place the victim in a tub of cool water. The main objective is to cool without chilling the victim. Give no stimulants or hot drinks. Since heat stroke is a severe medical condition requiring professional medical attention, emergency medical help should be summoned immediately to provide on-site treatment of the victim and proper transport to a medical facility.

Skin Hazards

Sunburn and prickly heat are both symptoms of skin irritation/damage produced through exposure to sunlight and operating in hot work environments. Protect exposed skin with an appropriate sun-screen. A sun-screen with a sun protection factor (SPF) of 15 or greater is recommended for a full day in the sun. Heat rash, also known as prickly heat, can be prevented by the application of a hydrophobic, water-repellent barrier cream such as Kerodex 71.

1.10.3.10 Cold Stress.

Cold injury (frostnip, frostbite, and hypothermia) may impair a person's ability to work. Low temperatures and wind chill factors should be considered. Adverse and cold climatic conditions are important considerations in planning and conducting site operations. Ambient temperature effects can include physical discomfort, reduced efficiency, personal injury, and increased accident probability.

Control Measures

Dead air space between the warm body and clothing and the outside air is essential. Clothing is worn to keep body warmth in and cold out. Usually, no one type of clothing is best for all weather conditions. Denim is relatively loose woven, and not only allows water to penetrate, but permits wind to blow away the body heat that should remain trapped between the body and clothing. Duck or goose down is good for stopping wind, but is of little use when wet. Plastic or closely woven nylon is good protection from wind and rain, but offers little insulation against cold.

Many layers of relatively light clothing with an outer shell of windproof material maintain body temperature much better than a single, heavy, outer garment worn over ordinary indoor clothing. The more air cells each of these clothing layers has, the more efficiently the body is insulated against heat loss. It is essential that clothing allow some venting of perspiration because wet skin will freeze more rapidly than dry skin. Use all feasible means to keep as dry as possible. Make full use of windbreaks, and avoid exposing skin to the direct effects of wind. The need to wear layers of special clothing may make the wearer very clumsy in performing many routine work procedures. Increased body dimensions must also be considered if tight spaces are encountered. Ensure water consumption is adequate and encouraged. Fluid intake is often neglected in cold weather.

To guard against potential cold stress hazards that could impair ability to work or cause cold injuries, field personnel are advised to

- Wear appropriate cold weather clothing in multiple layers that can be removed as needed

- Carefully schedule work and rest periods to warm the body
- Familiarize themselves with available warm shelters that can be used during breaks
- Use the buddy system to monitor workers' physical condition.

Hypothermia. Hypothermia is the significant loss of body heat. It is a potential hazard whenever cold weather operations are conducted. Hypothermia can be prevented by wearing insulated garments in layers. Chills, pale or cold skin, muscle rigidity, depressed heart rate, and/or disorientation may be signs of early hypothermia.

There are degrees of hypothermia characterized as "moderate" and "severe." A victim suffering from moderate hypothermia may exhibit the signs listed below; the victim will often be conscious but confused. Severe hypothermia is characterized by extremely cold skin; loss of consciousness; faint pulse; and shallow, infrequent, or apparently absent respiration. If the condition is not properly treated, death can result. The onset of severe shivering signals danger to personnel. Any worker who is shivering severely will immediately be moved to a warmer environment.

Signs of hypothermia:

- Severe shivering
- Abnormal behavior
- Slowing of movements
- Stumbling
- Weakness
- Repeated falling
- Inability to walk
- Collapse
- Stupor
- Unconsciousness.

Personnel will be removed from exposure to cold upon the onset of any symptoms associated with hypothermia. Additional emergency procedures include:

- Seek immediate expert help.
- Reduce handling to a minimum. Do not rub or massage the victim.
- Prevent further body heat loss by covering the victim lightly with blankets. Plastic may be used for further insulation. Do not cover the victim's face.

- If the victim is still conscious, administer hot drinks. Encourage activity, such as walking while wrapped in a blanket. Do not administer any form of sedative, tranquilizer, or analgesic (pain reliever), because these may cause heat loss and elevate a moderate case of hypothermia to a severe case.

Chilblain. Chilblain is an inflammation of the hands and feet caused by exposure of the extremities to cold, moist environments. It is characterized by recurrent, localized itching, swelling, and painful inflammation of the fingers, toes, or ears produced by mild frostbite. Such a sequence produces severe spasms accompanied by pain. Insulated gloves and footwear are essential in preventing injury to hands and feet.

1.10.4 Lighting

At a minimum, all portions of each work location will be sufficiently lit so that all surfaces are illuminated at 10-foot candle strength or greater. Since OE work activities are expected to be conducted exclusively outdoors and during daylight hours, the need for supplemental lighting is not anticipated.

1.10.5 Accident or Incident Reports

All accidents and incidents that occur on site during any field activity will be promptly reported to the HSO.

If any Earth Tech employee is injured and requires medical treatment, Earth Tech's Worker's Compensation Adjuster, Sedgwick CMS (877-261-8926) will be notified. The Site Safety Officer will initiate a written report, using the *Supervisor's Report of Incident* form (see Attachment G). The SSO will complete the first two sections and forward to the PM. The PM will complete Section 3 and forward it to the HSO within 24 hours of the incident.

If any employee of a subcontractor is injured, documentation of the incident will be accomplished in accordance with the subcontractor's procedures; however, copies of all documentation (which, at a minimum, must include the OSHA Form 101 or equivalent) must be provided to the HSO within 24 hours after the accident has occurred.

The HSO will review the documentation and will assist in the performance of any necessary accident investigation or other follow-up. The PM will ensure that the recommendations resulting from any investigation are implemented without delay.

1.10.6 Visitor Clearances

Visitors will not be allowed within any controlled work area unless they comply with the health and safety requirements of the OE SSHP and can demonstrate an acceptable need for entry into the work area. All visitors (including the site owner or the owner's representative, regulatory agency representatives, or Earth Tech clients) desiring to enter any controlled work area must be briefed on the hazards associated with the site activities being performed and must acknowledge receipt of this briefing by signing the appropriate tailgate safety briefing form.

If the site visitor requires entry to any exclusion zone, but does not comply with the above requirement, all work activities within the exclusion zone must be suspended. Until these requirements have been met, entry will not be permitted.

1.11 ACTIVITY-SPECIFIC HEALTH AND SAFETY PROCEDURES

The following safety procedures will apply to work operations as specified in the THAs presented in Section 1.9.

1.11.1 Slips, Trips, and Falls, and Protruding Objects

Hazards from protruding objects, careless movements, or placement of materials on paths or in foot traffic areas present a problem with regard to slips, trips, and falls, and puncture wounds. Personnel will use a reasonable amount of effort to ensure the prevention of such injuries.

1.11.2 Hazardous Noise Safety

Working around large equipment often creates excessive noise. The adverse effects of noise can include physical damage to the ear, pain, and temporary and/or permanent hearing loss. Workers can also be startled, annoyed, or distracted by noise during critical activities.

Earth Tech has compiled noise monitoring data indicating that work locations within 25 feet of operating heavy equipment (e.g., earthworking equipment) can result in exposure to hazardous levels of noise (levels greater than 85 decibel, A-weighted sound level [dBA]). Accordingly, all personnel are required to use hearing protection (e.g., ear plugs, ear muffs) within 25 feet of any operating piece of heavy equipment.

The HSO may also choose to monitor employee exposure to hazardous noise levels as part of Earth Tech's Hearing Conservation Program.

1.11.3 Heavy Machinery

The use of heavy earthworking machinery (e.g., excavators/backhoes, bulldozers) poses significant hazards if equipment is not maintained in good working order. In order to assure that all equipment used on site presents no unwarranted safety hazards, the owner/operator of each piece of heavy equipment must perform a safety evaluation and certification. Instructions and a copy of the submittal form can be found in Attachment I.

Working around heavy equipment poses considerable hazards to pedestrian workers and operators of light vehicles. To minimize the hazards, the following requirements will be observed:

1. Operators are responsible for the safe use of their equipment, and must be aware of the location of unprotected personnel at all times while operating this machinery to avoid serious accidents.
2. To improve visibility to operators, all personnel working in an area where heavy equipment operations are ongoing will wear a high-visibility traffic safety vest.
3. Light vehicles (e.g., trucks, tractors) on the Project Site will be equipped with orange flags that extend to a height of at least 8 feet above ground. Vehicles equipped with headlights will activate them at all times when moving.
4. Use of project-constructed haul roads by light vehicles will require coordination with equipment operators to minimize the potential for vehicle accidents.

1.11.4 Hand and Portable Power Tool Safety

The use of hand tools during field operations is a potential source of accidents. Portable power tools (e.g., chainsaws) are not anticipated to be utilized frequently during field activities. However, a fundamental program of using the right tool in a correct manner, together with proper maintenance and storage, is necessary to prevent personal injury and property damage. The following procedures should be observed:

- Access to hand-held and portable power tools should be controlled to prevent use by unauthorized personnel.
- Appropriate PPE should be used by personnel using safety features (e.g., guards). Guards are not to be removed or rendered inoperative unless written permission is obtained from the HSO.

- The Earth Tech SSO should establish and conduct periodic inspections of hand and portable power tools used at the site.
- The Earth Tech SSO should remove from use any damaged, worn, or improper tool.

1.11.5 Operation of an All-Terrain Vehicle

The following requirements will be observed during the operation of tow-tractors and 4-wheel-drive all-terrain vehicle (ATV):

- The vehicle should be operated only by personnel approved by the PM, and only after they have read the operator's manual.
- Protective glasses, gloves, and appropriate footwear should be worn by all occupants, as well as appropriate clothing to protect operator(s) from the weather.
- An observer should accompany the driver during the off-road (i.e., off-pavement) operation. The driver should monitor the vehicle's forward progress, while the observer should monitor for any hazards the vehicle may encounter.
- No passengers, other than the observer, should be allowed to ride on the vehicle.
- The vehicle should be fitted with a fire extinguisher and first aid kit.
- Vehicle refueling should be conducted only within a designated refueling area.
- The vehicle should be operated only during daylight hours.
- Vehicle operators should be in radio communication at all times with the Command Post and other personnel working within designated fieldwork areas.

1.11.6 Underground Utilities

Various forms of underground utility lines or pipes may be encountered during intrusive work activities. Underground Service Alert (USA) will be contacted at least 48 hours prior to the start of intrusive operations.

Should intrusive operations cause equipment to come into contact with utility lines, the SSO and the HSO will be notified immediately, and a Supervisor's Report of Incident will be completed. Work will be suspended until the appropriate actions can be taken for the particular situations assessed.

1.11.7 Electromagnetic Emissions Safety

Electronic fusing devices used in many types of ordnance devices are sensitive to emissions of EM radiation (EMR). Since many of the communication devices and investigation equipment employed on site emit or generate EMR, there is the potential for use of these devices to cause accidental detonation of OE, which may be present on site. To prevent this, the following procedures will be followed:

- An assessment of the safe separation distance (SSD) associated with each transmitter unit (e.g., radios, cellular telephones) will be conducted using the Hazards of Electromagnetic Radiation to Ordnance (HERO) methodology found in Attachment F.

Any device with an SSD greater than 4 feet will not be permitted for use on site until a complete characterization of on-site OE has been conducted. Once characterization has been completed, devices with SSDs exceeding 4 feet can be used at distances greater than the calculated SSD from any identified OE items/areas. No device will be operated at a distance closer than its SSD from any identified OE.

- SSD calculations will be performed on site by the SSC for all emission sources. All use of geophysical instrumentation on the site will be in accordance with Chapter 4.0 of the OE RDD guidelines.

Note: There is no indication or evidence from site records or subsurface sampling activities that HERO-sensitive OE were ever stored, fired, or disposed of by detonation on the Tourtelot Property. These findings are consistent for the time period that the arsenal was operating.

1.11.8 Ordnance and Explosives Safety

OE items present hazards if encountered in subsurface areas during excavations. The fundamental policy to be observed regarding OE is:

***DO NOT TOUCH, HANDLE, OR OTHERWISE DISTURB ANY OE ITEM
UNLESS SPECIFICALLY AUTHORIZED BY THE PM AND SUXOS.***

In addition, use the following information to minimize the hazards to personnel from OE.

1.11.8.1 Ordnance and Explosives at the Project Site.

All personnel must be briefed concerning the potential for OE at the Project Site and any known identifying characteristics of OE items. Chapter 1.0 of the OE RDD provides a history of the Project Site including OE operating and type of OE which may be encountered. When moving about the site, personnel should remain

alert for any OE items that might be present. Each work site should be thoroughly checked for the presence of OE before any other activities commence. In the event that any OE item is observed or expected, the following requirements will be observed:

- Personnel should note the location of the OE item and alert all other personnel in the area to its presence.
- Any work operations occurring within 20 feet of the item will cease. All Earth Tech and subcontractor employees will evacuate this area.
- Under no circumstances will any non-OE-qualified Earth Tech or subcontractor employee attempt to move or otherwise handle any OE/suspected OE item. COLLECTION OF "SOUVENIRS" IS PROHIBITED.

The OE Supervisor/OE Safety Manager will be alerted to the location of the suspected item.

1.11.8.2 OE Hazards.

OE Hazards

OE at the site increases the potential of exposing both site personnel and the general public to explosive environments and conditions. The risk of personnel exposure to OE during site operations will be high since previous site investigations have indicated the presence of OE. In addition, the required tasking of the subcontractor to explosively dispose of any hazardous OE will expose OE personnel to the additional hazards associated with the handling of demolition supplies and demolition operations. The hazards associated with OE exposure and demolition operations include the possibility of personnel injury or death caused by explosion, fire, fragmentation, or over-pressurization. These hazards may result if OE are not properly located, identified, transported, or handled. Extreme caution and adherence to safety procedures must be exercised to minimize the hazards associated with the demolition operations used for disposal of OE. While there are no "hazard-free" procedures for the handling of OE and explosives, maximum safety will be achieved through strict adherence to operational plans, application of relevant safety procedures, and effective supervision of site operations. The procedures that will be used to safely excavate, identify, and dispose of OE found during site operations are outlined in the OE SSHP and Chapter 4.0 of the OE RDD.

General OE Safety Measures

Operations involving the potential for exposure to OE hazards shall be conducted only by, or under the supervision of, appropriately trained OE personnel. Non-OE-

qualified personnel will be allowed to operate in an OE area only when escorted and directly observed by a OE-qualified technician. For the purpose of these safety measures, an OE area is defined as an area that has not been cleared of surface OE hazards and where the potential exists for encountering OE. The general safety measures listed below will be strictly followed during all OE operations:

- Before driving stakes or marker posts into the ground, a magnetometer check of that point will be performed by OE personnel to ensure the location is free of anomalies/OE.
- All personnel will require an escort to enter an OE area until that area has been surveyed and cleared of OE hazards by OE personnel.
- Once an area has been surveyed for OE and identified as free of such hazards by OE personnel other personnel may perform duties in the area unescorted, but must be escorted to and from that area if access is through non-cleared areas.
- Only OE-qualified personnel and heavy equipment operators directly supervised by UXO Technicians will be allowed in the work areas while conducting OE operations requiring an MSD. All other personnel will be located a safe distance outside the MSD from the area of operation.
- All personnel will immediately notify the nearest OE technician if a potential OE item is found. The item will not be disturbed or touched by unqualified personnel.
- Subsurface survey equipment will be tested daily and operated in accordance with the manufacturer's requirements.

Weapons Agents - Chemical

It has been determined that the Project Site should not contain chemical warfare material (CWM). If site personnel identify any items potentially containing CWM, field operations will cease, the subject area will be marked accordingly, all personnel will exit the area upwind, and the local military EOD unit will be notified immediately. OE personnel will secure the area from public access until relieved by local military EOD representatives. Fieldwork will not resume until it has been determined safe to do so.

Excavating and Trenching

Anomaly removal activities could require the excavation of soils deeper than 4 feet to determine the identity of a geophysical anomaly. If excavations deeper than 4 feet are required, they will be conducted in accordance with the following

requirements. Earth Tech or their excavation subcontractor will obtain a Cal/OSHA permit prior to excavating beyond 4 feet in accordance with 8 CCR Section 341.1.

Excavation Construction Guidelines

Trenching and excavation operations will follow the safe operating guidelines presented below when trenches or excavations exceed 4 feet in depth, in accordance with the requirements of 8 CCR Section 1540.

Excavation Construction Guidelines

1. Excavated materials will be stored and retained at least 2 feet from the edge of the excavation. (Note: This procedure should be observed even when excavation/trench entry will not occur.)
2. Surface encumbrances that create a hazard will be removed or made safe before excavation is begun.
3. Based on the prior excavation activities that have occurred at the Project Site, the maximum allowable slope that will be used at the Project Site is 1:1.
4. Excavations will not exceed 20 feet in depth.
5. Materials used for sheeting, sheet piling, cribbing, bracing, and underpinning will be in good, serviceable condition.
6. Special precautions will be taken in sloping or shoring the sides of excavations adjacent to a previously backfilled excavation.
7. All ladders used in excavation operations will be in accordance with the requirements of 8 CCR Sections 1675 through 1678.
8. Excavations may be entered/exited by use of ladders or ramps. The use of buckets, forklifts, or any other machinery not designed for personnel transportation is prohibited at all times.
9. Where ramps, walkways, or bridges are used for employees or equipment, the design and construction will be accomplished by a qualified person in accordance with accepted engineering requirements.
10. When personnel are requested to be in excavations that exceed a depth of 4 feet or more, an adequate means of exit, such as a ladder or steps, will be provided.

11. Excavations will be inspected daily, or more often as conditions warrant, by a competent person to ensure that changes in temperature, precipitation, shallow groundwater, overburden, nearby building weight, vibrations, or nearby equipment operation has not caused weakening of sides and faces.
12. Dust conditions during excavation will be kept to a minimum. Wetting agents shall be used upon the direction of the SSO. (Note: This procedure should be observed even when excavation/trench entry will not occur.)
13. Field personnel shall not enter an excavation that does not meet the requirements of 8 CCR Section 1540 for any reason except to rescue injured individuals who have fallen into the excavated area.

Trench Entry Requirements

These requirements will be enforced whenever personnel are required to enter trenches or excavations:

1. Expected hazardous ground movement areas and banks more than 4 feet high will be shored, laid back to a stable slope, or equivalent.
2. Sides of trenches in unstable or soft material 4 feet or more in depth will be shored, sheeted, braced, sloped, or equivalent.
3. Sides of trenches in hard, compact soil, including embankments, will be shored or otherwise supported when the trench is deeper than 4 feet.
4. Materials used for sheeting, sheet piling, bracing, shoring, and underpinning will be in good, serviceable condition.
5. Additional precautions by way of shoring and bracing will be taken to prevent slides or cave-ins when excavations are subjected to vibrations.
6. When trenches are shored, the standard shoring system will meet the OSHA requirements.

1.11.9 Environmental Contaminant Hazards

1.11.9.1 Explosive Compounds.

Based on existing site data, it is not anticipated that significant occupational exposures can result due to chemicals present in the soils which will be encountered in this project.

TNT is the only explosive on site above the preliminary remediation goal (PRG). TNT is an explosive compound that exhibits relatively stable properties when handled correctly. It has a low sensitivity to impact and friction; therefore, it is commonly used as a military and industrial explosive. TNT has effects similar to those of other nitro-compounds. Long-term exposure to TNT may result in irritation to the gastrointestinal tract. Other indications of exposure to TNT include toxic jaundice, aplastic anemia, methaemoglobaimea (effects of oxygen deficiency), and cataract formation. Exposure routes for TNT are absorption, ingestion, and inhalation, with skin absorption being the primary cause for concern. Dermatitis is not a common illness associated with TNT exposure; however, indications are evident by orange staining of the hands, arms, and face. Papular eruption and reddening of exposed skin has also been observed as a symptom of prolonged skin exposure. The Threshold Limit Value (TLV) is 0.1 milligram per cubic meter (mg/m^3) by the American Conference of Governmental Industrial Hygienists (ACGIH), while federal OSHA has established the PEL for TNT at $0.5 \text{ mg}/\text{m}^3$. Both agencies have applied a "skin" notation to the exposure limits, indicating that dermal exposure is a significant potential hazard.

Protection against skin exposure can be provided by the use of chemically protective gloves and other clothing.

Note: The PM or SSO will inform all personnel prior to entering the Project Site of the potential health effects associated with the use of the medication "Viagra" on a site with explosive constituents. Personnel using Viagra are required to wear Modified Level D PPE at all times while on site. Health hazards due to dermal absorption of explosives while taking Viagra can cause severe illness and death. All personnel are required to wear at least Modified Level D PPE while performing homogenization and excavation of TNT-affected soil to prevent contact with explosive constituents.

1.11.10 Dangerous Plants

Various types of thistle and stinging nettle grow within the designated fieldwork areas. Personnel should avoid these plants if possible. Should work be conducted in areas where these plants are present, standard Level D PPE will reduce, but not eliminate, the risk of injury. In the case of laceration or puncture, simple cleansing of the wound to remove dirt and plant material is usually sufficient. If a thorn or needle remains, seek medical attention to have it excised.

Tetanus prophylaxis may be appropriate following removal of deeply imbedded plant fragments.

The most common type of skin trauma, after needle picks, results from contact with plants in the poison ivy family. Personnel should avoid plants in the poison ivy family if possible. Plants within the poison ivy family include poison ivy, poison oak, and poison sumac. Should work be conducted in areas where these plants are present, standard Level D PPE will reduce, but not eliminate, the risk injury.

One or more contacts with the plant may be necessary before an individual becomes sensitized. The severity of the response varies greatly among personnel sensitized to the allergen. The degree of reaction depends on the amount of allergen, the size of the exposure area, and whether the skin is toughened with calluses at the exposure site. Response at the site of contact may be delayed 12 to 48 hours. The first sign of exposure is reddening of the skin, frequently followed by raised welts. The rash is usually limited to the area of contact, but previous reaction sites may flare. During the next 24 hours, blisters containing nonallergenic, clear fluid form, which cannot spread the rash. Some fluid may weep from the blisters. Intense itching is a prominent and consistent feature of allergic-contact dermatitis. Crusting and scaling begin within a few days and, in the absence of complications or continued exposure, the dermatitis rarely lasts longer than 10 days. Allergic-contact dermatitis affecting eyelids or scrotum is usually expressed as diffuse, raised red blotches. The soles, palms, and hair or scalp are rarely affected.

The best prevention is to avoid contact with the plants. However, if the skin does contact the plant, the dermatitis may be avoided by prompt removal of the allergen. About 10 minutes are required for penetration of the cutaneous by the allergen. Washing the affected area with running water is recommended to remove the allergen, but avoid the use of soap. Soap removes protective skin oils and may cause or hasten penetration of the allergen. Avoid nonpolar solvents, such as alcohol, which may spread the allergen over a wider area. Early application of topical steroids can minimize the severity of the dermatitis. If the face or genitalia is involved, seek professional medical help within 6 hours of exposure.

The allergen may be carried by other objects such as tools or clothing. Personnel should avoid touching the face or genitalia with unwashed hands after possible exposure. Burning poison ivy produces smoke particles that carry the allergen and that may produce extremely severe systemic response.

No barrier creams have been found effective in preventing penetration of the cutaneous by the poison ivy family allergen. Protective clothing that prevents skin contact should be used when there is unavoidable contact or when working in areas where there is a high likelihood of contact.

1.11.11 Dangerous Animals

The Project Site supports some types of dangerous animals (e.g., snakes, stinging insects), and personnel should be alert to their presence. When contact with these animals is made, the following measures should be taken.

1.11.11.1 Stinging Insects.

Avoid disturbing the nest or hive of stinging insects. If bees, wasps, or hornets are disturbed, leave the area. Seek first aid for stings. Individuals with allergic reactions to bee stings should carry a doctor's prescribed bee sting kit.

1.11.11.2 Biting Insects and Spiders.

If mosquitos become a pest, use a commercially available repellent. Spider bites can usually be avoided by carefully observing for spiders when picking up objects or putting hands in enclosed spaces.

- **Black Widows** (*Latrodectus mactans*) are web spiders. The sedentary females may bite if molested. Males move about but do not bite. The Black Widow is found in most warm parts of the world. The bite may go unnoticed and may not hurt. But the subsequent severe abdominal pain from a Black Widow's bite resembles appendicitis. There is also pain in the muscles and in the soles of the feet, but usually no swelling at the site of the bite. Alternately, the saliva flows freely, then the mouth is dry. The bite victim sweats profusely. The eyelids are swollen. The patient usually recovers after several days. Physicians can relieve the severe pain by injection of calcium gluconate. Antivenom is available. No first aid treatment is available for any spider bite.

The black widow spider is recognizable by the following characteristics: The male's abdomen is elongated with white and red markings on sides. The female's abdomen is almost spherical, the lower abdomen is usually marked by two orange to reddish triangles resembling an hourglass. Their habitat is among fallen branches and under objects of many kinds, including furniture, outhouse seats, and trash.

- **Brown Spiders** (*Loxosceles* sp.) commonly live in structures on the floor and behind furniture. Bites occur when a spider rests in clothing or in a towel. There may be no harm at all. In very severe cases, a red zone appears around the bite, then a crust forms and falls off. In any bite from a spider known to be poisonous, it is wise to consult a physician as soon as signs of illness appear.

The Brown Spider, also known as the Brown Recluse Spider or Violin Spider, is recognizable by the orange-yellow back with dark violin pattern. The base of its legs is orange-yellow, and the rest of its legs are grayish to dark brown. Abdomen is grayish to dark brown with no obvious patterns.

There is a possibility that ticks or fleas can be encountered in wooded areas. These insects can be present on plants and animals. Human infestation can occur as a result of direct contact. Both types of insects are mobile, and once infesting a human victim, will move to their preferred locations on the body.

Fleas will congregate in the warmer, less accessible parts of the body. The insects, while producing irritation of the skin (itching), are not directly harmful. However, they can serve as vectors (transmitters) for numerous types of diseases. Ticks will move towards the top part of the body (preferably the head), and can embed themselves into the victims skin and withdraw small amounts of blood. Once imbedded, they are extremely difficult to dislodge. As with fleas, ticks do not themselves present a significant danger; however, they too can transmit various diseases to their victims.

Protection against infestation can be accomplished by wearing long-sleeved shirts and pants, and by avoiding thickly wooded areas and contact with wild animals. Personnel should also inspect each other after working in wooded areas to spot ticks and fleas before they can become established. If a person does become infested, treatment should be provided by a medical professional. The victim should proceed promptly (but not on an emergency basis) to a medical treatment facility.

1.12 HAZWOPER PROTECTIVE ENSEMBLES

Each THA (see Attachment A) provides requirements for PPE; however, in general, personnel performing remedial activities will utilize a Level D ensemble when working on the Site.

Upgrades in PPE ensembles (Level C, Level B, or Level A) are not anticipated due to the low hazard potential associated with the chemicals (see Addendum I Section 4.2). If Site conditions present a more significant inhalation or skin contact hazard than anticipated, work will cease and the HSO will be contacted for additional guidance and development of revised/supplemental documentation.

1.12.1 Level D

Level D protection is the lowest level of personal protection allowed on HAZWOPER sites. Respiratory protection is not required, since concentrations of airborne chemicals are expected to be below applicable action levels.

During HAZWOPER activities, Level D protection will be the primary level of protection worn during all operations where contact with chemically affected materials is unlikely (e.g., geophysical testing). The Level D ensemble provides minimal levels of skin protection.

Level D Equipment List

- Hard hat
- Short-sleeved shirt (tank tops are not acceptable)
- Long pants (shorts or cut-offs are not acceptable)
- Safety-toed work boots
- Safety glasses.

1.12.2 Modified Level D

If the potential exists for contact with chemically affected material (e.g., minor splashes, "dirty operations") but the respiratory hazard is low, the use of a Modified Level D ensemble is appropriate. Modified Level D consists of protective clothing to preclude hazards due to contact with chemically affected materials but does not provide increased respiratory protection. The use of Modified Level D PPE will be required for on-site operations where contact with chemically affected soils can be expected (i.e., sample collection, soil handling/containerization). The Modified Level D ensemble provides moderate skin protection against chemical contact, but no respiratory protection.

Modified Level D Equipment List

- Chemical resistant disposable outer coveralls (e.g., Tyvek™ or poly-coated Tyvek™ coveralls)
- Chemical-resistant outer gloves (taped to outer coveralls)
- Chemical-resistant inner gloves
- Hard hat
- Short-sleeved shirt (tank tops are not acceptable)
- Long pants (shorts or cut-offs are not acceptable)
- Safety-toed work boots
- Safety glasses
- Hearing protection (as required).

1.12.3 Respiratory Protection

The use of respiratory protection is not anticipated for project-related activities based on specific work conditions. Should the use of respirators become necessary, personnel will inspect their respirators prior to and after each use. Additionally, all used filter cartridges will be discarded at the end of each day. Workers may choose to change out filter cartridges more often as they feel necessary or comfortable.

1.13 PROTECTIVE EQUIPMENT REQUIREMENTS

All use of PPE will conform to the requirements provided below. Requirements for task-specific PPE use are specified in the THAs found in Attachment A.

1.13.1 Head Protection

Project personnel will wear hard hats on the work site when working with overhead hazards.

Where necessary, ear protection and faceshields may be attached to hard hats, provided the method of attachment does not compromise the integrity of the hard hat. All hard hats shall meet the requirements set forth in American National Standards Institute (ANSI) Z89.1.

1.13.2 Eye Protection

Eye protection will be worn on work sites at all times unless otherwise directed by the SSO. All selected eye protection will meet the following minimum requirements:

- Provide adequate protection against the particular hazards for which they are designed
- Be reasonably comfortable when worn under the designated conditions
- Fit snugly and not unduly interfere with the wearer's movements
- Be durable
- Be easily cleaned and disinfected.

Where specified due to particular work conditions, eye protection must also meet the impact and durability standards set forth in ANSI Z87.1. However, where this is not specified, the use of commercial sunglasses will be permitted at work sites (due to the limited potential for high-velocity impact hazards associated with most of the work activities performed).

Persons whose vision requires correction and are required to wear eye protection may wear goggles or spectacles of one of the following types:

- Spectacles whose protective lenses provide optical correction (Rx)
- Goggles that can be worn over corrective (Rx) spectacles without disturbing the adjustment of the spectacles
- Goggles that incorporate corrective (Rx) lenses mounted behind the protective lenses.

1.13.3 Hearing Protection

Appropriate hearing protection (ear plugs, canal caps, or ear muffs) will be provided when noise may be a problem, such as around heavy machinery, power support equipment, and impact tools. All hearing protectors will provide a minimum noise reduction rating (NRR) of 25. Employees who may be exposed to hazardous noise must be participants in a hearing conservation program that meets the requirements of 29 CFR Part 1910.95.

1.13.4 Foot Protection

Employees will wear appropriate foot protection while working on site, which will consist of leather or chemical-resistant boots (as appropriate) with safety toes. All footwear must meet the specifications of ANSI Z41.1. EXCEPTION: Footwear used by UXO Technicians and geophysical technicians is not required to have a safety-toe.

1.13.5 Hand Protection

Employees will use appropriate hand protection when exposed to hazards that could cause injury to the hands. Gloves must resist puncturing and tearing as well as provide any necessary physical abrasion or chemical resistance.

Where the use of chemically protective gloves is specified below, the following items will be acceptable:

Inner Gloves

- Best Safety Model N-Dex gloves (nitrile rubber)
- Other models approved on a case-by-case basis by the HSO.

Outer Gloves

- North Model Solvex gloves (nitrile rubber)
- Other models approved on a case-by-case basis by the HSO.

1.14 OVERALL SITE CONTROL

Overall control of the Project Site is the responsibility of Earth Tech. Access to the site will be secured through an entrance gate to the Project Site and will be limited to authorized personnel only.

1.14.1 Work Area Control

Earth Tech is responsible for properly controlling its work locations to prevent injury to other personnel operating at the site. To ensure that conflicts do not occur, Earth Tech will coordinate daily work activities with the other organizations performing work at the site (if any), and will inform each organization of the hazards and clearance requirements for each work activity so that they can inform/manage their personnel accordingly.

The following requirements describe the work zone control procedures to be implemented with respect to soil remediation and OE clearance activities. Additional OE-related site control measures are specified in the OE RDD.

1.14.1.1 Exclusion Zones.

For ordnance work, a minimum separation area (MSA) will be set for each activity as described in Chapter 4 of the OE RDD, which discusses the MSD and associated MSA.

For chemical remediation will be such that all physical, noise, and chemical-related hazards are fully contained within. Where feasible, boundaries of each exclusion zone will be designated using cones, yellow "CAUTION" tape, and/or other positive physical/visual barriers. However, it is recognized that during some work operations (i.e., manual excavation), the work pace will preclude use of this equipment. In such instances, visual control of the work area should be adequate due to the limited potential for unexpected entry.

Within each exclusion zone, Earth Tech will have complete control of all operations and personnel. Only Earth Tech-authorized personnel, who must

meet the training and medical monitoring requirements specified in Sections 11.1.2, will be permitted within any exclusion zone. Once an exclusion zone is established, access will be limited to qualified personnel equipped with the proper PPE.

1.14.1.2 Contamination Reduction Zone.

Since it is considered unlikely that significant soil contamination will be encountered, there is limited need for establishment of a specific contamination reduction zone (CRZ) around each exclusion zone. Instead, Earth Tech will establish designated entry/exit areas that will serve as decontamination locations.

1.15 EMERGENCY CONTINGENCY PLAN

There are four types of emergencies that could occur during performance of this project:

- Illness and physical injury
- Catastrophic event at the work site (fire, explosion, earthquake, or chemical)
- Catastrophic event involving site personnel and/or equipment.
- Catastrophic event off the worksite (Valero).

Although a catastrophic event or severe medical emergency is unlikely to occur during work activities, an emergency contingency plan has been prepared for this project should such a critical situation arise.

The PM is responsible for notifying all federal, state, and local government organizations as specified in the OE RDD. The Valero Plant is a minimum of 1,125 feet from the Project Site boundaries. The Project Manager or SSO will notify the Valero Health and Safety Department prior to initiating site activities and provide contact numbers for Valero to use to contact Earth Tech in the event of an accident at the refinery. Additionally, the PM or SSO will notify Valero in the event of an accident or incident on the Project Site.

1.15.1 Responsibilities

1.15.1.1 Site Safety Officer.

The SSO will be the primary contact individual and coordinator of all emergency activities. Responsibilities include:

- Evaluating the severity of the emergency
- Implementing appropriate response action
- Summoning appropriate emergency services (e.g., fire department, ambulance)
- Notifying all site personnel, the HSO, and concerned authorities of the emergency situation.

1.15.1.2 Other On-Site Personnel.

It will be the obligation of the field personnel to inform the SSO of all emergency situations and to abide by their issued response actions. Special medical problems of field personnel (e.g., allergies to insects, plants, prescription medication) will be reported to the SSO.

1.15.2 Emergency Equipment

Provisions will be made to have appropriate emergency equipment available and in proper working condition.

1.15.2.1 First Aid Kits.

Each work team will have access to a first-aid kit meeting the following requirements:

- First-aid kits in weatherproof containers, approved by Earth Tech's Occupational Physician and meeting all regulatory requirements, will be present at all locations where Earth Tech employees will be working.
- First-aid kits will be available at the job site at all times.
- Use of any item from the first-aid kit will necessitate completion of an Accident/Injury Report. The report will be submitted to the HSO within 1 working day of the incident.
- First-aid kits will be inspected and restocked weekly. An inventory of first-aid supplies sufficient to restock kits on a weekly basis will be maintained.
- Personnel permitted to use first-aid kits will possess a current first-aid provider card.

1.15.2.2 Fire Extinguisher.

A fire extinguisher with a minimum rating of 1A:10B:C will be available to each work team, and within 50 feet of any work location. Personnel will be made aware of the location of the nearest fire extinguisher at all times.

1.15.3 Notification and Recordkeeping

Any injury or illness will be immediately reported to the PM, who will implement any immediate corrective actions and report the incident to the HSO. OSHA requires notification within 24 hours, and preferably during the same work shift, in the event of a fatality or severe injury requiring hospitalization. The HSO will make such notifications to OSHA and consequently must receive the information in time to make the notification without penalty.

1.15.4 Response Actions - Safety Equipment Problems

An emergency may develop due to malfunction or other problems associated with use of health and safety equipment by field personnel. These equipment problems must be corrected before field activities can be continued. Health and safety problems that may occur include:

- Leaks or tears in protective clothing
- Failure of respiratory protective devices
- Encountering contaminants for which prescribed protective equipment may not be suitable.

1.15.5 Response Actions - Medical Emergencies

Medical emergencies can be described as situations that present a significant threat to the health of personnel. These can result from chemical exposures, heat stress, cold stress, and poisonous insect or snake bites. Medical emergencies must be dealt with immediately, and proper care should be administered. This may be in the form of first aid and emergency hospitalization.

Telephone numbers and locations for the local fire department, hospitals, ambulance service, and other emergency services will be maintained by the SSO (see Figure 1; Table 2). Information regarding nonemergency medical treatment for on-site injury, on-site illness, or on-site exposure to chemical contaminants will be provided to the hospital by the SSO. Communication methods available on site will be a hard-line telephone in the Command Post, cellular telephones (carried by SSO and PM), and hand-held radios.

1.15.6 Response Actions - Worksite Catastrophic Events

In the event of a catastrophic incident at the worksite:

- Work activities will cease and all project personnel will be evacuated from the work location. The evacuation will proceed in a direction opposite of the critically affected area with all personnel assembling in a predesignated location outside of the job site proper.
- A headcount will be taken of the assembled employees, and any injured individuals will be administered first aid.
- If not present at the work location, the SSO will be contacted immediately. Immediate notification of the event will be provided to the PM or HSO by the SSO.

Table 1. Contaminants of Concern by Location and Concentration Range

Page 1 of 2

Contaminant	Site	State	Low	High
2,4,6-Trinitrotoluene	TNT Strips	Solid	2 mg/kg	380,000 mg/kg
Antimony	Flare Site	Solid	ND (0.18 mg/kg)	150 mg/kg
Arsenic	TNT Strips	Solid	7.9 mg/kg	25.3 mg/kg
	Howitzer Test Facility	Solid	7.6 mg/kg	24.7 mg/kg
	Ammunition Renovation/Primer Destruction Site	Solid	6 mg/kg	27.1 mg/kg
	Flare Site	Solid	7.1 mg/kg	37.4 mg/kg
	Demolition Site #1	Solid	11.7 mg/kg	18 mg/kg
	Demolition Site #2	Solid	13 mg/kg	19 mg/kg
	Demolition Site #3	Solid	4.4 mg/kg	21.6 mg/kg
	Wetlands	Dissolved Solid	15 mg/kg	15 mg/kg
Barium	Flare Site	Solid	190 mg/kg	20,000 mg/kg
Copper	Flare Site	Solid	47.5 mg/kg	81,000 mg/kg
Iron	TNT Strips	Solid	25,000 mg/kg	51,000 mg/kg
	Howitzer Test Facility	Solid	34,800 mg/kg	51,900 mg/kg
	Ammunition Renovation/Primer Destruction Site	Solid	26,300 mg/kg	48,200 mg/kg

Table 1. Contaminants of Concern by Location and Concentration Range

Page 2 of 2

Contaminant	Site	State	Low	High
	Demolition Site #3	Solid	37,500 mg/kg	48,600 mg/kg
	Wetlands	Dissolved Solid	44,000 mg/kg	44,000 mg/kg
Lead	Flare Site	Solid	8.1 mg/kg	7,600 mg/kg
Manganese	TNT Strips	Solid	290 mg/kg	3,800 mg/kg
benzo(a)pyrene	Ammunition Renovation/Primer Destruction Site	Solid	0.11 mg/kg	0.11 mg/kg
2,3,7,8- tetrachlorodibenz o-p-dioxin	Flare Site	Solid	1.5 pg/g	1.5 pg/g
total hexachlorinated dibenzo-p-dioxins	Flare Site	Solid	110 pg/g	110 pg/g

mg/kg = milligrams per kilogram
 ND = non-detect
 pg/g = picograms per gram
 TNT = trinitrotoluene

Table 2. Emergency Contacts and Telephone Numbers

Fire Department	911
Fire Department - Non-emergency	745-2424
Ambulance	911
Ambulance - Non-emergency	552-1187
Police	911
Police - Non-emergency	745-3411
Information and Response Organizations	
California Dept. of Health Services (Sacramento)	(916) 445-4171
EPA Region IX (San Francisco)	(415) 974-8071
Earth Tech Personnel	
Health and Safety Officer	
Robert Poll, CIH, CSP	(562) 951-2242
	Mobile: (562) 884-1414
Project Manager	
Brian Weith	(909) 554-5063
	Pager: (909) 433-8488
Site Safety Officer	
TBD	TBD
OE Safety Manager	
Greg Peterson	(909) 554-5057
	Pager: (909) 872-9839

Directions to Hospital

From the site, head south on east 2nd Street to Interstate 780. Proceed west on I-780 to Highway 80. Head north on 80 and exit at Redwood Street. Head west on Redwood and make a right onto Fairgrounds Drive. Proceed north on Fairgrounds Drive to Serrano Drive. Make a left onto Serrano and the hospital will be on the left-hand-side of the street.

Figure 1

TBD

ATTACHMENT A
EARTH TECH STANDARD PROCEDURES

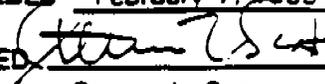
STANDARD PROCEDURE

SUBJECT
ACCIDENT REPORTING, INVESTIGATION, AND REVIEW

PROCEDURE NO. HS203

DATE December 5, 1995

SUPERSEDES February 7, 1995

APPROVED 
Steven L. Scott

1.0 PURPOSE AND POLICY

1.1 Purpose

This procedure prescribes the requirements for incident reporting, investigation, and review. Key requirements include:

- All injuries, vehicle accidents, and significant near miss incidents must be reported and investigated promptly, to determine root cause and prescribe corrective action.
- OSHA-Recordable injuries and illnesses and chargeable vehicle accidents must be reviewed by the Accident Review Board. The Accident Review Board report is submitted and approved through the chain of management to the President.
- All incidents involving a fatality, multiple injuries, major injury, or major property damage shall be immediately reported to the Group President, Division Vice President, Corporate Environmental Health and Safety Director, and General Counsel.
- All Departments/Sections must submit *Supervisor's Report of Incidents* to Environmental Health and Safety within 24 hours of the injury. (Reports of incidents where no injury occurred are not as time-critical.)

1.2 Policy

It is the policy of EARTH TECH that all accidents resulting in injury or property loss and significant near miss incidents be reported, investigated, and evaluated for the benefit of improving the management of the Company.

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3.0 RESPONSIBILITY MATRIX

- 3.1 Procedure Responsibility.** The Corporate Director, Environmental Health and Safety is responsible for the issuance, revision, and maintenance of this procedure.
- 3.2 Action/Approval Responsibilities.** The Responsibility Matrix is Attachment 1 in Section 8.0.

4.0 DEFINITIONS

Chargeable Vehicle Accident. Any at-fault vehicle accident meeting any one of the following criteria:

1. Any individual sustains an OSHA-recordable injury as a result of the accident
2. An individual other than an employee of EARTH TECH is a party in the accident
3. Property owned by a person or entity other than EARTH TECH is damaged
4. When only EARTH TECH employees, EARTH TECH owned or leased (not rented) vehicles, and EARTH TECH property is involved and damage exceeds \$1000.00.

Company. EARTH TECH, Inc.

Department/Section/Location Manager. The business unit manager of the involved organization. Various parts of the Company are organized in different ways. Small offices sometimes have a section or department number that is the same as the location code. In these small offices, the department or section manager is also the location manager and is also known as the business unit manager. In other small offices, the office is viewed as the branch of a larger department or section. In these cases, the location manager is not the section or department manager. Some of the larger offices hold many sections and departments. The location manager may be a staff manager with no line management responsibility. Regardless of the organization, the intent in this procedure is the Department/Section/Location Manager is at a management level equal to or above the program manager or the project manager.

EHS. Environmental Health and Safety

EHS Professional. A person certified by the American Board of Industrial Hygiene or the Board of Certified Safety Professionals who works to prevent injury or illness.

EHS Staff. A person whose primary work assignment is to prevent injury or illness.

Lost Workday Injury. Cases which involve days away from work or days of restricted work activity or both. Days away from work are: the number of workdays (consecutive or not), excluding the date of injury, the employee would have worked, but could not because of occupational injury or illness; and/or the number of workdays (consecutive or not), excluding the date of injury, on which, because of injury or illness:

1. The employee was assigned to another job on a temporary basis
2. The employee worked at a permanent job less than full time
3. The employee worked at a permanently-assigned job, but could not perform all duties normally connected with it.

Major Injury/Illness. When an employee is hospitalized for more than observation, the injury or illness is considered major.

Major Property Damage. Major property damage has occurred when preliminary loss estimates exceed \$5000.

Near Miss Incident. Any incident where no injury occurred, but where the potential for injury existed. A significant near miss incident is an incident in which tragedy is narrowly averted.

OSHA Recordable Injury. All work-related deaths and illnesses, and those work-related injuries which result in:

1. Loss of consciousness
2. Restriction of work or motion
3. Transfer to another job
4. Require medical treatment beyond first aid (see Attachment 6 in Section 8.0).

5.0 PROCEDURE

5.1 Accident/Injury/Near Miss Report.

All incidents involving a fatality, major injury or illness, or major property damage shall be reported to the Group President, Division Vice President, Corporate Environmental Health and Safety (EHS) Director, General Counsel and the Regional/Divisional EHS Manager as soon as possible, but not later than the close of business on the day of the incident. The Corporate EHS Office will notify the EARTH TECH Medical Director to arrange prompt follow-up with the treating physician regarding lost or restricted workday incidents,

5.1.1 Employee

Reports all injuries, illnesses, accidents, and near miss incidents having the potential for injury to his/her supervisor immediately.

5.1.2 Supervisor

- Arranges appropriate medical care via the EARTH TECH clinic, emergency room, 911, or on site first aid provider, as appropriate.
- Immediately notifies the responsible EHS Professional.
- Completes Form HS203-F1 *Supervisor's Report of Incident* (Attachment 2) as soon as possible, but no later than 24 hours after the incident, and forwards to Manager.
- If employees are injured, notifies the Regional Human Resources Representative to initiate the workers' compensation process.

- Immediately notifies General Counsel and Corporate EHS Director in the event of a fatality or multiple serious injuries.
- Any supervisor with first-hand knowledge of an accident or injury, but preferably the supervisor directly responsible for the involved employees, may accomplish the required reporting.

5.1.3 Manager

- The Department/Section or Program Manager reviews the *Supervisor's Report of Incident*, adds comments, concurrence, clarification, or recommendations to achieve correction, signs in the Manager's block and forwards the form to the Environmental Health and Safety Department within 24 hours of the accident.
- Ensures a copy of the *Supervisor's Report of Incident* for each incident is forwarded to Corporate EHS Director in a timely way so that the OSHA Form 200 *Log of Injuries and Illnesses* is current and accurate. OSHA considers violations of their recordkeeping regulations to be willful with penalties as high as \$70,000 for each infraction.

5.1.4 Environmental Health and Safety Professional

- Ensures necessary information regarding the incident is recorded and reported.
- Reviews, evaluates, and comments on the *Supervisor's Report of Incident*.

5.1.5 Regional/Division EHS Manager

- Serves as EHS Professional when no other EHS Professional is assigned to the organization which sustained the incident.
- Expedites incident reporting by the Supervisor.
- Assists Manager to evaluate processes, procedures, and actions which led to the incident.
- Expedites timely reporting of the incident and coordinates notification to all appropriate levels of management.

5.1.6 Corporate EHS Director

- Classifies the incident and records on the *OSHA Form 200 Log of Injuries and Illnesses* or equivalent form. Attachment 6 includes Injury/Illness Classification Guidelines.
- In the case of a fatality or multiple serious injuries involving five (5) or more employees, confers with General Counsel and CEO, and notifies the OSHA District Office nearest the site of the occurrence on the same business day as the accident, if possible, but in no case longer than 24 hours after the accident.

- Notifies the EARTH TECH Medical Director to arrange prompt follow-up with the treating physician regarding lost or restricted workday incidents

5.2 Accident/Injury Investigation.

All injuries, illnesses, property damage accidents, and significant near miss incidents shall be investigated. The level of effort expended for the accident investigation is commensurate with the actual or potential seriousness of the injuries, illnesses, or property damage.

The investigation shall be started immediately after the occurrence and completed as soon as possible, generally within 3-5 days after the occurrence. A written report (optional sample form provided as Attachment 3) is submitted to the Department/Section Manager, with a copy to the Regional/Division EHS Manager and the Corporate EHS Department.

5.2.1 Supervisor

- Take control of investigation once immediate medical care for injured personnel has been accomplished.
- Obtain assistance from the operations/discipline manager, health and safety professional, and others as appropriate, to conduct investigation.
- Collect the facts about the accident, including a descriptive narrative of the conditions which led to the accident.
- Describe and document how the accident occurred. Include sketches, photos, and any relevant documentation.
- Obtain in addition to the above information, reports from external sources, such as police, insurance carriers, testing laboratories, etc. These reports should be obtained as soon as they become available and included in the investigation report.
- List witnesses and collect written statements when possible.
- Identify and discuss the causative factors.
- Identify the unsafe act or unsafe condition that existed at the time of the accident.
- Identify systematic and management deficiencies.
- List the corrective actions to be taken to prevent re-occurrence of this type of accident, the responsible person, and the date by which action is to be completed.

5.2.2 Operations Manager. Provides appropriate manpower to assist in the investigation.

5.2.3 Discipline Manager. Provides appropriate manpower to assist in the investigation.

5.2.4 Regional/Division Environmental Health and Safety Manager.

- Provides guidance to Supervisor to ensure proper conduct of investigation.
- Provides appropriate manpower to assist in the investigation.

5.3 Accident Review Board.

Management review of accidents is the key to prevention of future incidents, and is a key part of each managers responsibility to implement effective health and safety practice.

5.3.1 When to Convene

Each Department/Section/Location Manager who experiences an accident classified as an OSHA recordable, or a chargeable vehicle accident shall convene an accident review board. The actions of the Accident Review Board are more effective the sooner the Board convenes after an accident, providing the involved managers and discipline leaders are available. Convening the Board within 10 days of the incident is a good guideline when practical. The purpose of the board is to review the information gathered for each accident and take appropriate action to prevent recurrence of the accident. Identified action items shall be assigned to appropriate individuals with a schedule of completion. These action items will be tracked, with reports sent to the Group President and/or the Division Vice President as appropriate.

5.3.2 Composition of Board

The Accident Review Board shall be composed of the appropriate members of management and staff, depending on the seriousness of the accident and the management actions likely to be taken to prevent recurrence. Typical Accident Review Boards usually include the Department or Section or Location Manager, the operations or discipline manager and an EHS Staff. When appropriate, a representative of other internal sources of expertise may be requested to sit on the Board.

Accidents which result in actual or potential significant adverse action against the Company shall include a member of the Corporate staff to be included on the Accident Review Board. Accidents resulting in third party fatality, serious injury, or major property loss would be considered to have a significant adverse impact on the Company.

5.3.3 Conduct of Review

The Accident Review Board shall meet with the employee having the accident and his/her supervisor to conduct a detailed review of the accident. The

Accident Review Board examines the documents such as HS203-F1 *Supervisor's Report of Incident*, HS203-F2 *Accident/Injury Investigation*, OSHA Form 101, worker's compensation insurance reports, or police reports to determine the cause and to prevent future accidents. Additional information regarding the accident may be needed and should be added to the record. Note that it is not acceptable to discipline an employee for having an accident. However, when the investigation determines that the accident resulted from a violation of company policy on the employee's part, the employee should be subject to disciplinary action according to EARTH TECH's progressive discipline system.

5.3.4 Accident Review Board Report

The completed Accident Review Board Report Form (Attachment 6) shall be reviewed and signed by the following progression (as appropriate):

- Department/Section/Location Manager
- Regional/Division Environmental Health and Safety Manager
- Division Vice President
- Group President

The Group President will then forward the original to the President of EARTH TECH, with a copies to General Counsel and Corporate EHS Director. The Corporate EHS Director distributes a summary to all EHS Managers.

5.4 Monthly Loss Report.

5.4.1 Regional/Division Environmental Health and Safety Manager.

- Completes and distributes copies of Form HS203-F3 *Monthly Loss Report* (Attachment 5) to Corporate EHS, Group President/Division Vice President, and Department/Section Manager.
- Includes a copy of Form HS203-F1 *Supervisor's Report of Incident* for each incident with the *Monthly Loss Report*.

5.4.2 Regional Human Resources.

- Provides a copy of each workers' compensation claim to Corporate Environmental Health and Safety.
- Provides a copy of the quarterly loss report from the workers' compensation insurance carrier to Corporate Environmental Health and Safety.

5.4.3 Corporate Environmental Health and Safety.

- Provides a copy of the *OSHA Form 200 Log of Injuries and Illnesses* or equivalent form to each location each month.
- Provides copy of Form HS203-F1 *Supervisor's Report of Incidents* to Human Resources

6.0 EXCEPTION PROVISIONS

None permitted.

7.0 CROSS REFERENCES

HS105 Record Keeping and Statistical Reports
HS603 Occupational Injury and Illness

8.0 FORMS AND CHECKLISTS

Attachment 1: Responsibility Matrix
Attachment 2: Form HS203-F1 *Supervisor's Report of Incidents*
Attachment 3: Form HS203-F2 *Accident/Injury Investigation*
Attachment 4: Form HS203-F3 *Accident Review Board Report*
Attachment 5: Form HS203-F4 *Monthly Loss Report*
Attachment 6: Injury/Illness Classification Guidelines

RESPONSIBILITY MATRIX

Action	Procedure Section	Injured Employee	Employee's Supervisor	Manager	Project/ Location EHS Rep	Regional/ Division EHS Manager	Corporate EHS Director
Reports injury, illness, incident	5.1.1	X	X				
Arrange medical care	5.1.2		X				
File reports	5.1.3		X	X	X	X	
Investigates accident	5.2		X		X		
Notifies OSHA, Medical Director	5.1.5						X
Conducts Accident Review Board	5.3			X			
Submits Monthly Loss Report	5.4		X	X	X	X	
Provides notification to HR	5.4		X				X

Supervisor's Report of Incident E A R T H T E C H N

This is an official document to be initiated by the injured employee's supervisor. Please answer all questions completely. This report must be forwarded to Health and Safety office within 24 hours of the injury.

Injured's name		S.S.No.	Sex	Birthdate
Home address		City	State	Zip
Job Title	Section	Hire date	Hourly wage	Phone
Property Damaged				Value
Vehicle		<input type="checkbox"/> Chargeable <input type="checkbox"/> Non-chargeable <input type="checkbox"/> Not at Fault <input type="checkbox"/> DOT		

Supervisor

Date of incident	Time	Time reported	To whom
Client name	Client address		Time shift began
Exact location of incident		Did injured leave work?	When?
Has injured returned to work? <input type="checkbox"/> Yes <input type="checkbox"/> No		Did employee miss a regularly scheduled shift? <input type="checkbox"/> Yes <input type="checkbox"/> No	
Doctor/hospital name		Address	
Witness name		Statements attached <input type="checkbox"/> Yes <input type="checkbox"/> No	
Nature of injury		Body part	
Medical attention			
Job assignment at time of incident			
Describe incident			
What caused the incident?			
What corrective action has been taken to prevent recurrence?			
Supervisor/foreman Print name		Signature	Date

Manager

Comments on incident and corrective action		
Manager Print name	Signature	Date

Environmental Health and Safety

Concur with action taken? <input type="checkbox"/> Yes <input type="checkbox"/> No Remarks:		
OSHA classification <input type="checkbox"/> Incident only <input type="checkbox"/> First aid <input type="checkbox"/> No lost work days <input type="checkbox"/> Lost work days <input type="checkbox"/> Restricted activity <input type="checkbox"/> fatality		
Days away from work	Days of restricted work	Total days charged
EHS Professional Print name	Signature	Date

Accident Review Board

E A R T H  T E C H

The Board

Date of Board	Location
Board Member	Board Member
Board Member	Board Member

The Accident

Accident Date	Type
Report Complete: Yes No	Investigation Complete Yes No
Employee Name	Employee Signature
Employee Name	Employee Signature
Supervisor Name	Supervisor Signature
Supervisor Name	Supervisor Signature
Cause of Accident	
Action by Board	

Acceptance and Approval

ACCEPTED Employee Signature	ACCEPTED Supervisor Signature
APPROVED EHS Manager	REJECTED FOR
APPROVED Department/Section Manager	REJECTED FOR
APPROVED Division Manager/Group President	REJECTED FOR

Monthly Loss Report



Reporting Period: _____

Report Covers (Group, Division, or Region): _____

Occupational Injuries and Illnesses

Department/Section Name	Dept/Sec. Number	First Aid	OSHA Recordable	Lost Workday Cases	Total Cases

Summary of Occupational Injuries and Illnesses

Employee Name	Dept/Sec. Number	Date of Injury/Illness	Number of Days Lost	Number of Days of Restriction	Description

Summary of Vehicle and General Liability/Property Damage Accidents

Employee Name	Dept/Sec. Number	Date of Accident	Vehicle Identification	Third Party (Y or N)	Description

Report completed by: _____

Date: _____

Distribution:

- Corporate EHS
- Group President/Division Manager
- Department/Section Manager

Injury/Illness Classification Guide

MEDICAL TREATMENT

The following are generally considered medical treatment. Work-related injuries that receive this type of treatment are considered OSHA-recordable.

- Treatment of infection
- Application of antiseptics during second or subsequent visit to medical care provider
- Treatment of second or third degree burns
- Application of sutures, stitches, or butterflies in lieu of sutures
- Removal of foreign body imbedded in eye
- Removal of foreign body from wound, if procedure is complicated because of depth of imbedment, size, or location
- Use of prescription medications, except single dose administered on first visit for minor pain or discomfort
- Hypodermic injection, excluding tetanus booster given for prophylaxis
- Use of hot or cold soaking therapy during second or subsequent visit to medical care provider
- Cutting away dead skin or tissue, surgical debridement
- Application of heat therapy during second or subsequent visit to medical care provider
- Use of whirlpool bath therapy during second or subsequent visit to medical care provider
- Positive x-ray diagnosis, including fractures, broken bones, herniation, etc.
- Treatment for an amputation involving loss of bone or function
- Admission to a hospital or equivalent medical care facility for treatment

FIRST AID TREATMENT

The following are generally considered first aid treatment. Work-related injuries that receive only first aid treatment and that do not result in lost time or restricted work activity are usually not OSHA recordable. An injury or illness that results in loss of consciousness, time away from work on days following the day of occurrence, restriction of work or motion, or transfer to another job is always OSHA-recordable.

- Application of antiseptics during first visit to medical care provider
- Treatment of first degree burns
- Application of bandages during any visit to medical care provider
- Use of elastic bandages during first visit to medical care provider
- Removal of foreign bodies not imbedded in eye, if only irrigation is required
- Removal of foreign bodies from wound, if procedure is not complicated, for example, if removal is by tweezers or other simple technique
- Use of non-prescription medications and administration of single dose of prescription medication for the relief of minor pain or discomfort
- Soaking therapy on initial visit to medical care provider or removal of bandages by soaking
- Application of hot or cold compresses during first visit to medical care provider
- Application of heat therapy during first visit to medical care provider
- Use of whirlpool bath therapy during first visit to medical care provider
- Negative x-ray diagnosis
- Observation of injury during visit to medical care provider
- Tetanus booster injection given for prophylaxis

STANDARD PROCEDURE

SUBJECT

HAZARD COMMUNICATION

Steven L. Scott

1.0 PURPOSE, POLICY, AND SUMMARY**1.1 Purpose**

This procedure presents a program and a system whereby every employee has access to and receives the information about the materials that he/she is working with so that he/she may protect against the hazards presented by the materials.

1.2 Policy

It is the policy of EARTH TECH that every employee shall have the knowledge of the materials that he/she is working with so that he/she will take adequate precautions to prevent harm to him/herself, the community and the environment.

1.3 Summary

This Hazard Communication Program applies to products and commodities which are known to be present in the work place in such a manner that employees may be harmed by an exposure under normal conditions of use or in a reasonably foreseeable emergency resulting from work place operations. This Hazard Communication Program does not apply to articles, food, cosmetics, radioactive materials or waste/hazardous waste. The Hazard Communication Program contains the following elements:

- A person designated to be responsible for the Hazard Communication Program
- An inventory of all products and commodities that are at the workplace in the form of liquids, compressed gasses, powders, granules, pastes, gels, etc.
- Material Safety Data Sheets (MSDS) for all hazardous materials in the workplace
- Training for all employees who work with hazardous materials
- Procedure to ensure all containers of hazardous materials are properly labeled
- Procedure to access and protect proprietary and trade secret information
- Procedure to protect visitors to the workplace

- Procedures for multi-employer work sites
- A written program.

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3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility. The Corporate Director, Environmental Health and Safety is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities. The Responsibility Matrix is Attachment 1 in Section 8.0.

4.0 DEFINITIONS

Article. A manufactured item:

- (1) Which is formed to a specific shape or design during manufacture;
- (2) Which has end use function(s) dependent in whole or in part upon its shape or design during end use; and
- (3) Which does not release, or otherwise result in exposure to, a hazardous substance under normal conditions of use or in a reasonably foreseeable emergency resulting from workplace operations.

Blasting Agent. Any material or mixture consisting of a fuel and oxidizer, intended for blasting not otherwise classified as an explosive, provided that the finished product, as mixed and packaged for shipment, cannot be detonated by means of a No. 8 test blasting cap when unconfined.

CAS number. The unique identification number assigned by the Chemical Abstracts Service to specific chemical substances.

Chemical name. The scientific designation of a chemical in accordance with the nomenclature system developed by the International Union of Pure and Applied Chemistry (IUPAC) or the Chemical Abstracts Service (CAS) rules of nomenclature, or a name which will clearly identify the substance for the purpose of conducting a hazard evaluation.

February 1, 1980

Combustible liquid. Any liquid having a flashpoint at or above 100°F (37.8°C), but below 200°F (93.3°C), except any mixture having components with flashpoints of 200°F (93.3°C), or higher, the total volume of which make up 99 percent or more of the total volume of the mixture.

Common name. Any designation or identification such as code name, code number, trade name, brand name or generic name used to identify a substance other than by its chemical name.

Compressed gas. Compressed gas means:

(A) A gas or mixture of gases having, in a container, an absolute pressure exceeding 40 psi at 70°F (21.1°C); or

(B) A gas or mixture of gases having, in a container, an absolute pressure exceeding 104 psi at 130°F (54.4°C) regardless of the pressure at 70°F (21.1°C); or

(C) A liquid having a vapor pressure exceeding 40 psi at 100°F (37.8°C) as determined by ASTM D-323-72.

Container. Any bag, barrel, bottle, box, can, cylinder, drum, reaction vessel, storage tank, tank truck, or the like that contains a hazardous substance. For purposes of this section, pipes or piping systems are not considered to be containers.

Designated representative. Any individual or organization to whom an employee gives written authorization to exercise such employee's rights under this section. A recognized or certified collective bargaining agent shall be treated automatically as a designated representative without regard to written employee authorization.

Distributor. A business, other than a manufacturer or importer, which supplies hazardous substances to other distributors or to employers.

Emergency. Any potential occurrence such as, but not limited to, equipment failure, rupture of containers, or failure of control equipment, which may or does result in a release of a hazardous substance into the workplace.

Employee. Every person who is required or directed by any employer, to engage in any employment, or to go to work or be at any time in any place of employment.

Employer. Employer means EARTH TECH, Inc.

Explosive. A substance that causes a sudden, almost instantaneous release of pressure, gas, and heat when subjected to sudden shock, pressure, or high temperature.

Exposure or Exposed. Any situation arising from work operation where an employee may ingest, inhale, absorb through the skin or eyes, or otherwise come into contact with a hazardous substance.

Flammable. A substance that falls into one of the following categories:

(A) **Aerosol, flammable.** An aerosol that, when tested by the method described in 16 CFR 1500.45, yields a flame projection exceeding 18 inches at full valve opening, or a flashback (a flame extending back to the valve) at any degree of valve opening;

(B) **Gas, flammable.**

1. A gas that, at ambient temperature and pressure, forms a flammable mixture with air at a concentration of thirteen (13) percent of volume or less; or

2. A gas that, at ambient temperature and pressure, forms a range of flammable mixtures with air wider than twelve (12) percent by volume, regardless of the lower limit;

(C) **Liquid, flammable.** Any liquid having a flashpoint below 100°F (37.8 °C), except any mixture having components with flashpoints of 100°F (37.8°C) or higher, the total of which make up 99 percent or more of the total volume of the mixture.

(D) **Solid, flammable.** A solid, other than a blasting agent or explosive as defined above, that is liable to cause fire through friction, absorption of moisture, spontaneous chemical change, or retained heat from manufacturing or processing, or which can be ignited readily and when ignited burns so vigorously and persistently as to create a serious hazard. A chemical shall be considered to be a flammable solid if, when tested by the method described in 16 CFR 1500.44, it ignites and burns with a self-sustained flame at a rate greater than one-tenth of an inch per second along its major axis.

Flashpoint. The minimum temperature at which a liquid gives off a vapor in sufficient concentration to ignite when tested as follows:

(A) **Tagliabue Closed Tester** (see American National Standard Method of Test for Flash Point by Tag Closed Tester, Z11.24-1979 (ASTM D56-79)) for liquids with a viscosity of less than 45 Saybolt Universal Seconds (SUS) at 100°F (37.8°C), that do not have a tendency to form a surface film under test; or

(B) **Pensky-Martens Closed Tester** (see American National Standard Method of Test for Flash Point by Pensky-Martens Closed Tester, Z11.7-1979 (ASTM D 93-79)) for liquids with a viscosity equal to or greater than 45 SUS at 100°F (37.8°C), or that have a tendency to form a surface film under test; or

(C) **Setaflash Closed Tester** (see American National Standard Method of Test for Flash Point by Setaflash Closed Tester (ASTM D 3278-78)).

Organic peroxides, which undergo autoaccelerating thermal decomposition, are excluded from any of the flashpoint determination methods specified above.

Hazard warning. Any words, pictures, symbols, or combination thereof appearing on a label or other appropriate form of warning which convey the health hazards and physical hazards of the substance(s) in the container(s).

Hazardous substance. Any substance which is a physical hazard or a health hazard.

Health hazard. A substance for which there is statistically significant evidence based on at least one study conducted in accordance with established scientific principles that acute or chronic health effects may occur in exposed employees. The term "health hazard" includes substances which are carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, neurotoxins, agents which act on the hematopoietic system, and agents which damage the lungs, skin, eyes, or mucous membranes. Appendix A provides further definitions and explanations of the scope of health hazards covered by this section, and Appendix B describes the criteria to be used to determine whether or not a substance is to be considered hazardous for purposes of this standard.

Identity. Any chemical or common name which is indicated on the material safety data sheet (MSDS) for the substance. The identity used shall permit cross references to be made among the required list of hazardous substances, the label and the MSDS.

Immediate use. The hazardous substance will be under the control of and used only by the person who transfers it from a labeled container and only within the work shift in which it is transferred.

Importer. The first business with employees within the Customs Territory of the United States which receives hazardous substances produced in other countries for the purpose of supplying them to distributors or purchasers within the United States.

Label. Any written, printed, or graphic material displayed on or affixed to containers of hazardous substances.

Manufacturer. A person who produces, synthesizes, extracts, or otherwise makes a hazardous substance.

Material safety data sheet (MSDS). Written or printed material concerning a hazardous substance which is prepared in accordance with section 29 CFR 1910.1200(g).

Mixture. Any solution or intimate admixture of two or more substances, at least one of which is present as a hazardous substance, which do not react chemically with each other.

MSDS means Material Safety Data Sheet, a presentation by the manufacturer of information about the product or commodity prepared in accordance with 29 CFR 1910.1200(g).

NIOSH. The National Institute for Occupational Safety and Health, U.S. Department of Health and Human Services.

February 1, 1996

Organic peroxide. An organic compound that contains the bivalent-O-O-structure and which may be considered to be a structural derivative of hydrogen peroxide where one or both of the hydrogen atoms has been replaced by an organic radical.

Oxidizer. A substance other than a blasting agent or explosive as defined above, that initiates or promotes combustion in other materials, thereby causing fire either of itself or through the release of oxygen or other gases.

Physical hazard. A substance for which there is scientifically valid evidence that it is a combustible liquid, a compressed gas, explosive, flammable, an organic peroxide, an oxidizer, pyrophoric, unstable (reactive) or water-reactive.

Produce. To manufacture, process, formulate, repackage, or relabel.

Pyrophoric. A substance that will ignite spontaneously in air at a temperature of 130°F (54.4°C) or below.

Responsible party. Someone who can provide additional information on the hazardous substance and appropriate emergency procedures, if necessary.

Specific chemical identity. The chemical name, Chemical Abstracts Service (CAS) Registry Number, or any other information that reveals the precise chemical designation of the substance.

Substance. Any element, chemical compound or mixture of elements and/or compounds.

Trade secret. Any confidential formula, pattern, process, device, information, or compilation of information which gives its user an opportunity to obtain a business advantage over competitors who do not know or use it. A trade secret shall not include chemical identity information which is readily discoverable through qualitative analysis. Appendix D sets out the criteria to be used in evaluating trade secrets.

Unstable (reactive). A substance which in the pure state, or as produced or transported, will vigorously polymerize, decompose, condense, or will become self-reactive under conditions of shocks, pressure or temperature.

Use. To package, handle, react, or transfer.

Visitor. Any person, including clients, subcontractors, and fellow EARTH TECH employees, who enter the work area, but are not regularly assigned to the work area.

Water-reactive. A substance that reacts with water to release a gas that is either flammable or presents a health hazard.

Work area. A room or defined space in a workplace where hazardous substances are produced or used, and where employees are present.

Workplace. Any place, and the premises appurtenant thereto, where employment is carried on.

5.0 PROCEDURE

5.1 Responsible Person

5.1.1 Business Unit Manager

Appoints a person, usually the Health and Safety Representative, to be responsible for implementing this Hazard Communication Procedure within the office/shop/lab.

5.1.2 Program Manager

Appoints a person within the program to be responsible for implementing this Hazard Communication Procedure within the program.

5.1.3 Project Manager

Appoints a person within the project, usually the Site Safety Officer, to be responsible for implementing this Hazard Communication Procedure on the project.

5.2 Inventory

5.2.1 Project Inventory

The Project Manager coordinates with the writer of the health and safety plan (HASP) to ensure the HASP contains a list of the hazardous substances (products and commodities) that will be used on the project. The inventory of hazardous substances lists each substance using an identity that is referenced on the appropriate material safety data sheet.

Project employees report to the Project Manager every hazardous material found at the project site which is not on the list of hazardous substances.

5.2.2 Office/Shop/Lab Inventory

The Responsible Person for each office/shop/lab prepares list of hazardous substances used in the office/shop/lab.

Office/shop/lab employees report to the Responsible Person every hazardous material found in the office/shop/lab which is not on the list of hazardous substances.

5.3 Material Safety Data Sheets

5.3.1 Project MSDS File

The Project Manager coordinates with the writer of the health and safety plan (HASP) to ensure the HASP contains a material safety data sheet (MSDS) for each hazardous substance listed.

5.3.2 Office/Shop/Lab MSDS File

The Responsible Person for each office/shop/lab maintains the MSDS file or binder. The Responsible Person requests an MSDS from suppliers and manufacturers to ensure that the MSDS file or binder has an MSDS for each hazardous substance on the inventory. A sample letter to request an MSDS is shown in Attachment 2.

5.3.3 New Information

Whenever a new or revised material safety data sheet is received, such information shall be provided to employees on a timely basis not to exceed 30 days after receipt, if the new information indicates significantly increased risks to, or measures necessary to protect, employee health as compared to those stated on a material safety data sheet previously provided.

5.4 Training

5.4.1 HAZWOPER Training

All HAZWOPER training, including the 40-hour initial training and the 8-hour annual refresher training, includes Hazard Communication training.

5.4.2 Accident Prevention Training

All accident prevention training, injury and illness prevention program training, and safety awareness training includes Hazard Communication training.

5.4.3 Hazard Communication Course Content

Hazard Communication training shall address the following topics:

- (A) The elements and requirements of the OSHA hazard communication standard.
- (B) Tasks and operations where hazardous substances are present.
- (C) The location and availability of the written hazard communication program, including the list(s) of hazardous substances and material safety data sheets.
- (D) The methods and observations that may be used to detect the presence or release of a hazardous substance, such as personal and area monitoring, continuous monitoring devices, visual appearance or odor of hazardous substances when being released, etc.
- (E) The physical and health hazards of the substances in the work area, and the measures they can take to protect themselves from these hazards, including specific procedures implemented for the project or shop to protect employees from exposure to hazardous substances, such as appropriate work practices, emergency procedures, and personal protective equipment to be used.

- (F) The project or shop specific details of the hazard communication program, including an explanation of the labeling system and the material safety data sheet, and how employees can obtain and use the appropriate hazard information.
- (G) Information regarding hazardous substances to which they may be exposed, according to the provisions of the OSHA hazard communication standard.
- (H) Information for their physician or collective bargaining agent to receive regarding hazardous substances to which the employee may be exposed according to provisions of this section;
- (I) Freedom from discharge or other discrimination due to the employee's exercise of the rights afforded pursuant to the provisions of the Hazardous Substances Information and Training Act.

5.5 Labels

5.5.1 User

Each user shall ensure that each container of hazardous substances in the workplace is labeled, tagged, or marked with the following information:

- (A) Identity of the hazardous substance(s) contained therein; and
- (B) Appropriate hazard warnings.

5.5.2 Receiving

Employees receiving shipments of hazardous substances shall not accept the shipment, but return it to the shipper, if the containers are not properly labeled with the following information:

- (A) Identity of the hazardous substance(s);
- (B) Appropriate hazard warnings; and
- (C) Name and address of the manufacturer, importer, or other responsible party.

Exception to labeling requirement: For solid metal (such as a steel beam or a metal casting) that is not exempted as an article due to its downstream use, the required label may be transmitted to the customer at the time of the initial shipment, and need not be included with subsequent shipments to the same employer unless the information on the label changes. The label may be transmitted with the initial shipment itself, or with the material safety data sheet that is to be provided prior to or at the time of the first shipment. This exception to requiring labels on every container of hazardous substances is only for the solid metal itself and does not apply to hazardous substances used

conjunction with, or known to be present with, the metal and to which the employees handling the metal may be exposed (for example, cutting fluids or lubricants).

5.6 Trade Secrets

5.6.1 Non-Emergency Access to Trade Secret Information

Each Responsible Person who obtains a material safety data sheet which claims trade secret information forwards a copy of that MSDS to the Corporate Medical Director. The Corporate Medical Director will submit a written request to the supplier explaining the that the information is needed for the following reasons:

- (A) To assess the hazards of the substances to which employees will be exposed;
- (B) To guide appropriate sampling of the workplace atmosphere to determine employee exposure levels;
- (C) To conduct pre-assignment or periodic medical surveillance of exposed employees;
- (D) To provide medical treatment to exposed employees;
- (E) To guide the selection of appropriate personal protective equipment for exposed employees;
- (F) To guide the development of appropriate engineering controls or other protective measures for exposed employees; and,
- (G) To conduct studies to determine the health effects of exposure.

The request includes an agreement to protect the confidentiality of the disclosed information with assurance that the trade secret information will not be used for any purpose other than the health needs asserted.

The Medical Director will provide such information as necessary to conduct an industrial hygiene evaluation of employee exposures to the cognizant EHS Professional. If this involves releasing trade secret information, the EHS Professional signs a nondisclosure agreement before receiving such information.

Employees working with materials protected by trade secret have access to the MSDS which does not have protected information.

5.6.2 Emergency Access to Trade Secret Information

Emergency access to trade secret information is provided through the Corporate Medical Director. Where a physician or nurse determines that a medical emergency exists and the specific chemical identity of a hazardous substance is necessary for

emergency or first-aid treatment, the Corporate Medical Director shall request the manufacturer, importer, or other supplier immediately disclose the specific chemical identity of a trade secret substance, regardless of the existence of a written statement of need or a confidentiality agreement. The manufacturer, importer, or other supplier may require a written statement of need and confidentiality agreement, in accordance with the provisions of OSHA's Hazard Communication standard as soon as circumstances permit.

5.7 Visitors

5.7.1 Escorted Visitors

Visitors to the work area who have not received a hazard communication briefing on the hazardous substances present in the work area must be escorted the entire time they are in the work area to ensure that they are not harmed by the hazardous substances.

5.7.2 Unescorted Visitors

The supervisor must ensure all visitors who enter the work area unescorted receive a hazard communication briefing before encountering any of the hazardous substances in the work area.

5.7.3 Multiemployer Worksites

In multi-employer workplaces, any employer bringing hazardous substances into work area shall inform all the employers sharing the same work area of the hazardous substances to which their employees may be exposed while performing their work, and any suggestions for appropriate protective measures, and shall provide the following:

- (A) Material safety data sheets
- (B) Any precautionary measures that need to be taken to protect employees during the workplace's normal operating conditions and in foreseeable emergencies; and,
- (C) The labeling system used in the workplace.

5.8 Written Program

5.8.1 Hazard Communication in Health and Safety Plans

Health and Safety Plans (HASP) written for HAZWOPER projects contain all the elements of the Hazard Communication Program. Material safety data sheets for hazardous substances which are brought to the project site are included in an appendix to the HASP. See HS209.

5.8.2 Hazard Communication in Injury and Illness Prevention Programs

The Injury and Illness Prevention Program (IIPP) contains all the elements of the Hazard Communication Program. The hazardous substance inventory and MSDS

maintained in appendices to the IIPP. See HS201.

5.8.3 Location Specific Hazard Communication Programs

Each EARTH TECH location where hazardous substances are present that does not have a Hazard Communication Program provided by paragraph 5.8.1 or 5.8.2 above, shall develop a hazard communication in accordance with OSHA's hazard communication regulation, this procedure, and HS157 Location-Specific Work Rules. The location-specific hazard communication program must be in writing and contain all the elements of a hazard communication program as shown in paragraph 1.3.

6.0 EXCEPTION PROVISIONS

Variances to this procedure shall be requested in accordance with established variance procedures. See HS109.

7.0 CROSS REFERENCES

HS157 Location-Specific Work Rules
HS201 Injury and Illness Prevention Program
HS209 Health and Safety Plans

8.0 ATTACHMENTS

Attachment 1: Responsibility Matrix
Attachment 2: Sample Request Letter

RESPONSIBILITY MATRIX

Action	Procedure Section	Department/ Section Managers	Project Manager	Responsible Person	Regional/ Division EHS Manager	Corporate Medical Director	Corporate EHS Manager
Issuance, revision and maintenance of this procedure	3.1						X
Designate Responsible Person	3.1	X	X				
Develop and maintain inventory of hazardous substances	3.2		X	X			
Maintain MSDS file	3.3			X			
Provide training	3.4				X		
Ensure labels on containers	3.5	X	X	X	X		
Access trade secret information	3.6					X	
Protect visitors	3.7	X	X				

SAMPLE REQUEST LETTER

Date

Supplier/Manufacturer
Address
City, State Zip

Gentlemen:

OSHA's Hazard Communication regulation requires manufacturers and importers of hazardous substances to prepare and provide material safety data sheets (MSDS). The same regulation requires employers to have MSDS in their workplaces for all hazardous substances.

We currently purchase the following products from you:

1. _____

2. _____

etc.

Please send a completed MSDS for each of the above listed products, or a statement that the product is exempt from the OSHA Hazard Communication regulation.

Very truly yours,

EARTH TECH, Inc.

STANDARD PROCEDURE

SUBJECT
PERSONAL PROTECTIVE EQUIPMENT

PROCEDURE NO. HS501

DATE April 22, 1996

SUPERSEDES December 17, 1995

APPROVED 
Diane C. Creel

1.0 PURPOSE AND POLICY

1.1 Purpose

Wherever it is necessary by reason of hazards of processes or environment, chemical hazards, radiological hazards, or mechanical irritants encountered in a manner capable of causing injury or impairment in the function of any part of the body through absorption, inhalation or physical contact, EARTH TECH shall provide protective equipment, including personal protective equipment for eyes, face, head, and extremities, protective clothing, respiratory devices, and protective shields and barriers.

1.2 Policy

It is the policy of EARTH TECH to assess the hazards of every workplace, mitigate those hazards through practical engineering and work practice controls, and provide personal protective equipment to protect employees from residual hazards. EARTH TECH will reimburse the actual cost of personal protective equipment up to \$150 per year per employee for such personal items as footwear and prescription safety glasses. Other items of PPE of a less personal nature, such as hard hats, traffic vests, etc., will be purchased with department operating funds.

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3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility. The Corporate Environmental Health and Safety Director is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities. The Responsibility Matrix is shown in Attachment 1 to Section 8.

4.0 DEFINITIONS

The following definitions apply to all requirements of this procedure:

EHS. Environmental Health and Safety

EHS Professional. Environmental Health and Safety Professional, an individual assigned to the Environmental Health and Safety Department who is certified in the practice of either industrial hygiene (CIH) or safety (CSP), or any other individual designated by the Environmental Health and Safety Department Manager.

EHS Staff. A person whose primary work assignment is to prevent injury or illness. A Site Safety Officer is an EHS Staff.

Field Personnel. Field personnel include any employee who performs field work as part of his/her assigned duties.

Field Work. Any work activity occurring outside of an office setting.

HASP. Health and Safety Plan, the site-specific document written in accordance with HS209.

PPE. Personal Protective Equipment, devices worn by the worker to protect against hazards in the environment.

SOW. Statement of Work, a document to describe the work to be performed.

5.0 TEXT

5.1 General

The goal is to prevent harm to the body from hazards in the work environment. The preferred method is to eliminate the source of the hazard. When this is not possible, the next line of defense is stopping, capturing, or containing the hazard at its source. The next fall back is to intercept the hazard along its path to the worker. The last resort is shielding the person with personal protective equipment.

5.1.1 Hazard Determination

Every operation, activity, and task is evaluated by management to determine hazards and potential hazards that may be present that would necessitate the use of personal protective equipment (PPE).

Where hazards derive from exposure to chemical substances, managers seek the assistance of an Environmental Health and Safety (EHS) Professional.

5.1.2 Hierarchy of Controls.

Engineering and work practice controls are used to eliminate the hazard or stop, contain, or capture at the source or intercept it along its path to the worker. When feasible, these controls are preferred to burdening the worker with PPE. Administrative controls are control measures to limit the duration of exposure to the hazard. Generally, administrative controls are not acceptable to control inhalation or direct skin hazards, except when no other control technology is feasible or effective. With the exception of administrative controls to prevent heat-, cold-, or radiation- related illness, the use of administrative controls requires the approval of the Corporate EHS Director.

5.1.3 Routes of Entry.

Various types of PPE are used to prevent the entry of chemical and biological substances through

- Inhalation
- Absorption through intact skin
- Ingestion
- Penetration through break in skin (injection).

5.1.4 Selection

The selection of PPE is based on the hazards identified in the workplace hazard assessment and the activities that will be performed while using the PPE. To assure adequate protection, the selected PPE meets ANSI requirements where standards have been published, such as foot, eye, and head protection, and NIOSH or MSHA requirements for respiratory protection. Corporate EHS maintains comprehensive data to aid in the selection of PPE.

5.1.5 Training

Every worker who is required to use PPE receives training provided by his/her supervisor, with assistance from EHS Professional when requested, which covers the following topics:

- When is PPE necessary
- What PPE is necessary
- How to properly don, doff, adjust, and wear PPE
- The limitations of PPE
- The proper care, maintenance, useful life, and disposal of the PPE.

5.1.6 Maintenance of PPE

After each use, employees inspect all PPE that will be used again. Any item needing maintenance or repair will be identified and removed from service until the maintenance or repair has been completed and the item verified fit for use. Maintenance and repair will use only replacement parts approved by the manufacturer and be conducted in a manner consistent with manufacturer's instructions. Maintenance and repair will restore PPE to a condition meeting original certification (NIOSH, MSHA, ANSI, etc.) or the item will be discarded as not reparable or beyond economical repair.

5.1.7 Loss of protection.

The major reason for loss of protection from PPE results from non-use. Other factors influencing loss of protection include contamination of the PPE, penetration (i.e., rips, tears, holes, etc.), and permeation through the materials of construction. There are many factors influencing non-use of PPE.

Because using PPE is generally less comfortable than not using PPE, workers need to be motivated to use it. Through education and training, workers need to recognize the need for PPE and understand the benefits of using it. Acceptance of PPE is aided by providing sizes and styles that improve fit and comfort. The PPE must be selected with full consideration for the task to be performed while using it.

Non-use of PPE becomes more of a problem when the PPE is not stored in a readily accessible location, handy to the work. No one likes to use PPE that is not clean, dry, and protected from

deterioration. PPE that is difficult to put on or take off will be avoided. To reduce this as an influence for non-use, ease of donning and doffing must be a consideration in the selection of PPE.

5.2 PPE Program Responsibilities

5.2.1 Supervisor of Field Personnel.

- Coordinates with Project/Response Managers to determine the necessary and appropriate personal protective equipment to be permanently assigned to his/her employees.
- Ensures that his/her employees have all appropriate personal protective equipment.
- Conducts periodic inspections of his/her employees' personal protective equipment to ensure it is properly maintained and ready for use.
- Coordinates with Project Manager when conditions require change in PPE or additional training.

5.2.2 Project/Response Manager.

- Ensures that project documents, such as statements of work, health and safety plans, or accident prevention plans, clearly state the required PPE to be used on the project.
- Verifies that personnel assigned to project have completed the appropriate training for the PPE required for the project and maintains copy of training certificate in project file.
- Ensures that personnel working on the project have and use the PPE specified for the assigned tasks.

5.2.3 Environmental Health and Safety Professional.

- Determines hazards through review of Statement of Work (SOW), Work Plan, or other project documents or site visit.
- Ensures workplace hazard assessment has been completed. In accordance with 29 CFR 1910.132, there must be a written certification of the workplace hazard assessment. The form HS501-F1 *Workplace Hazard Assessment* as shown in Attachment 2 in Section 8 of this procedure provides a convenient means to certify the workplace hazard assessment.
- Selects PPE to provide adequate protection for identified hazards. PPE must be compatible with intended activities.
- Communicates selection via project documents (HASP, etc.) to project personnel.

- During the performance of field inspections in accordance with HS205, inspects company and employee owned PPE to assure the adequacy, maintenance, and sanitation of such equipment.
- Audits the use of PPE to assure adequacy and proper use of such equipment.
- Conducts annual evaluation to determine where PPE programs can be improved.

5.2.4 Field Personnel.

- Ensures he/she has all the required PPE for the work assignment. Coordinates with Supervisor to obtain any item that he/she is lacking.
- Ensure PPE fits properly.
- Maintains permanently assigned PPE in sanitary and reliable condition.
- Inspects all PPE that will be used again after each use.
- Repairs or replaces PPE when worn, damaged, or missing.
- Ensures defective and damaged PPE is removed from service.
- Facilitates timely replacement of worn, depleted, and missing items of permanently assigned personal protective equipment to assure reliable operation.
- Properly disposes of all single-use PPE after each use.

6.0 EXCEPTION PROVISIONS

Exceptions to this procedure must be approved by the responsible Environmental Health and Safety Manager with notification to Corporate EHS Director.

7.0 CROSS REFERENCE

HS201 Injury and Illness Prevention Program
HS205 Safety Inspections and Audits
HS503 Respiratory Protection
HS505 Eye Protection
HS507 Foot Protection
HS509 Hand Protection
HS511 Body Protection
HS513 Supplied Air Respirators, including SCBA
29 CFR 1910.132 Personal Protective Equipment

8.0 ATTACHMENTS

Attachment 1: Responsibility Matrix

Attachment 2: Workplace Hazard Assessment Certification HS501-F1

RESPONSIBILITY MATRIX

Action	Procedure Section	Employee	Supervisor	Project Manager	EHS Professional	Corporate EHS Manager
Issuance, revision and maintenance of this procedure	3.1					X
Hazard assessment and determination of need for PPE	5.1		X		X	
Selection of PPE	5.1.5				X	
Issuance of PPE	5.2.1		X	X		
Training	5.1.6					
Maintenance of PPE	5.1.7	X				
PPB program evaluation	5.2.3				X	



WORKPLACE HAZARD ASSESSMENT

I. WORKPLACE IDENTIFICATION

PROJECT NAME	PROJECT NUMBER
LOCATION	
PROJECT MANAGER	
OPERATION/ACTIVITY/TASK DESCRIPTION	

II. REFERENCE AND SOURCES USED FOR HAZARD ASSESSMENT

STATEMENT OF WORK	<input type="checkbox"/>
WORK PLAN	<input type="checkbox"/>
HEALTH AND SAFETY PLAN	<input type="checkbox"/>
SITE VISIT	<input type="checkbox"/>
OTHER	<input type="checkbox"/>

III. CERTIFICATION

I certify that a hazard assessment was performed in accordance with 29 CFR 1910.132 on the workplace here- identified on this date.	
NAME	SIGNATURE

MINIMUM STANDARDS OF PERSONAL PROTECTIVE APPAREL

The following are minimum standards of apparel, personal protective equipment, and dress for field activities.

1. Field work not involving chemical or physical hazards; activities not at industrial, manufacturing, or construction locations:
 - Shirt with sleeves
 - Pants, full length
 - Footwear, closed-toe
2. Field work involving equipment, such as drill rigs, field work at construction sites, activities at industrial sites, and activities at manufacturing locations requires, in addition to the above, the following personal protective items:
 - Hard hat (May be optional in industrial and manufacturing settings depending on conditions)
 - Safety toe footwear
 - Safety glasses, cover goggles, or faceshield
3. Where exposure or potential exposure to chemical hazards exist, personal protective equipment shall be selected and used which is appropriate for the work to be done and which will provide adequate protection for the chemical hazard. Chemical protective PPE includes respirators, gloves, aprons, coveralls, overalls, boots, boot covers, etc.
4. Where noise hazards exist or are likely, hearing protectors shall be selected and worn. Hearing protectors shall be selected to be compatible with the rest of the required PPE and the activities to be performed.
5. Where physical hazards exist, such as hot surfaces, sharp objects, vibrating tools, extremely cold surfaces, etc., the personal protective equipment shall be selected and used that is appropriate to hazard, provides adequate protection, and is compatible with the rest of the protective apparel
6. Not acceptable for any field work are the following:
 - Dress, skirt, kilt
 - Tank tops, halter tops, topless, shirtless
 - Slippers, sandals, thongs, flip-flops, go-aheads, "Tijuana specials"
 - Shorts, cut-offs, bathing suit
7. Exceptions to these minimum standards requires the approval of an EHS Professional.

STANDARD PROCEDURE

SUBJECT

EYE PROTECTION

APPROVED 

Diane C. Creel

1.0 PURPOSE AND POLICY

1.1 Purpose

Sight is the most cherished of the human senses. The protection of our ability to see requires protecting the eyes and face from injury by physical and chemical agents or by radiation. This procedure defines the EARTH TECH vision conservation program.

1.2 Policy

It is the policy of EARTH TECH to assess workplace hazards and provide protective eyewear appropriate to the hazard. The costs associated with obtaining prescription safety spectacles are reimbursable to the employee as part of each individual's personal allowance of \$150 per year for personal protective equipment. (See HS501.)

EARTH TECH reimburses the actual cost of prescription safety spectacles up to a limit of \$150 per year per employee for such personal items as footwear and prescription safety glasses. Non-prescription eye and face protection which is of a less personal nature is provided with department operating funds.

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3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility. The Corporate Environmental Health and Safety Director is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities. The Responsibility Matrix is shown in Attachment 1 to Section 8.

4.0 DEFINITIONS

The following definitions apply to all requirements of this procedure:

EHS. Environmental Health and Safety

EHS Professional. Environmental Health and Safety Professional, an individual assigned to the Environmental Health and Safety Department who is certified in the practice of either industrial hygiene (CIH) or safety (CSP), or any other individual designated by the Environmental Health and Safety Department Manager.

EHS Staff. A person whose primary work assignment is to prevent injury or illness. A Site Safety Officer is an EHS Staff.

Field Personnel. Field personnel include any employee who performs field work as part of his/her assigned duties.

Field Work. Any work activity occurring outside of an office setting.

HASP. Health and Safety Plan, the site-specific document written in accordance with HS209.

PPE. Personal Protective Equipment, devices worn by the worker to protect against hazards in the environment.

SOW. Statement of Work, a document to describe the work to be performed.

5.0 PROCEDURE

5.1 General

Employees working in locations where there is a risk of receiving eye injuries such as punctures, abrasions, contusions, or burns as a result of contact with flying particles, hazardous substances, projections or injurious light rays which are inherent in the work or environment, shall be safeguarded by means of face or eye protection.

5.1.1 Hazard Determination

Every operation, activity, and task is evaluated by management to determine the need for eye and/or face protection. (See HS201 and HS501.)

Where hazards are of an ergonomic nature, managers seek the assistance of an Environmental Health and Safety (EHS) Professional.

5.1.2 Prescription Eyewear

Where eye protection is required and vision correction is required, such eye protection shall be provided as follows:

- (1) Safety spectacles with suitable corrected lenses, or
- (2) Safety goggles designed to fit over spectacles, or
- (3) Protective goggles with corrective lenses mounted behind the protective lenses.

Contact lenses shall not be worn in working environments having harmful exposure to hydrophilic airborne contaminants, such as formaldehyde or hydrogen chloride.

5.1.3 Maintenance of PPE

Protective eyewear shall be maintained clean and sanitary. The optical quality of the eyewear is as important as the physical protection. Lenses shall be cleaned in a manner to preserve the optical quality. Generally, this means using non-abrasive cleaners. Depending on the degree of soiling, if

rinsing in potable water is insufficient to restore the cleanliness, use a nonabrasive face or dishwashing soap. Cracked, chipped, or scratch lenses must be replaced when the optical quality is degraded or the physical integrity is impaired. Straps, frames, and other parts of the eye protection must be maintained as well.

5.2 Selection

The selection of appropriate eye protection is based on the hazards identified in the workplace hazard assessment and the activities that will be performed.

5.2.1 Mechanical Hazards.

When operating or working near power or hand tools which may produce flying particles, punctures, abrasions, contusions, or mechanical penetration, safety glasses shall be worn which meet the requirements of American National Standard, Practice for Occupational and Educational Eye and Face Protection, Z87.1-1989 for industrial safety eyewear.

When more than one worker in an area is doing eye hazardous work as depicted in the preceding paragraph, all workers in the area shall use eye protection with side protection. Permanent or detachable side protectors (e.g. clip-on or slide-on side shields) are acceptable.

Where there are no hazards of penetrating particles, where workers are not using tools as depicted above, ordinary spectacles meeting the standards for streetwear are sufficient eye protection.

5.2.2 Splash and Liquid Hazards.

Faceshields provide the best protection for splash hazards and shall be used to protect the eyes and face when performing tasks with significant splash hazards, such as pressure washing, cleaning parts with strong and/or hot caustic or acid, working on systems containing hot or strong caustic or acid.

Where there is only minor risk of splash from hot or strong caustic or acid, or when working with cryogenic liquids, a chemical splash cover goggle may be substituted for a faceshield.

5.2.3 Radiant Energy Hazards

Eyes shall be protected from radiant energy hazards, including sunlight reflected off water, snow, or sand, by eyewear of a suitable shade. Protective eyewear for solar radiation, electric arc welding, and ultra-high temperature torches shall protect against ultraviolet radiation as well as visible radiation.

5.3 Vision Conservation Program Responsibilities

5.3.1 Supervisor of Field Personnel.

- Determines the need for and selects the appropriate eye protection.

- Coordinates with Section Manager to ensure the adequate quantities of plano safety glasses and other required eye protection are on hand. Orders additional supplies with department operating funds when necessary.
- Ensures that his/her employees have at a minimum safety glasses.
- Provides plano (non-prescription) safety glasses to those employees who do not wear prescription eyewear.
- Ensures those employees who wear corrective lenses obtain safety glasses meeting ANSI Z87.1-1989 Practice for Occupational and Educational Eye and Face Protection.
- Observes his/her employees to ensure their wearing of eye protection when required.

5.3.2 Project/Response Manager.

- Ensures that project documents, such as statements of work, health and safety plans, or accident prevention plans, clearly identify eye protection requirements.
- Ensures that personnel working on the project have and use the specified eye protection for the assigned tasks.

5.3.3 Section Manager.

- Ensures that adequate supplies of plano safety glasses are available.
- Approves reimbursement of employee purchased prescription safety glasses within the EARTH TECH allowance for employee purchased safety equipment.

5.3.3 Environmental Health and Safety Professional.

- Determines hazards through review of Statement of Work (SOW), Work Plan, or other project documents or site visit.
- Ensures workplace hazard assessment has been completed in accordance with HS501.

5.3.4 Field Personnel.

- If corrective lenses are not needed, obtains from supervisor plano safety glasses.
- If corrective lenses are needed, obtains current ophthalmic prescription at his/her own expense and orders industrial safety glasses from any retail optician.
- Submits receipt with expense claim for reimbursement for the industrial safety glasses. EARTH TECH allows reimbursement of the full price of prescription safety glasses and other

personal protective equipment up to \$150 per year. Employee expenditures for prescription safety glasses and other personal protective equipment exceeding \$150 per year will not be reimbursed.

- Maintains eye protection in a manner that preserves the optical quality and the safety integrity.

6.0 EXCEPTION PROVISIONS

Exceptions to this procedure must be approved by Environmental Health and Safety Manager with notification to Corporate EHS Director.

7.0 CROSS REFERENCE

HS201 Accident Prevention Program
HS209 Health and Safety Plans
HS501 Personal Protective Equipment

8.0 ATTACHMENTS

Attachment 1: Responsibility Matrix

RESPONSIBILITY MATRIX

Action	Procedure Section	Employee	Supervisor	Section/ Project Manager	EHS Professional	Corporate EHS Director
Issuance, revision and maintenance of this procedure	3.1					X
Determination of need for eye protection	5.3.1		X			
Selection of eye protection	5.3.1		X		X	
Issuance of eye protection	5.3.1		X			
Ensuring supplies are on hand	5.3.3			X		
Maintenance of PPE	5.3.4	X				
PPE program evaluation	5.3.3				X	

ATTACHMENT B

GENERAL SAFETY RULES FOR CONTRACTORS

GENERAL SAFETY RULES FOR CONTRACTORS

Introduction

The rules and requirements contained in this attachment have been written for the guidance of Contractors who are performing work under contract with Earth Tech. This booklet prescribes general requirements. Additional specific rules may be necessary to ensure the safety of workers on a particular job. The Contractor, working in collaboration with the Earth Tech representative, will be expected to establish such additional rules and procedures as may be necessary to conduct a safe operation and comply with all Earth Tech, regulatory, and insurance requirements and those of our clients. Earth Tech health and safety professionals are available to assist.

The term Contractor, as used in this attachment, shall be understood to include any and all persons, sole proprietorships, partnerships, corporations, or other business ventures under contract, oral or written, to Earth Tech.

Contractor is responsible for informing its subcontractors of these requirements, for directing and supervising work of subcontractors, and for assuring that its subcontractors adhere to the requirements herein. Earth Tech may request Contractor to provide proof of its subcontractor's adherence to all rules and regulations and will prohibit access to Earth Tech property or job sites or our client's property for those Contractors not in compliance.

In order to assist Contractor in following these instructions, a Earth Tech Representative will be assigned to the Contractor to act as Earth Tech's agent in all matters relative to work activities at Earth Tech facilities or job sites. Under no circumstances shall any work be started until the Earth Tech Representative has been contacted, a job orientation has been conducted by the Earth Tech Representative, and all permits, insurance, Earth Tech, client, and regulatory pre-job requirements met.

The Earth Tech Representative and the Earth Tech Health and Safety professionals are authorized to stop any work which they may consider hazardous to Earth Tech personnel or equipment or Contractor personnel. This authority may be delegated to appropriate individuals.

General Safety Rules and Requirements

Accident Reporting

All accidents (personal and property damage) shall be reported orally to the Earth Tech Representative as soon as emergency conditions no longer exist. A written report shall follow within 7 days after emergency conditions are resolved.

Alcohol, Firearms, etc.

Alcoholic beverages, illegal drugs or narcotics, or guns and ammunition are not permitted on Earth Tech property or job sites. Personnel under the influence of alcohol or drugs shall not be allowed on Earth Tech property or job sites.

Approvals

The Contractor shall be required to obtain pertinent work permits or authorization and approval from the Earth Tech Representative before:

- Working on existing pipelines or equipment
- Entering tanks or closed vessels
- Entering any designated high-hazard areas
- Using torches, electrodes, electronic motors, forges, soldering irons, any open flames, or any device which could produce sparks or ignition source
- Closing walkways, roads, or restricting traffic
- Starting excavations
- Removing tanks from excavations
- Backfilling excavations
- Using utilities such as steam, water, compressed air, or electricity
- Sandblasting, spray painting, or guniting
- Storing flammable materials such as gasoline, oil, paints, oxygen cylinders, etc.
- Walking or working on roofs of buildings or equipment
- Drilling, boring, preparing test pits, or using geophysical equipment or any other exploratory equipment requiring penetration of surfaces
- Operating cranes or similar equipment near overhead power lines or pipelines
- Opening cutting through firewalls or berms
- Fueling or repairing Contractor operating equipment on Earth Tech property or job sites.

Security

For security reasons, entrance to and exit of Earth Tech facilities and job sites is restricted to those areas designated as the Contractor's work area.

Speed Limits

All vehicles on Earth Tech job sites and facilities must observe a maximum speed limit of 10 mph unless otherwise posted.

Vehicle Safety

- All vehicles must be parked in authorized areas only.
- There will be no passing of moving vehicles at job sites where there are narrow roads and short-sight distances.
- Vehicles will only be operated by personnel with valid licenses and good driving records.
- Vehicles shall have all required inspection and operating permits.
- Seat belts shall be used.

Safe Work Practices

Communication

Communication and coordination is vital to prevent accidents on construction sites. Every worker must be aware of equipment operating in his vicinity.

Confined Space Entry

Confined spaces include storage tanks, bins, sewers, in-ground vaults, degreasers, boilers, vessels, tunnels, manholes, pits, etc. These enclosures, because of inadequate ventilation and/or the introduction of hazardous gases and vapors, may present conditions that could produce asphyxiation or injury.

Before entering a confined space, Contractor must notify the Earth Tech Representative of intent to enter. The Earth Tech Representative will review with Contractor the safe entry requirements which include:

Removal of Contents. Before entering, confined spaces should be as clean and free of hazardous materials and chemicals as possible. Where appropriate, confined spaces may be purged by water or other suitable means. Purging with hazardous solvents should be avoided where possible.

Isolation. All input lines which discharged into the confined space shall be disconnected and capped or isolated. The use of a single in-line valve shut-off as the sole means of isolating the confined space from any input lines is prohibited.

However, the use of a double in-line valving arrangement with a vent or drain in between the two valves is acceptable provided that dangerous air contaminants are not introduced by such venting. Isolation valves shall be locked closed, vent or drain valves shall be locked open, and the key shall be kept by that person performing the job.

Electrical Lockout. Where electrical devices located within the confined space (motors, switches, etc.) are to be repaired or worked on, the line-disconnect switches supplying the power must be tagged and locked in the "OFF" position. The lock key is to be kept by the person performing the job, and only this person is authorized to unlock the switch and remove the tag upon completion of the job. Where more than one person is working on the line, each must place a lock on the switch and retain his own key.

- Where there are multiple sources of power to an electrical device that supplies power to the device through an automatic or manual bus transfer switch, lockout devices must be placed on the breaker nearest to the electrical device that is to be isolated, and an electrician shall test the power supply lines to ensure that power has been secured.
- Line-disconnect switches supplying power to any mechanical apparatus in the confined space (mixers, conveyors, etc.) must also be tagged and locked in the "OFF" position. This must be done for any entry, even though work will not be performed on the apparatus itself.

Securing of Covers. All manhole and cleanout covers shall be removed and the openings maintained clear of any obstructions. When hinged doors or lids are provided, they shall be secured so they cannot close. See **Excavations and Trenches** for guarding requirements.

Testing Atmosphere. A qualified person (NIOSH Publication No. 80-106) using only equipment approved and tagged for Class 1, Division 1 locations shall make appropriate tests of the atmosphere in the confined space and place a record of the test results at the entrance to the confined space. Testing shall ensure the following:

- Combustible gas and vapor concentrations do not exceed 10 percent of the lower explosive limit
- Oxygen content is no less than 20 percent and no greater than 25 percent
- Appropriate respiratory protective equipment and other appropriate personal protective devices have been provided for all employees when concentrations of toxic materials exceed established threshold limit values (TLVs).

Continuous Monitoring. If the nature of the work to be performed introduces, or has the potential to introduce, harmful air contaminants, continuous monitoring of the atmosphere and/or the oxygen content drops below 20 percent, all personnel shall evacuate the confined space immediately.

Ventilation. All confined spaces found to be unsafe must be ventilated by means of mechanical exhaust systems arranged so as to avoid recirculating contaminated air. The Contractor must contact the Earth Tech Representative to obtain approval not to ventilate. Personnel shall be evacuated immediately in the event of failure of the mechanical ventilation system. The confined space shall be retested prior to reentry following ventilation system repair.

Buddy System. At least two workers shall remain outside the confined space. One standby worker shall be stationed just outside the access opening of the any confined space while such space is occupied. This person shall:

- Maintain continuous awareness of the activities and well-being of the occupant in the confined space
- Be able to maintain communication at all times
- Be alert and fully capable of quickly summoning help
- Be physically able and equipped to assist in the rescue of an occupant from a confined space under emergency conditions.

Safety Gear and Personal Protective

Equipment. All Contractor employees must be instructed in accordance with OSHA regulations regarding safety gear and personal protective clothing, hard hats, respirators, lifelines, and harnesses. Such instructions shall be received and documented before entering any confined space.

Compressed Gas Cylinders

Valve protection caps. Valve protection caps shall be in place when compressed gas cylinders are transported, moved, or stored.

Cylinder valves. Cylinder valves shall be closed when work is finished and when cylinders are empty or are moved.

Compressed gas cylinders. Compressed gas cylinders shall be secured against rolling or tipping (roped or chained) at all times, except when cylinders are actually being hoisted or carried.

Gas regulators. Gas regulators shall be in proper working order while in use.

Leaks. If a leak develops in a gas cylinder, after donning appropriate safety equipment,

immediately remove it to a safe location. If the leak cannot be corrected, report it to the Earth Tech Representative.

Identification of Contents. Cylinders should be permanently marked or stenciled to identify the type of gas in the cylinder.

Breathing Air. All compressed breathing air shall meet OSHA specifications for breathing air quality. All compressed breathing air cylinders shall have their contents checked at the job site for correct oxygen concentration and rejected for breathing air if the oxygen concentration is not 20.7% \pm 0.2%.

Oil and oily rags. Oil and oily rags shall be kept away from oxygen equipment.

Cranes, Hoists, and Other Heavy Equipment

Contractor personnel will not be permitted to use hoists and powered apparatus belonging to Earth Tech unless approval is obtained in each instance from the Earth Tech Representative.

ROPs. Roll over protection shall be used when conditions or regulations call for such use.

Cutting or Welding

Hot Work/Welding/Burning. "Hot Work" authorization must be obtained from the Earth Tech Representative before any welding, cutting, or other "hot work" is done. "Hot work" permits and results of tests are to be submitted to the Earth Tech Representative at the completion of the job or at the end of each workday.

Welding Flash. Noncombustible or flame-proof shields or screens must be provided to protect welder or others who might be harmed by direct rays or arc.

Personal Protective Equipment. Goggles, gloves, aprons, and other personal protective equipment appropriate to the job shall be used.

High Fire-Hazard Areas

- Contractor personnel are responsible to see that a fire watch is maintained and all adjacent combustible materials are protected or removed as designated by the Earth Tech Representative.
- Contractor shall provide his own calibrated combustible gas meter or other instruments for checking areas before hot work.
- Documentation of calibration shall be submitted to the Earth Tech Representative for review by the Earth Tech Health and Safety Section.
- Contractor is responsible for all testing and monitoring required by applicable regulations and to assure work place safety.

- Earth Tech shall have the right, not the responsibility, to perform additional testing. Earth Tech testing shall not be in lieu of Contractor's requirements.
- In the event of a bona fide emergency, such as emergency spill response work, and where the Contractor warrants that he cannot conduct the required testing, Earth Tech may upon written agreement then conduct all tests necessary to assure safety and regulatory compliance. The Contractor shall cosign the "hot work" permit form when tests are conducted by Earth Tech personnel.
- Contractor shall provide his own fire extinguisher(s) for welding and cutting, as designated by the Earth Tech Representative.

Electrical Safety

Grounding. The noncurrent-carrying metal parts of fixed, portable, or plug-connected equipment shall be grounded. Since ground wires can break, they shall be tested with an electrical resistance meter to assure conductivity as often as necessary to assure safety. Portable tools and appliances protected by an approved system of double insulation need not be grounded.

Extension Cords. Extension Cords shall be the three-wire type for grounded tools (two-wire is permissible for double-insulated tools) and shall be protected from damage; do not fasten with staples or extend across an aisleway or walkway. Worn or frayed cords shall not be used. Cords shall not be run through doorways where the door could cut or damage them.

Light Bulbs. Exposed bulbs on temporary lights shall be guarded to prevent accidental contact, except where bulbs are deeply recessed in the reflector. Temporary lights shall not be suspended by their electric cords unless designed for this use. Explosion-proof bulb covers shall be used when contact with flammable vapors or gases is likely and shall meet Class I, Division I requirements.

Electrical Receptacles. Receptacles for attachment plugs shall be of the approved, dead-front, concealed contact type. Where different voltages, frequencies, or types of current are supplied, receptacles shall be of such design that attachment plugs are not interchangeable.

Wet Environments. Work done in wet environments shall require ground fault interrupters and water-tight connectors.

Emergency Equipment

Earth Tech's fire equipment is not to be moved, relocated, or otherwise rendered inaccessible unless specific permission is granted in each case by the Earth Tech Representative.

Self-contained breathing apparatus, first aid equipment, fire blankets, stretchers, eyewash fountains, and deluge showers are not to be moved, relocated, or blocked without the express permission of the Earth Tech Representative.

Excavations and Trenches

Permits. Before any excavation work begins, all required permits shall be obtained.

"Dig-Alert". Before any excavation work begins, the existence and location of underground pipes, electrical conductors, etc., must be determined by Contractor who shall in turn notify the Earth Tech Representative.

Cave In Protection. The walls and spaces of all excavations and trenches (which will be entered by people) more than 4 feet deep shall be guarded by shoring, sloping of the ground, or some other equivalent means, in accordance with Cal/OSHA regulations.

Daily Inspections. Daily inspections of excavations shall be made by the Contractor. If there is evidence of possible cave-in or slide, all work in the excavation shall cease until the necessary safeguards have been taken.

Egress. Trenches more than 4 feet deep shall have ladders or steps located so as to require 10 feet or less of lateral travel between means of access.

Backfill. All trenches shall be backfilled as soon as practical after work is completed and all associated equipment removed.

Housekeeping. All Contractor equipment, such as pipe, rebar, etc., shall be kept out of traffic lanes and access ways. Equipment shall be stored in a manner which ensures the safety of Earth Tech and Contractor employees at all times.

Fall In Protection. All trenches shall be completely guarded on all sides. Standard guardrails are preferred. However, when wooden or metal barricades are used for trench guarding, they shall be spaced no further apart than 20 feet, and at least two feet from the edge of the trench. Such barricades shall be at least 36 inches high when erected.

- Battery-lighted barricades shall be used as follows:
 - (1) A minimum of two battery-lighted barricades shall be used at corners, one on each side of the barricade.
 - (2) At least one battery-lighted barricade shall be used where vehicular traffic approaches the trench at right angles.
 - (3) Where trenches parallel roadway, distance between battery-lighted

barricades shall not exceed 40 feet unless this requirement conflicts with Item (1), above, and additional units are required.

- (4) All battery-lighted units shall be serviced as necessary to ensure equipment is operating.
- Caution tape shall be stretched securely between barricades. The caution tape shall be at least 3/4-inch-wide and shall be yellow or yellow and black and may have the words "CAUTION - DO NOT ENTER."
- Barricaded sections immediately adjacent to where pedestrians cross trenches shall be arranged to direct pedestrians to the walkway or bridge.

Encroachment. Use of other trench excavating equipment, or storage of equipment or supplies within a distance equal to the depth of the trench, will not be permitted without approval by the Earth Tech Representative.

Bridges. All pedestrian bridges shall be of sufficient strength to prevent no greater vertical deflection than one-half inch when a 250-pound weight is applied to the center of the bridge.

- Handrails shall consist of intermediate and top rails on both sides of the bridge. The top rail shall be between 42 and 45 inches above the walking surface and be capable of withstanding a lateral force of 200 pounds against the center of the top rail.
- All surfaces which a person could reasonably contact should be sufficiently free of splinters, nails, or protrusions which may cause injury.
- All bridges intended for vehicular traffic shall be constructed to withstand twice the load of the heaviest vehicle anticipated.

Earth Grading Activity

Vest. All persons within an area where earthmoving are operating shall wear a safety vest or jacket at all times. Vests may be red, orange, or day-glo green in color, but bright or fluorescent orange is preferred. Significantly faded or damaged vest must be replaced.

Communication. Anytime a test pit is to be excavated, the technician shall notify the grading contractor's **authorized** representative for that area. That individual may be acting in the capacity as a dump man, operator, or supervisor from an independent vehicle. Advise that representative of the test pit location and request their cooperation to promote safety during the test period. This should include their advising those under their supervision of your existence in the grading area. Make a notation on your

records of the name of the individual with whom you spoke so that the communication is documented.

- Provide notice to the grading contractor
- Identify location of test pit
- Request the cooperation through the completion of the tests and document accordingly.
- A flag must be affixed to any vehicle driving in an earth grading activity area and hazard warning lights shall be operated.

Flags. Every over-the-road vehicle operating in the area of earthmoving equipment activity must carry a flag. The flag must be at least 300 square inches in area with no dimension less than 12 inches. Flags must be high visibility red, orange, day-glo green and mounted approximately 12 feet above grade level.

Hazard Warning Lights. Every over-the-road vehicle operating in the area of earthmoving equipment activity must operate the hazard warning flashers at all times.

Rotating or Flashing Beacon. All vehicles stationary in the grading area shall use a rotating or flashing amber beacon or strobe light on the top of the cab of the vehicle during all field testing.

Orientation of Test Pits. The technician is responsible for selecting a test pit location. Of paramount concern is the technician's safety. The test pit should be located behind the established pattern of grading equipment and outside any existing patterns. The orientation of the pit should include the use of the technician's vehicle as a barrier to potential oncoming traffic. The waste pile created from the excavation of the test pit should be opposite the vehicle so that the test pit is positioned between the vehicle and the waste pile. A flag shall be placed immediately on top of the waste (spoil) pile, satisfying the same requirements as the vehicle flag.

Zone of Non-Encroachment. The location of the test pit must be selected so that no earthmoving equipment will approach closer than 50 feet from the center of the test pit. This is not only for the technician's safety, but to ensure the integrity of the test. Excessive vibration from the operation of earthmoving equipment operating too closely may impair the accuracy or spoil the test results.

Completion of Tests. Immediately upon completion of tests, record the data and withdraw flags and vehicles outside the grading area to record notes and do calculations.

Fire Prevention

Earth Tech Representative, or his designee, is authorized to correct any condition which he may

consider a fire hazard. In any emergency, the site personnel are authorized to act directly with Contractor's Foreman in regard to fire hazards without waiting for the Earth Tech Representative.

Floor Openings

Floor openings shall be guarded by substantial barriers, railings, and/or covering materials strong enough to sustain twice the load of pedestrians or vehicular traffic. Barriers will be supplied by the Contractor.

Where a danger of falling exists for personnel, elevated floor areas must be provided with guardrails. In addition, toeboards shall be provided when the possibility of falling objects striking personnel below exists.

High-Hazard Areas

Although this list may not be all inclusive, there are certain areas and operations at Earth Tech facilities and job sites where extra precautions must be taken because of the nature of the hazards. When starting up any operation, the Contractor is required to check with the Earth Tech Representative for a review of the safety and health rules which apply before entering any of the following areas:

- Confined spaces (tanks, manholes, vaults, pits, etc.)
- Laboratories
- Chemical storage and disposal areas.

The contractor is also required to check with the Earth Tech Representative before any work is done on a flammable gas or solvent line; a tank or vessel that presently contains, or has contained, a flammable material; and before making an excavation anyplace on the site.

Housekeeping

Material should be carefully stacked and located so that it does not block aisles, doors, self-contained breathing apparatus, fire extinguishers, fire blankets, stretchers, emergency eyewash fountains, emergency safety showers, fixed ladders, stairways, or electrical breaker panels.

- Nails protruding from boards must be removed or bent over.
- All work areas shall be kept clear of form and scrap lumber and all other debris.
- Combustible scrap, waste materials, and debris shall be removed at regular and frequent intervals.
- Containers shall be provided for the collection and separation of refuse by type. Covers shall be provided on containers used for flammable, combustible, or harmful substances.

- Overhead storage of debris, tools, equipment, pipes, etc., is prohibited.
- At the end of each work day, Contractor shall provide for pick up of all debris such as paper, rags, empty cans and bottles, etc.

Ladders

The use of ladders with broken or missing rungs or steps, broken or split handrails, or with other faulty or defective construction is prohibited.

- Ladders must not be placed adjacent to a door unless the door is locked or guarded.
- Metal ladders shall not be used for electrical work.
- Tie off top of ladder to structure.

Medical Service and First Aid

Emergency Medical Service. Preplanned emergency medical service shall be provided as designated by Contractor and approved by the Earth Tech Representative.

First Aid Kit. Each Contractor shall provide a first aid kit for his employees which meets minimum OSHA requirements.

Mobile Cranes

Mobile cranes, including portable crane derricks, power shovels, or similar equipment, shall not be operated within ten feet of overhead electrical power lines.

Overhead Work

No overhead work shall be performed when, as a result of that work, the possibility of a falling object striking any person exists. Do not work above any person at any time.

Personal Protective Clothing and Equipment

In certain construction and maintenance operations, personal protective equipment such as safety glasses, chemical goggles, respirators, hard hats, and protective clothing is required. The type of protective equipment to be worn will be determined by the degree of exposure to the potential hazard. There will be very few occasions when hard hats and eye protection will not be required at Earth Tech job sites. When in doubt of the safety measures to be observed, Contractor shall contact the Earth Tech Health and Safety Section. This shall not, however, relieve Contractor of his responsibilities to determine appropriate protection.

Eye protection is required when engaging in such operations as the following:

- Drilling, chipping, grinding, wire brushing

- Handling caustics and acids
- Breaking bricks or concrete
- Hammering chisels, drift pins, etc.
- Burning or welding
- Other situations which create a possible eye hazard, e.g., chemical environments.

Photographs

Only Earth Tech photographers, with permission from DIPEF, are permitted to carry cameras or take pictures. If progress or finished construction photographs are desired, request for same should be made through the Earth Tech Representative.

Power Tools

Power and Air-Actuated Tools. Gasoline-powered, electric, or air-actuated tools are not to be used on Earth Tech property or job sites without prior approval of the Earth Tech Health and Safety Department. To obtain approval, Contractor must contact the Earth Tech Representative.

Explosive-Actuated Tools. Explosive-actuated (powder-actuated) fastening tools shall meet the design requirements in "American National Standard Safety Requirements for Explosive-Actuated Fastening Tools" (ANSI A10.3-1970). A tool which does not meet these design standards cannot be used.

- Power tools shall never be left unattended in a place where they would be available to unauthorized persons.
- Power tools shall not be used in explosive or flammable atmospheres.

Fall Protection

Appropriate fall protection, such as safety harness and lanyard, must be worn when worker is exposed to falling more than 6 feet. Lanyard or lifeline must be tied off to appropriate structure capable of supporting five times the weight of the person (nominal 1,000 pounds).

- Appropriate fall protection, such as safety harness and lanyard, must be worn when working above eight feet on straight or extension ladders when the work involves pushing, pulling, or action which may dislodge the person from the ladder.
- Safety harnesses are also required on swinging or portable scaffolds when handrails and toeboards are not provided (eight feet or more above ground or floor level).
- Safety harnesses and lifelines (including extraction devices for top entry spaces) are required on all work performed in

confined spaces where an oxygen deficiency or toxic vapors may exist.

- All lifelines shall be safety secured to stable and adequate supports.
- Safety harnesses and lifelines must be worn on rooftops where there are no guardrails and where the work is within ten feet of the edge.

Salamanders

- "Hot work" authorization must be obtained from the Earth Tech Representative before using a salamander.
- Salamanders must be a Factory Mutual or Underwriters Laboratories-approved type.
- Position salamanders away from all combustible material to reduce the possibility of uncontrolled fire.
- Guard salamanders from traffic to prevent them from being overturned.

Scaffolds

All scaffolds, whether fabricated on site, purchased, or rented, shall conform to the specifications found in ANSI A10.8, Safety Requirements for Scaffolding. Rolling scaffolds shall maintain a three-to-one height-to-base ratio.

- The footing or anchorage for a scaffold shall be sound, rigid, and capable of carrying the maximum intended load without settling or displacement.
- Unstable objects, such as barrels, boxes, loose bricks, or concrete blocks, shall not be used to support scaffolds or planks.
- No scaffold shall be erected, moved, dismantled, or altered except under the supervision of competent persons.
- Scaffolds and their components shall be capable of supporting at least four times the maximum intended load without failure.
- Guardrails and toeboards shall be installed on all open sides and ends of platforms more than 10 feet above the ground or floor.
- Scaffolds measuring four to ten feet in height, and having a horizontal dimension of less than 45 inches, shall have standard guardrails installed on all open sides and ends of the platform.
- Wire, synthetic, or fiber rope used for suspended scaffolds shall be capable of supporting at least six times the rated load.

- No riveting, welding, burning, or open flame work shall be performed on any staging suspended by means of fiber or synthetic rope.
- Tested fiber or approved synthetic ropes shall be used for or near any work involving the use of corrosive substances.
- All scaffolds, boatswain's (bosun's) chairs, and other work access platforms shall conform to the requirements set forth in the federal OSHA Regulations for Construction (29 CFR 1926.451) except where the specifications in ANSI A10.8 7 or state or local regulations are more rigorous.

Smoking and Open Flames

Smoking and the use of open flames are strictly prohibited in areas where flammable liquids, gases, or highly combustible materials are stored, handled, or processed. Obey "No Smoking" signs. Smoke only in designated areas.

Solvents and Paints

- Adequate ventilation must be maintained at all times when paints or solvents are used.
- Personnel should use proper respiratory protection and protective clothing when toxicity of the material requires such protection.
- Flammable solvents and materials must be used with extreme caution when possible sources of ignition exist.
- Flammable paints and solvents must be stored in an approved (Factory Mutual or Underwriters Laboratories) flammable liquids storage cabinet when storage is required inside the buildings. If an approved cabinet is not available, paints and solvents must be removed from the building when not in use.
- Flammable liquids must be dispensed in safety cans with flash arresters bearing a Factory Mutual or Underwriters Laboratories approval. These containers must be clearly identified as to their contents.
- Material Safety Data sheets, for materials used by the Contractor, shall be maintained by the Contractor, and a copy provided to the Earth Tech Representative.

Tarpaulins

When tarpaulins are required for the detection of hot slag, dust, paint drippings, etc., or as

security barriers, they shall be flame-resistant and in good condition.

Tools

Hand and power tools shall be kept in safe operating condition. Mushroomed heads on cold chisels, star drills, etc., are unsafe and should not be used. Hammers should have handles which are not cracked, split, or broken.

Nonsparking tools may be necessary in certain areas where flammable materials are handled or where sparks could create an explosion.

Transporting Material and Equipment

Extreme care must be taken while carrying sections of pipe, conduit, and other materials to assure safety to Earth Tech, Contractor, and client personnel and property. This includes, but is not limited to, flagging and use of two people to carry pipe of lengths greater than 10 feet.

- Tools, materials, and equipment must not be left unattended in access ways.
- Tools, material, and equipment shall not be removed from the job site without permission of the Earth Tech Representative.

Walking and Work Surfaces

- Workroom floors shall be clean and, to the extent possible, dry.
- Drainage mats, platforms, or false floors should be used where wet processes are performed.
- Floors shall be free from protruding nails, splinters, holes, and loose boards or tiles.
- Permanent aisles or passageways shall be marked.
- Floor holes shall be protected by covers that leave no openings of more than one inch wide.
- Floor openings into which persons can accidentally walk shall be guarded by standard railing and toeboards.
- Open-sided floors, platforms, and runways higher than four feet shall be guarded by standard railings.
- Toeboards shall be used wherever people can pass below, or where hazardous equipment or materials are located below.

Warning Signs

All posted warning, safety, and security signs and barriers shall be observed. Additionally, Contractor shall provide warning signs, barriers,

barricades, etc. wherever such protection is needed. Where signs and barricades do not provide adequate protection, particularly along a road, flagmen shall be used.

Regulatory References

- (a) *Standard Operating Safety Guides*, USEPA, November 1984
- (b) *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities*, NIOSH 85-115, 1985
- (c) Title 29 of the Code of Federal Regulations, Part 1910 (29 CFR 1910), Occupational Safety and Health Standards (USDOL/OSHA), with special attention to Section .120, Hazardous Waste Operations and Emergency Response
- (d) Title 29 of the Code of Federal Regulations, Part 1926 (29 CFR 1926), Safety and Health Regulations for Construction (USDOL/OSHA), with special attention to Section 1926.65, Hazardous Waste Operations and Emergency Response
- (e) Title 8 of the California Code of Regulations, Chapter 4, Subchapter 7, (commencing with Section 3200) General Industry Safety Orders (Cal/OSHA), with special attention to Section 5192, Hazardous Waste Operations and Emergency Response
- (f) Title 8 of the California Code of Regulations, Chapter 4, Subchapter 4, (commencing with Section 1500) Construction Safety Orders (Cal/OSHA)
- (g) Title 22 of the California Code of Regulations, Division 4, Chapter 30 (commencing with Section 66000) Environmental Health Standards for the Management of Hazardous Waste (California Environmental Protection Agency, Department of Toxic Substances Control)
- (h) Title 22 of the California Code of Regulations, Division 2, Chapter 3, (commencing with Section 12000) Safe Drinking Water and Toxic Enforcement Act Regulations (California Health and Welfare Agency)
- (i) National Oil and Hazardous Substances Contingency Plan

Contractors are expected to brief their employees on these requirements and enforce these rules with their employees. Earth Tech management may stop or suspend work at any time the Contractor fails to comply with Earth Tech rules and regulations.

ATTACHMENT C

**TASK HAZARD ANALYSES
DATA SHEETS**

**Summarized Task Hazard Analysis
Former Benicia Arsenal, Benicia, California**

Activity Site Reconnaissance **Analyzed by/Date** _____ **Reviewed by/Date** _____

PRINCIPAL STEPS	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Contact utility companies Inspect site Walk the site Check equipment Load equipment	OE Weather-related hazards: Wind, rain, sun, heat, cold Walking surfaces: Unimproved land, range land, sand, rocks, gravel, mud Dangerous plants and animals: Poison oak, stinging nettle, thistle, stinging insects, black widow, brown spider. Lifting hazards	Employees of utility service provider must be escorted by OE-qualified personnel Wear clothing appropriate to weather conditions Use sunscreen Watch carefully where you walk Do not step in shadows until you are sure of your footing Shadows may hide small animals, pits, holes, or other areas of unstable footing Carefully choose your footholds when crossing rocky, uneven, or loose ground surfaces Optimize ergonomics of instrument handling
EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
Level D PPE (see Section 1.12.1)	Stay within sight of buddy	HAZWOPER Qualified Site-specific training Review and comply with SSHP Graduate of U.S. Navy EOD School (Escort Personnel only)

**Summarized Task Hazard Analysis
Former Benicia Arsenal, Benicia, California**

Activity Vegetation Removal **Analyzed by/Date** _____ **Reviewed by/Date** _____

PRINCIPAL STEPS	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Use hand tools to clear vegetation Use power tools to clear vegetation	OE Weather-related hazards: Wind, rain, sun, heat, cold Walking surfaces: Unimproved land, range land, sand, rocks, gravel, mud Dangerous plants and animals: Poison oak, thistle, stinging insects, black widow, brown spider Power Tools Heavy machinery	Must be escorted by OE-qualified personnel Level D PPE, leather palm working gloves, and hearing protection Apply OE safety concepts and basic considerations Proper footing Use flagging system to mark OE Use eye protection Trained personnel only
EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
Hand tools, power equipment, Level D PPE (see Section 1.12.1) Heavy machinery (see Section 1.11.3)	Daily equipment inspection	Experience with the hand/power tools HAZWOPER Qualified Site-specific training Review and comply with SSHP Graduate of U.S. Navy EOD School (Escort Personnel only)

**Summarized Task Hazard Analysis
Former Benicia Arsenal, Benicia, California**

Activity Fence Removal and Installation

Analyzed by/Date _____

Reviewed by/Date _____

PRINCIPAL STEPS	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Remove fencing and fence posts Install fence posts and fencing Inspect fence installation locations	OE Weather-related hazards: Wind, rain, sun, heat, cold Walking surfaces: Unimproved land, range land, sand, rocks, gravel, mud Dangerous plants and animals: Poison oak, stinging insects, black widow spider, brown spider Lifting hazards	Employees of fencing subcontractor must be escorted by OE-qualified personnel Wear clothing appropriate to weather conditions Use sunscreen Watch carefully where you walk Do not step in shadows until you are sure of your footing Shadows may hide small animals, pits, holes, or other areas of unstable footing Carefully choose your footholds when crossing rocky, uneven, or loose ground surfaces Optimize ergonomics of tool handling
EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
White Pulse Induction Metal Detector, fence posts, fencing, post hole digger, slide hammer, Level D PPE (see Section 1.12.1)	Daily check of metal detector using known source Stay within sight of buddy	Site-specific training Review and comply with SSHP Graduate of U.S. Navy EOD School (Escort Personnel only)

Former Benicia Arsenal, Benicia, California

Activity Location and Marking of Search Grids Analyzed by/Date _____ Reviewed by/Date _____

PRINCIPAL STEPS	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
<p>Walk the site Check equipment Load equipment Set transit Set control points Locate grid corners Set stakes and monuments Enter data into GIS</p>	<p>OE Weather-related hazards: Wind, rain, sun, heat, cold Walking surfaces: Unimproved land, range land, sand, rocks, gravel, mud Dangerous plants and animals: Poison oak, stinging insects, black widow spider, brown spider Lifting hazards Repetitive motion injury</p>	<p>Must be escorted by EOD-trained personnel Wear clothing appropriate to weather conditions Use sunscreen Watch carefully where you walk Do not step in shadows until you are sure of your footing Shadows may hide small animals, pits, holes, or other areas of unstable footing Carefully choose your footholds when crossing rocky, uneven, or loose ground surfaces Optimize ergonomics of work station within limits of available equipment Take 5-minute break each hour</p>
EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
<p>GPS, stakes, hammer approved metal detector^(a) Hand-held radios Transit, pole, rod, chain, PC Level D PPE (see Section 1.12.1)</p>	<p>Daily check on source with approved metal detector^(a). Stay within sight of buddy. Ensure that electrical equipment is properly grounded.</p>	<p>HAZWOPER Qualified Site-specific training Review and comply with SSHP Knowledgeable, familiar, and trained with equipment and ergonomic recommendations Graduate of U.S. Navy EOD School (Escort Personnel only)</p>

Note: (a) As demonstrated at geophysical equipment test plot.

Summarized Task Hazard Analysis

Former Benicia Arsenal, Benicia, California

Activity OE Surface Clearance Analyzed by/Date _____ Reviewed by/Date _____

PRINCIPAL STEPS	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Visually inspect ground Inspect ground with Schonstedt magnetometer Remove all OE scrap and metallic debris Flag all suspected OE	OE Weather-related Hazards: Wind, rain, sun, heat, cold Walking surfaces: Unimproved land, sand, rocks, gravel, mud Dangerous plants and animals: Poison oak, stinging insects, black widow spider, brown spider Lifting hazards	Must be OE-qualified Wear clothing appropriate to weather conditions Use sunscreen Watch carefully where you walk Do not step in shadows until you are sure of your footing Shadows may hide small animals, pits, holes, or other areas of unstable footing Carefully choose your footholds when crossing rocky, uneven, or loose ground surfaces Optimize ergonomics of instrument handling
EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
Approved metal detector, pin flags, debris bags, Level D PPE (see Section 1.12.1)	Daily check of metal detector using known source Stay within sweep lanes and/or sight of buddy	Graduate of U.S. Navy EOD School Site-specific training HAZWOPER Qualified Review and comply with SSHP

**Summarized Task Hazard Analysis
Former Benicia Arsenal, Benicia, California**

Activity Geophysical Investigation

Analyzed by/Date _____

Reviewed by/Date _____

PRINCIPAL STEPS	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Conduct magnetometer or electromagnet sweep of OE grid	OE Weather-related hazards: Wind, rain, sun, heat, cold Walking surfaces: Unimproved land, range land, sand, rocks, gravel, mud Dangerous plants and animals: Poison oak, stinging insects, black widow spider, brown spider Lifting hazards	Level D PPE Apply OE safety concepts and basic considerations Proper footing Know heat and cold stress warning signs and proper action Have first-aid kits and fire extinguishers Use eye protection Shadows may hide small animals, pits, holes, or other areas of unstable footing Carefully chose your footholds when crossing rocky, uneven, or loose ground surfaces Optimize ergonomics of instrument handling
EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
Tow-tractors or ATV (see Section 1.11.5) Magnetometers or EM61 ^(a) , (see Section 1.11.7) Level D PPE (see Section 1.12.1)	Daily check of geophysical equipment using known source	HAZWOPER Qualified Site-specific training Review and comply with SSHP

Note: (a) As demonstrated at geophysical equipment test plot.

**Summarized Task Hazard Analysis
Former Benicia Arsenal, Benicia, California**

Activity OE Subsurface Clearance **Analyzed by/Date** _____ **Reviewed by/Date** _____

PRINCIPAL STEPS	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Excavate ferrous metal contacts Possible use of heavy equipment	OE Noise Fragmentation Accidental detonation Weather-related hazards: Wind, rain, sun, heat, cold Walking surfaces: Unimproved land, sand, rocks, gravel, mud Dangerous plants and animals: Poison oak, stinging insects, black widow spiders, brown spider Bending and stooping Lifting hazards	Level D PPE Apply OE safety concepts and basic considerations Use sunscreen Watch carefully where you walk Do not step in shadows until you are sure of your footing shadows may hide small animals, pits, holes, or other areas of unstable footing Carefully choose your footholds when crossing rocky, uneven or loose ground surfaces Have first-aid kits and fire extinguishers Use flagging system to mark OE Use eye protection while excavating Optimize ergonomics of instrument handling
EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
Approved metal detector (see Section 1.11.7) Level D PPE (see Section 1.12.1) Backhoe (see Section 1.11.3)	Daily serviceability of shovels Daily instrument checks Daily instrument checks of backhoe Heavy Equipment Certification (Attachment XX)	Graduate U.S. Navy EOD School HAZWOPER Qualified Site-specific training Review and comply with SSHP (except heavy equipment operators)

**Summarized Task Hazard Analysis
Former Benicia Arsenal, Benicia, California**

Activity Backfill **Analyzed by/Date** _____ **Reviewed by/Date** _____

PRINCIPAL STEPS	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Return excavated soil to opening Compact with feet and shovel	Weather-related hazards: Wind, rain, sun, heat, cold Walking surfaces: Unimproved land, range land, sand, rocks, gravel, mud Dangerous plants and animals: Cactus, livestock Bending and stooping Lifting hazards	Level D PPE Wear clothing appropriate to weather conditions Use sunscreen Watch carefully where you walk Do not step in shadows until you are sure of your footing Shadows may hide small animals, pits, holes, or other areas of unstable footing Carefully choose your footholds when crossing rocky, uneven, or loose ground surfaces Optimize ergonomics of instrument handling Use eye protection while backfilling
EQUIPMENT TO BE USED Level D PPE (see Section 1.12.1) Shovels Backhoe (see Section 1.11.3)	INSPECTION REQUIREMENTS Daily serviceability of shovels Daily instrument checks of backhoe Heavy equipment certification (Attachment)	TRAINING REQUIREMENTS HAZWOPER Qualified Site-specific training Review and comply with SSHP Train people in use of tools

Summarized Task Hazard Analysis
Former Benicia Arsenal, Benicia, California

Activity OE Scrap and Metallic Debris Disposal **Analyzed by/Date** _____ **Reviewed by/Date** _____

PRINCIPAL STEPS	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Picking up scrap Loading onto truck Transport	OE Weather-related hazards: Wind, rain, sun, heat, cold Walking surfaces: Unimproved land, sand, gravel, rocks, mud Dangerous plants and animals: Poison oak, stinging insects, black widow spider, brown spider Lifting heavy objects Vehicle accident Cut hazard Bending and stooping	Inspect vehicle for suitability to travel over terrain Use proper lifting techniques Use only qualified drivers Properly secure load for transport
EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
Vehicle with rate load capacity of ½ ton or greater, suitable for off-road travel Level D PPE (see Section 1.12.1)	IAW Department of Transportation requirements per 49 CFR	IAW with Department of Transportation, state, and local laws HAZWOPER Qualified Site-specific training Review and comply with SSHP

**Summarized Task Hazard Analysis
Former Benicia Arsenal, Benicia, California**

Activity OE Identification and Disposal **Analyzed by/Date** _____ **Reviewed by/Date** _____

PRINCIPAL STEPS	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Explosives handling Setting charges Disposal by detonation	Explosives OE Noise Fragmentation Accidental detonation Lifting hazards Weather-related hazards: Wind, rain, sun, heat, cold Walking surfaces: Unimproved land, sand, rocks, gravel, mud Dangerous plants and animals: Thistle, stinging nettle, poison oak, stinging insects, black widow spider, brown spider	Level D PPE Apply OE safety concepts and basic considerations Proper footing and footwear Remove obstacles on disposal site Use security to deny access to site Know heat and cold stress warning signs and proper action Use TM60 series for specific OE Have first-aid kits and fire extinguishers Educate personnel to stay beyond MSD from disposal site Conduct operations and safety briefing prior to beginning operation Comply with OE Disposal SOP (Appendix G - OE RDD)
EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
Demolition equipment Firing system Hand tools Level D PPE (see Section 1.12.1) Blast chamber (see Section 4.11 of OE RDD).	Ensure demolition equipment and hand tools are serviceable - to be inspected daily prior to use	Graduate U.S. Navy EOD School HAZWOPER Qualified Site-specific training Review and comply with SSHP Training people in use of tools

**Summarized Task Hazard Analysis
Former Benicia Arsenal, Benicia, California**

Activity INT Soil Homogenization **Analyzed by/Date** _____ **Reviewed by/Date** _____

PRINCIPAL STEPS	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
<p>Water soil to control dust</p> <p>Use tractor and plow to turn soil</p> <p>Use tractor and disc to turn and breakup soil</p> <p>Implement air monitoring</p>	<p>OE</p> <p>TNT exposure via inhalation or skin contact/ absorption</p> <p>Weather-related hazards: Wind, rain, sun, heat, cold</p> <p>Walking surfaces: Unimproved land, range land, sand, rocks, gravel, mud</p> <p>Dangerous plants and animals: Cactus, livestock</p> <p>Lifting hazards</p> <p>Repetitive motion injury</p>	<p>Wear clothing appropriate to weather conditions</p> <p>Watch carefully where you walk</p> <p>Wear Modified Level D PPE</p> <p>Implement dust monitoring IAW Section 4.2 of the OERDD.</p> <p>Have first-aid and fire extinguishers available</p> <p>Optimize ergonomics of work station within limits of available equipment</p> <p>Take 5-minute break each hour</p>
EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
<p>Tractor (rubber tires)</p> <p>Water Truck</p> <p>Hand-held radios</p> <p>Modified Level D PPE</p> <p>Note: All equipment will have sealed bearings and shielded junction boxes</p>	<p>Daily Equipment Inspection</p>	<p>HAZWOPER initial 40-hour training</p> <p>Site-specific training</p> <p>Review and comply with SSHP</p> <p>Knowledgeable, familiar, and trained with equipment and ergonomic recommendations</p>

Summarized Task Hazard Analysis
Former Benicia Arsenal, Benicia, California

Activity Soil Excavation/Stockpiling **Analyzed by/Date** _____ **Reviewed by/Date** _____

PRINCIPAL STEPS	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Remove non-hazardous construction debris from stockpiles Level remaining soils and OE point clear in lifts	OE Weather-related hazards: Wind, rain, sun, heat, cold Walking surfaces: Unimproved land, range land, sand, rocks, gravel, mud Vehicle Accident Repetitive motion injury	Must be escorted by UXO Technician Wear clothing appropriate to weather conditions Use sunscreen Observe heavy equipment operation safety Watch carefully where you walk Optimize ergonomics of work station within limits of available equipment Take 5-minute break each hour
EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
MTAD geophysical equipment Heavy equipment (front-end loader) Hand-held radios First-aid kit Fire extinguisher Level D PPE (see Section 8.1)	Daily Equipment Inspection	HAZWOPER initial 40-hour training Site-specific training Review and comply with SSHP Knowledgeable, familiar, and trained with equipment and ergonomic recommendations

ATTACHMENT D

**40-HOUR HAZWOPER MEDICAL
SURVEILLANCE REQUIREMENTS**

STANDARD PROCEDURE

SUBJECT
MEDICAL SURVEILLANCE

1.0 PURPOSE AND POLICY

1.1 Purpose

The medical surveillance program ensures that employees are physically fit to perform their assigned duties and that exposures to chemical and physical agents has not compromised their health. The medical surveillance program is designed to monitor the effectiveness of health and safety programs.

The medical surveillance program consists of baseline (initial), periodic (annual or biennial), special, exposure-specific examinations, and exit medical examinations. In addition to ensuring the fitness of workers for demanding assignments and tracking the effects of exposures, the medical surveillance program satisfies regulatory requirements.

1.2 Policy

It is the policy of EARTH TECH that each employee whose work assignments involves potential or actual exposure to harmful agents participate in a medical surveillance program.

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3.0 RESPONSIBILITY MATRIX

3.1 **Procedure Responsibility.** The Environmental Health and Safety Director is responsible for the issuance, revision, and maintenance of this procedure.

3.2 **Action/Approval Responsibilities.** The Responsibility Matrix is Attachment 1.

4.0 DEFINITIONS

Light Duty. Light Duty Work is defined as a temporary alternate job assignment other than the employee's normal duties, in response to physical activity restrictions established by an EARTH TECH contract physician or clinic.

Medical Director. The Medical Director is a physician, board certified in occupational medicine, employed by the Medical Services Contractor. The Medical Director manages the services provided by the Medical Services Contractor and provides guidance on medical matters to EARTH TECH.

Medical Services Contractor. The Medical Services Contractor manages all occupational medical services, including medical surveillance programs, substance abuse prevention programs, and care for workers with occupational injuries or illness.

Physical Activity Restriction. To prevent aggravation of an existing condition, the Medical Director recommends a physical activity restriction to limit exposure to a chemical or class of chemicals, such as hepatotoxins; a physical agent, such as temperatures above 26°C WBGT; or an activity, such as lifting in excess of 10 kg.

Safety-Critical. A task or position is designated as safety-critical when the task or position is such that malfeasance or incompetence would endanger the lives of others. Examples, but not a complete list, of positions that have been designated safety-critical by federal and state regulations are

- Drivers of commercial vehicles
- Workers on pipelines carrying fuels or toxic or corrosive substances
- Workers at nuclear power plants
- Operators of cranes of more than 6,000 pounds capacity
- Aircraft pilots

5.0 TEXT

5.1 Classes of Medical Examinations

5.1.1 Baseline/Preplacement/Preemployment

The baseline medical examination is used to identify physical capabilities and medical limitations that may have an impact on the candidate's ability to perform in the position for which he/she is being considered and to provide a baseline against which periodic or project-specific monitoring can be compared. The baseline medical examination is used to determine the suitability of an existing employee for a new assignment (preplacement) or a candidate's suitability to be hired (preemployment).

5.1.2 Periodic/Annual/Biennial

The periodic medical examination is used to evaluate an employee's continued fitness for duty and to assess any impact occupational exposures may have on his/her health status. The periodic examination includes an update to the medical and work history, results of any occupational exposure assessments, and a detailed medical examination tailored to the job description.

The Medical Director determines the frequency of the periodic medical examinations based on regulatory requirements, the position held by the employee, and the level of exposures to physical, chemical and biological agents.

5.1.3 Exposure/Activity/Project-Specific

The exposure-specific examination consists of specific medical tests to assess the impact of occupational exposures associated with a specific activity or project. The Medical Director will require an exposure-specific examination when he/she has reason to believe occupational exposures are impacting or may be impacting the health of an employee, or when he/she receives a recommendation from the Regional EHS Manager. Clients may recommend exposure-specific examinations for persons working on their projects. A client recommendation for an exposure-specific examination will be forwarded to the Regional EHS Manager who will evaluate the request, and if appropriate, forward the recommendation to the Medical Director. The Medical Director will determine the frequency of the exposure-specific medical examinations for each individual employee designated to participate based on sound medical practice and regulatory requirements.

5.1.4 Exit/Termination

An exit medical examination is given when an employee leaves the medical surveillance program, either because of termination of employment with EARTH TECH or because of reassignment to a position not designated to participate in the medical surveillance program. The exit examination assesses any impact occupational exposures may have on his/her health status.

5.2 Participating Employees

5.2.1 Required Participation

Participation in the medical surveillance program is required for employees who are or may be

- Exposed to substances at or above permissible exposure levels (PEL) for 30 or more days per year
- Required to wear a respirator for 30 or more days per year
- Exposed above PEL in accidents or emergency situations
- Working on sites covered by any of the following regulations:
 - 29 CFR 1910.120 Hazardous Waste Operations and Emergency Response
 - 29 CFR 1926.65 Hazardous Waste Operations and Emergency Response
 - 29 CFR 1926.62 Lead
 - 29 CFR 1926.1101 Asbestos
 - 29 CFR 1926.1118 Inorganic Arsenic
 - 29 CFR 1926.1127 Cadmium
 - 29 CFR 1926.1128 Benzene
- Driving a commercial vehicle
- Performing safety-critical tasks

5.2.2 Directed Participation

The Medical Director or the Corporate EHS Director may designate other employees to participate in a medical surveillance program with the concurrence of the other.

5.2.3 Mandatory Participation

All employees designated to participate in the medical surveillance program are required to do so as a condition of employment. Only employees who fall within the above listed categories will be included in the medical surveillance program

5.3 Entry Into the Medical Surveillance Program

5.3.1 Manager

Each Manager evaluates the duties of each employee and prospective employee reporting to him/her. If the duties meets the criteria for required participation in the medical surveillance program (see Section 5.1), then the employee must be enrolled in the medical surveillance program.

Candidates for positions which require medical surveillance may not be hired until satisfactory completion of the baseline (pre-employment) medical examination.

The Manager is responsible for providing the Medical Services Contractor with the following:

- Description of the employee's duties
- Description of actual and potential exposures to chemical, physical, and biological agents and results of measurements when available
- Description of personal protective equipment used or which may be used
- Information from previous examinations which may not be readily available.

5.3.2 Employee

When designated to participate in the medical surveillance program, the employee completes and signs the following documents:

- Medical and Work History Questionnaire
- Medical Records release form for medical records from previous examinations
- Medical Records release authorizing EARTH TECH to receive the results of the examination.

5.3.3 Regional EHS Manager

The Regional EHS Manager reviews employee assignments with Managers in his/her region to ensure all employee who should be participating in the medical surveillance program have been enrolled. The Regional EHS Manager provides such assistance as may be required to ensure all required information is provided to the Medical Director.

5.3.4 Corporate EHS Director

To ensure the appropriate medical examination and tests, the Corporate EHS Director provides the Medical Services Contractor with the following references:

- A copy of the medical program
- A copy of each regulation requiring the examination, including:
 - 29 CFR 1910.120 Hazardous Waste Operations and Emergency Response
 - 29 CFR 1926.65 Hazardous Waste Operations and Emergency Response
 - 29 CFR 1926.62 Lead
 - 29 CFR 1926.1101 Asbestos
 - 29 CFR 1926.1118 Inorganic Arsenic
 - 29 CFR 1926.1127 Cadmium
 - 29 CFR 1926.1128 Benzene
- Where appropriate, a copy of the corresponding state regulations

5.4 Scheduling Preemployment Medical Examination

5.4.1 Human Resources Representative

The Human Resources Representative coordinating the hire will provide the candidate with a baseline medical and work history questionnaire and determine from the candidate the geographical preference for the medical examination. The Human Resources Representative will contact the Medical Services Contractor to obtain the name, address, telephone number and contact person of the contract medical clinic which best suits the geographic preference of the candidate. The Human Resources Representative will coordinate the scheduling of the examination and ensure the scheduling information is provided to the Medical Services Contractor.

5.4.2 Hiring Manager

The hiring Manager informs the candidate that the offer of employment is contingent on the candidate being physically and medically capable of performing the duties of the position for which he/she is being hired. The Manager may not make the final offer until the medical examination is successfully completed and the medical clearance certificate has been received.

5.4.3. Regional EHS Manager

The Regional EHS Manager provides such assistance as is necessary to ensure the job description for the position being filled adequately describes the physical, chemical, and biological stresses of the position, and the PPE used or which may be used, including respiratory protection. The Regional EHS Manager provides

all necessary assistance to ensure that required and appropriate information is provided with the request and authorization for medical examination.

The Regional EHS Manager provides assistance to the hiring Manager to interpret physical activity restrictions if such restrictions are noted on the medical clearance certificate.

5.5 Scheduling Periodic and Exposure-Specific Medical Examinations

5.5.1 Medical Services Contractor

The Medical Services Contractor provides notification to the employee 60 to 30 days before the periodic or exposure-specific medical examination is due. This notification is in the form of a letter or fax to the office of record.

The Medical Services Contractor provides notification of delinquent medical examinations to the Manager, the Regional EHS Manager, and the Corporate EHS Director.

5.5.2 Manager

The Manager ensures the notification of examination due is forwarded to the employee in a timely way.

The Manager arranges the work assignment so that the employee is available to take the medical examination before the expiration of the medical clearance certificate.

The Manager removes the employee from the assignment if the employee has not completed the medical examination before the expiration of the medical clearance certificate.

5.5.3 Regional EHS Manager

The Regional EHS Manager ensures that all exposure assessments appropriate to the employee have been appropriately annotated to show the applicability to the employee and forwarded to the Medical Services Contractor.

The Regional EHS Manager ensures employees on delinquent medical examination list have been removed from designated assignments.

5.6 Scheduling Exit Medical Examinations

5.6.1 Human Resources Representative

Upon notification of termination or impending termination, the Human Resources Representative notifies the Medical Services Contractor to arrange for exit medical examination. The Human Resources Representative ensures terminating and reassigned employees who decline the opportunity to take an exit medical examination sign the waiver.

5.6.2 Manager

Upon notification of termination or reassignment, the Manager contacts the Human Resources Representative.

The Manager releases the terminating or reassigned employee from duties as necessary to complete the exit medical examination.

5.6.3 Regional EHS Manager

The Regional EHS Manager provides such assistance as needed to ensure terminating and reassigned employees are offered the opportunity to take an exit medical examination.

5.7 Medical Records

Medical records must be preserved and protected in accordance with 29 CFR 1910.20 for the duration of employment plus 30 years. Medical records contain information that is protected by the Privacy Act. To meet the obligations of preserving the medical records and protecting the information they contain, EARTH TECH has arranged for the Medical Services Contractor to manage the medical records.

5.7.1 Access to Records

An employee or designated representative may request to review his/her medical and exposure records. Such a request must be in writing, and signed and dated. The Regional EHS Manager will forward the request to the Medical Services Contractor who will provide the employee with a copy of the medical record.

The Medical Services Contractor will supply the copy within 15 days after the request has been submitted by the employee or designated representative. If the copy cannot be supplied within the allotted time, a request for extension will be submitted to the cognizant OSHA office.

5.7.2 Quality Control and Quality Assurance

The Medical Services Contractor performs quality control checks on all medical records to ensure examining physicians appropriately record the findings of the examination and tests.

The Corporate EHS Director has access to all medical records to perform quality assurance checks to ensure proper recording and preservation.

5.8 Reports

5.8.1 Report of Examination

The Medical Services Contractor provides the employee with a confidential report of findings of the examination and a medical clearance certificate. EARTH TECH recommends the employee preserve the medical clearance certificate in a safe place and carry copies of the medical clearance certificate to provide to project managers and clients.

The Medical Services Contractor provides Regional EHS Manager with a copy of the medical clearance certificate.

5.8.2 Examinations Due Report

The Medical Services Contractor produces a list by organization code of employees due to be examined 30 to 60 days before the expiration of their medical clearance certificate. This list is provided to Regional EHS Managers. The Regional EHS Manager ensures each Manager is notified of the employees in his/her charge due examinations so that he/she can schedule appropriately.

The Medical Services Contractor notifies each employee by letter or fax to the office of record 60 to 30 days before the periodic or exposure-specific medical examination is due.

5.8.3 Delinquent Examinations Report

The Medical Services Contractor distributes a report of delinquent medical examinations to the Manager, the Regional EHS Manager, and the Corporate EHS Director.

When an employee's name appears on the delinquent examination report for two consecutive months, the Corporate EHS Director in coordination with the Regional EHS Manager brings this to the attention of the Division Vice President for resolution.

5.8.4. Physical Activity Restriction Report

The Regional EHS Manager maintains a list of employees with physical activity restrictions. The Regional EHS Manager provides each Manager and Project/Location EHS Representative in his/her region with a list of the employees with physical activity restrictions assigned to to their project/location.

The Regional EHS Manager audits locations and projects from time to time to ensure employees with physical activity restrictions are not exceeding their limitations. Evidence of an employee exceeding his/her physical activity restriction is brought to the attention of the Department Manager and the employee's Manager/Supervisor for resolution.

5.8.5 Annual Reports

The Medical Services Contractor provides annual reports of utilization, medical trends, and statistical analyses. These reports are prepared to improve the service, reverse unfavorable trends, and reduce the cost of the medical surveillance program.

5.9 Cost Accounting

The Medical Services Contractor submits invoices directly to Corporate Accounts Payable. Each examination and service provided is coded with the organization code of the employee examined or receiving the service. The cost of medical surveillance is borne by the organizations with employees participating in the program.

6.0 EXCEPTION PROVISIONS

None permitted.

If an office elects not to use the Medical Services Contractor, the examination will be repeated by the Medical Services Contractor at additional cost to the organization.

7.0 CROSS REFERENCE

HS603 Occupational Injury and Illness

8.0 ATTACHMENTS

- Attachment 1: Responsibility Matrix
- Attachment 2: Medical Services Contractor
- Attachment 3: Form HSF601-F1 Authorization For Medical Examination
- Attachment 4: Form HSF601-F2 Notification of Physical Activity Restriction

RESPONSIBILITY MATRIX

Action	Procedure Section	Employee	Manager	Project/ Location EHS Rep	Regional/ Division EHS Manager	Corporate EHS Manager
Determining applicability of medical surveillance program	5.3.1		X			
Enrolling in medical surveillance program	5.3	X	X		X	
Scheduling initial examination	5.4		X			
Scheduling periodic examinations	5.5	X				
Scheduling exit examination	5.6		X			
Responding to delinquent examinations	5.8.3	X	X		X	X
Advise Operations about <i>Physical Activity Restriction</i>	5.3.3			X	X	

MEDICAL SERVICES CONTRACTOR

EMR, Inc.
4360 Chamblee Dunwoody Road, Suite 202
Atlanta, Georgia 30341

(404) 455-0818
(800) 229-3674
FAX (404) 457-1429

R. Burt Prater, MD
Chairman, CEO

Randall K. Hindman
President

DEDICATED EARTH TECH ACCOUNT TEAM

MEDICAL DEPARTMENT

Elayne F. Theriault, MD
Medical Director
medical@emrinc.uucp.netcom.com

Gail K. Mastin, COHN
Director, Medical Evaluation & Review

Susan Vollett, RN
Medical Review RN

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PRODUCTION SERVICES

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Vice President, Production Services

Terijene "TJ" Wolff
Director, Client Services

Mary Blake
Production Service Manager

EXPOSURE RECORDS MANAGEMENT

Rich DeLuca
Director, Environmental Health and Safety Services

EARTH TECH TEAM - TEAM 4

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Marcia Campbell
Team Leader/Client Support
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clinic@emrinc.uucp.netcom.com

Evelyn Cuckler
Medical Network Services Administrative Asst.

Kim Alcorn
Medical Network Services Administrative Asst.

RECORDS MANAGEMENT

David Goodman
Records Management

ACCOUNTING

Laurie Leimkuehler
Staff Accountant

Sherie Dunagan
Staff Accountant



AUTHORIZATION FOR MEDICAL EXAMINATION

To be faxed to EMR at least 48-hours prior to exam

Part I - Site Information

Program Coordinator requesting exam: _____
Coordinator's phone #: _____ FAX #: _____
Location (city/state): _____ EMR Site Code: _____
Earth Tech Organizational Code: _____

Part II - Medical Evaluation Required

- Pre-placement
- EKG
- Drug Screen ONLY this visit (EMR Collection Kit)
- Drug Screen in addition to exam at this visit
- Examinee requires or will require DOT Certification
- Additional testing required this visit
- Employee
- Chest X-ray
- Non-Nida Drug Screen
- NIDA Split Specimen Drug Screen
- Random NIDA Split Specimen Drug Screen (11D1)
- RUSH
- Tetanus
- Breath Alcohol

Type of Exam Requested

- Field
- Baseline (15F)
 - Annual (25F)
 - Exit (35F)
- Field/DOT
- Baseline (15D)
 - Annual (25D)
 - Exit (35D)

Type of Exam Requested

- Combo Field/Asbestos
- Baseline (15H)
 - Annual (25H)
 - Exit (35H)
- Field Biennial
- Baseline (15B)
 - Biennial (25B)
 - Exit (35B)

Part III - Facility Scheduling Information

Name of Facility to be used: _____
Location of Facility: _____
Date of Exam: _____ Facility A#: _____

Part IV - Examinee Information

Name (print): _____ Male Female
Social Security #: _____ Date of Birth: _____
Home Address: _____
Street Address: _____
City: _____ State: _____ Zip: _____

I authorize the release of any medical information necessary to determine my medical or physical condition concerning my application for employment, or ongoing employment, with this company. I further authorize EMR to release the results of this medical information to the designated individual at this company.

Examinee's Signature _____ Date _____

Fax this Authorization Form to EMR at (770) 455-0814
Questions? Call EMR at (800) 229-3674



NOTIFICATION OF
PHYSICAL ACTIVITY RESTRICTION

Employee Name	Employee SS No.	
Job Title	Dept/Sect.	Location

TO MANAGER/SUPERVISOR _____ :

• **Physical Activity Restriction**

The employee identified above has a medical condition for which the limitations described below are prescribed. Please ensure his/her work assignments are consistent with the limitation. If the limitations are inconsistent with his/her normal duties, please find a light duty work assignment.

- No reaching above shoulder
- No pushing or pulling
- No climbing of stairs or ladders
- No operating or working around moving machinery/driving
- No lifting over _____ pounds
- No repetitive waist bending
- No kneeling or squatting
- No exposure to hepatotoxic chemicals
- No exposure to extreme cold or extreme heat
- _____

Duration of Physical Activity Restriction: _____

• **Light Duty Work**

If the employee is unable to perform his/her normal duties with the above physical activity restriction, please notify the Regional Environmental Health and Safety Manager. EARTH TECH provides light duty work assignments whenever possible for employees with physical activity restrictions.

• **Medically Unable to Work**

If the employee is unable to be placed in any assignment consistent with his/her physical activity restrictions as described above, please notify the Regional Environmental Health and Safety Manager. EARTH TECH assists employees unable to work due to injury or illness in obtaining needed medical care and other benefits available to them.

Regional EHS Manager: _____

Phone: _____

ATTACHMENT E

**40-HOUR HAZWOPER
TRAINING REQUIREMENTS**

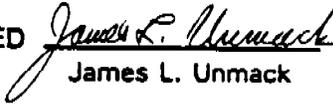
STANDARD PROCEDURE

SUBJECT
HAZWOPER TRAINING AND REFRESHER

PROCEDURE NO. HS301

DATE June 13, 1996

SUPERSEDES New

APPROVED 
James L. Unmack

1.0 PURPOSE AND POLICY

1.1 Purpose

To establish the EARTH TECH policy for HAZWOPER training, defining who must be trained and how training will be accomplished.

1.2 Policy

It is the policy of EARTH TECH that all employees who have occasion to work on a hazardous waste operation or hazardous waste site or supervise work on a hazardous waste operation or hazardous waste site as defined by 29 CFR 1910.120(b) shall receive training meeting the requirements of 29 CFR 1910.120(e).

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Attachment 2: References 6

Attachment 3: Field Experience Documentation 7

3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility.

The Corporate Director, Health and Safety, is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities.

The Responsibility Matrix can be found as Attachment 1 in Section 8.0.

4.0 DEFINITIONS

Hazardous Waste. Hazardous waste means a waste or combination of wastes as defined by 40 CFR 261.3 and 49 CFR 171.8.

Hazardous Waste Operation. Hazardous waste operation means any clean up operation or corrective action at a hazardous waste site.

Hazardous Waste Site. A hazardous waste site is any site where clean up or corrective action is required by a governmental body, whether federal, state, or local, involving hazardous waste. Hazardous waste sites include, but are not limited to, sites on the EPA's National Priority Site List (NPL), state priority site lists, sites recommended for the EPA NPL, and government identified sites before the initial investigation determines the presence or absence of hazardous waste. Hazardous waste sites also include sites covered by the Resource Conservation and Recovery Act of 1976 (RCRA) as amended (42 U.S.C. 6901 et seq.) and treatment, storage, and disposal (TSD) facilities regulated by 40 CFR Parts 264 and 265 pursuant to RCRA; or by agencies under agreement with U.S.E.P.A. to implement RCRA regulations, where clean-up operations or corrective actions are conducted, and sites where voluntary clean-up operations are conducted involving hazardous substances or hazardous waste.

HAZWOPER. Hazardous Waste Operations and Emergency Response, as applied to hazardous waste operations.

HAZWOPER Worker. A person who works on hazardous waste operation.

5.0 PROCEDURE

Employees shall not be permitted to participate in or supervise field activities until they have been trained to a level required by their job function and responsibility.

5.1 Business Unit Managers

- Ensure that all employees who are or will be assigned to work on a hazardous waste operation or hazardous waste site or supervise work on a hazardous waste operation or hazardous waste site as defined by 29 CFR 1910.120(b) receive training meeting the requirements of 29 CFR 1910.120(e).
- Schedule or provide for safety and health training meeting the requirements of 29 CFR 1910.120(e).
- Provide adequate facilities for in-house training to meet the needs of the scheduled training.
- Ensure that Project Managers, Response Managers, Construction Managers, and Supervisors of HAZWOPER workers receive 8 hours of hazardous waste operations supervisor training in accordance with 29 CFR 1910.120(e)(4).

5.2 Project, Response, Construction Managers

- Ensure that each of their employees who is assigned to work on a hazardous waste operation or hazardous waste site or supervise work on a hazardous waste operation or hazardous waste site as defined by 29 CFR 1910.120(b) receive a minimum of 40 hours of instruction off the site before being dispatched to the site, and a minimum of three days actual field experience under the direct supervision of a trained, experienced supervisor.
- Ensure that onsite employees who manage or supervise HAZWOPER workers receive 8 hours of hazardous waste operations supervisor training in accordance with 29 CFR 1910.120(e)(4).
- Ensure that each of their employees who is assigned to work on a hazardous waste operation or hazardous waste site or supervise work on a hazardous waste operation or hazardous waste site receives eight hours of refresher training annually.
- Schedule work assignments to allow timely completion of refresher training in accordance with 29 CFR 1910.120(e)(8).

5.3 HAZWOPER Employees

- Attend initial 40 hours of health and safety training for hazardous waste site workers before working on a hazardous waste site or supervising hazardous waste operations.

- Obtain and document a minimum of three days actual field experience under the direct supervision of a trained, experienced supervisor. See Attachment 2 to document field experience.
- Attend 8-hour HAZWOPER Refresher training no longer than 365 days from their last HAZWOPER training. If more than 24 months have passed since the last HAZWOPER training, the initial 40-hour training must be repeated.
- Provide copies of their 40-hour HAZWOPER training certificate and their most recent 8-hour HAZWOPER Refresher training certificate to the location Health and Safety Coordinator and to the Project/Response/Construction Manager.

5.4 Health and Safety Coordinators

- Keep a copy of each HAZWOPER training certificate received by employees assigned to the business unit.
- Remind HAZWOPER employees when due to take HAZWOPER refresher training in time to avoid expiration of HAZWOPER training certification.
- Coordinate with Business Unit Managers to schedule HAZWOPER training courses.
- Coordinate with Health and Safety Department to schedule in-house HAZWOPER refresher training.

5.5 Health and Safety Department

- Provides trainers for in-house HAZWOPER refresher training when resources are available.
- Assists Health and Safety Coordinator to schedule out-sourced training.

6.0 EXCEPTION PROVISIONS

Variations to this procedure shall be requested in accordance with established procedures. See HS109.

7.0 CROSS REFERENCE

None

8.0 ATTACHMENTS

- Attachment 1: Responsibility Matrix
- Attachment 2: References
- Attachment 3: Field Experience Documentation

RESPONSIBILITY MATRIX

Action	Procedure Section	Business Unit Manager	PM, RM, CM	HS Coordinator	Corporate EHS Manager
Issuance, revision and maintenance of this procedure	3.1				X
Facilities for training	5.1	X			
Enforcement of training requirements	5.2		X		
Maintenance of training records	5.4			X	

PM Project Manager
 RM Response Manager
 CM Construction Manager
 HS Health and Safety
 EHS Environmental Health and Safety

REFERENCES

29 CFR 1910.120 Hazardous Waste Operations and Emergency Response

29 CFR 1926.65 Hazardous Waste Operations and Emergency Response

42 U.S.C. 6901 et seq. Resource Conservation and Recovery Act of 1976

40 CFR 261.3 Definition of Hazardous Waste

40 CFR 264 Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities

40 CFR 265 Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities

49 CFR 171.8 Definitions and Abbreviations

FIELD EXPERIENCE DOCUMENTATION

NAME: _____

Title 29 of the Code of Federal Regulations, Part 1910.120(e)(3) requires general site workers (such as equipment operators, general laborers, and supervisory personnel) engaged in hazardous substance removal or other activities which expose or potentially expose workers to hazardous substances and health hazards to receive a minimum of three days actual field experience under the direct supervision of a trained, experienced supervisor following a minimum of 40 hours of initial instruction off the site. This *on-the-job training* is documented as follows:

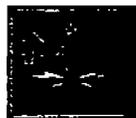
DATE	PROJECT	SUPERVISOR'S SIGNATURE

Employee's Signature

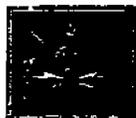
Date

ATTACHMENT F
40-HOUR HAZWOPER CPR
TRAINING REQUIREMENTS

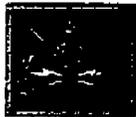
Training Links:



Home...



CORE...



DEMO...



TMD...



BIO/CHEM...



*Reserve
Training...*

Training at the Explosive Ordnance Disposal School

We are a Navy managed command located at Eglin Air Force Base, Florida and Indian Head Maryland, that is jointly staffed by over 300 Army, Marine Corps, Navy, and Air Force personnel. Each year approximately 325 U.S. Soldiers, Sailors, Marines, and Airman graduate from the seven month (12 for Navy) basic course. Also, over 100 non-U.S. students graduate each year and over 63 countries have EOD technicians who have been trained at this school. U.S. graduates from this school are currently performing EOD missions in places such as Bosnia, Laos, Cambodia, Korea, the Arabian Gulf, on board ships and U.S. bases throughout the world.

Currently EOD training is broken down into two phases.

Phase I consists of eleven (11) weeks of "basic level" EOD training at NAVSCOLEOD DET, Eglin Air Force Base, Florida. Eglin Air Force Base is located in Florida's north west panhandle.

Phase II consists of fifteen (15) weeks of "advanced" level EOD training at Naval Ordnance Station, Indian Head, Maryland. Naval Ordnance Station, Indian Head is located about 45 miles south of Washington DC. Training at Indian Head, Maryland is scheduled to consolidate with training at Eglin AFB, Florida sometimes late in 1998.

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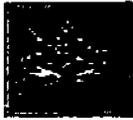
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[NAVSCOLEOD](#)**

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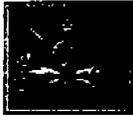
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**Information
Links:**



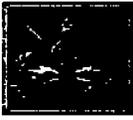
Home...



Training...



*Welcome
Aboard...*



History...



The Future...

Phase I Training at Explosive Ordnance Disposal School Detachment

Prior to starting training students will be given a one day indoctrination into the school. All aspects of the school are covered, giving each student an overview of the school, what they can expect as well as what is expected of them. Phase I training at NAVSCOLEOD Detachment is broken down into four (4) training divisions.

Training begins in the CORE Division. This division is 18 days long and covers a variety of subjects from basic safety to EOD operations and planning.

Students then enter the Demolition Division where in 15 days they will learn about basic demolition materials, explosive safety, and disposal techniques.

The next division is the Tools and Methods Division. Students will spend 11 days learning about EOD special tools and procedures, to include explosively actuated tools and ordnance locators.

As they enter the last division, which is the Biological and Chemical Division, they will be expected to put together what they have learned in the first three divisions and apply that during these last 11 days. This training provides basic information in biological/chemical materials, clothing, as well as related procedures. It also places the students in a EOD scenario while operating in a simulated chemical/biological environment.

Upon successful completion students then head north to Phase II training. This will be 15 weeks of training at Naval School, Explosive Ordnance Disposal, Indian Head, Maryland.

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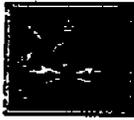
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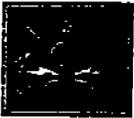
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"The First Division"

Training Links: CORE Division



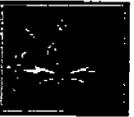
Home...



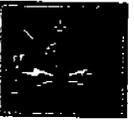
Demo...



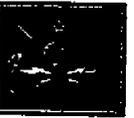
TMD...



Bio/Chem...



Phase I...



Training...



CORE Division provides the backbone of skills and knowledge upon which Explosive Ordnance Disposal (EOD) is built. During the course of 18 training days, a student would be immersed in the basic principles of electricity, physics, fuze functioning and ordnance identification. Students would also be trained in the use of the automated EOD publications systems. After the first 13 days of classroom instruction, the student will conduct and be evaluated on the application of these *core* skills in an outdoor environment. This environmental laboratory would require the student to approach a suspected item, make some preliminary evaluations, research, and positively identify the suspected munition, while observing safety during the whole evolution.

Routinely CORE Division is considered by most students to be the hardest division at NAVSCOLEOD. It is important that the student learn the safeties and fundamental theories first, before learning how to "save the world".

Yearning for excitement, most students look forward to the "blow and go" demonstrations of explosives in the Demolition Division, the second stop at Phase I.

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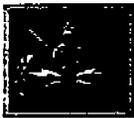
"The Second Division, It's a Blast"

Training Links:

Demo Division



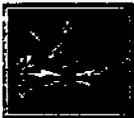
Home...



TMD...



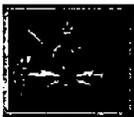
Bio/Chem...



CORE...



Phase I...



Training...



Welcome to the world of the *demolition* division. It is better known as "DEMO". Demo training last 15 days. This block of instruction begins with extensive classroom training in explosive safety, an essential element of any EOD operation.

The training provides a summary of the history of explosives, and expands into Explosives, and Explosives Effects (EEE) such as blast and fragmentation, and details explosive storage, handling and transportation requirements. From that base of information, demolition materials and their designated use become the heart of the Demo division.

After 5 intensive days in the classroom the student progresses to the practical application of electric, non-electric, and radio firing systems. This prepares trainees for disposal operations, i.e., disposal by detonation and disposal by burning. They will also learn Shaped Charges and Special Explosives. The remaining 10 days will be spent in practical application and testing.

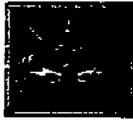
There are 5 tests in this division, but tests alone do not determine whether students successfully complete the Demolition division. Lack of concentration, casualness, inappropriate attitude or unsafe acts will eliminate them from this "High Risk" training before ever reaching the first test. This is a fun division but requires a serious approach.

Upon successful completion of this "It's a Blast" division, students will be moving on to the third division of Phase I the Tools and Methods division.

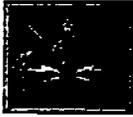
Home | [Welcome Aboard](#) | [History](#) | [The Future](#) | [USA](#) | [USMC](#) | [USN](#) | [USAF](#)

"The Third Division"

Training Links: Tools and Methods Division



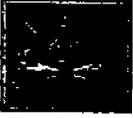
Home...



BIO/CHEM...



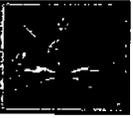
CORE...



DEMO...



Phase I...



Training...



Welcome to the Tools and Methods Division. During this eleven day block of instruction students will be exposed to a variety of EOD specific tools and techniques recognized by Explosive Ordnance Disposal technicians around the world. This division is primarily a "hands on" training evolution. There will be some classroom sessions necessary to expose trainees to the basic information needed to complete the practical exercises. Students will learn about non-magnetic tools and the roles they play when working on ordnance items. There will be classroom instruction on ordnance locators as well as practical applications and testing. Upon successful completion of ordnance locator training students will be able to located buried unexploded ordnance and mines.

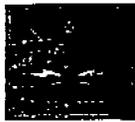
Students will receive classroom training on manual remote procedures designed to accomplish render safe procedures on hazardous fuzed munitions. After several days of practicing these procedures they will be expected to pass practical tests on the various methods.

Training will also be received on explosively acuated EOD tools. These tools are powered by special .50 caliber cartridges and are designed to perform render safe procedures on unexploded ordnance with hazardous fuzes.

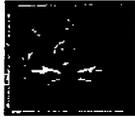
Final passage from the TMD division will be a written comprehensive test covering all of the information covered while in this division. Upon successful completion of this division students will move on to the Biological and Chemical Division, the final training division here at Phase I.

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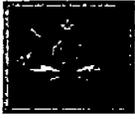
Phase II Links:



Home...



Ground Ordnance...



Air Ordnance...



IED Division...



Nuclear Weapons...



Underwater...



Training...

Phase II Training at Explosive Ordnance Disposal School, Indian Head, Maryland

Phase II consists of fifteen (15) weeks of "advanced" level EOD training at Naval Ordnance Station, Indian Head, Maryland. Naval Ordnance Station, Indian Head is located about 45 miles south of Washington DC. Training at Indian Head, Maryland is scheduled to consolidate with training at Eglin AFB, Florida sometimes late in 1998.

Before commencing training students will be given a two day indoctrination into the school. All aspects of the school are covered, giving each student an overview of the school, what they can expect as well as what is expected of them. Phase II training at NAVSCOLEOD is broken down into four divisions for surface students, Ground Ordnance, Air Ordnance, Improvised Explosive Devices, and Nuclear Weapons. Navy students attend a fifth division, Underwater Ordnance and Operations.

Phase I

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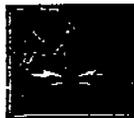
Comments or Problems?

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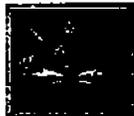
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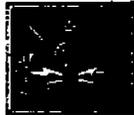
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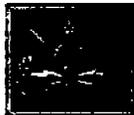
Home...



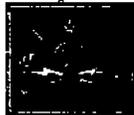
Air Ordnance...



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Phase II...

Ground Ordnance



Learning in Phase II begins in the Ground Ordnance Division. This division consists of 18 days of instruction and both classroom and practical testing in all aspects of emergency EOD response involving grenades, land mines, rockets, and projectiles. Focus has shifted from Phase I to where students are expected to perform EOD procedures on individual ordnance items, vice the methodology and techniques taught during the Core phase of training. This holds true for the remaining areas in Phase II as well.

[Air Ordnance](#)

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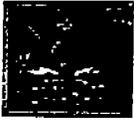
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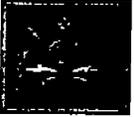
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Phase II Links:



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IED Division...



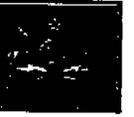
*Nuclear
Weapons...*



Underwater...



*Ground
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Phase II...

Air Ordnance



After completion of Ground successful students will progress to the Air Ordnance Division where they will spend the next 30 class-days learning the intricacies of air dropped munitions and associated devices. Classroom and practical training includes "Aircraft Explosive Hazards", "Guided Missiles", "Bombs and Bomb Fuzes", and "Dispensers and Payloads".

[IED Division](#)

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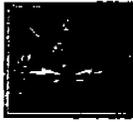
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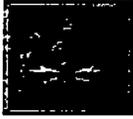
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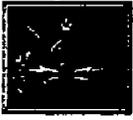
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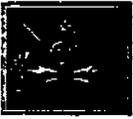
Home...



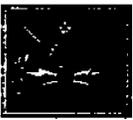
Nuclear Weapons...



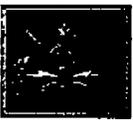
Underwater...



Ground Ordnance...



Air Ordnance...



Phase II...

Improvised Explosive Devices



Students then move on to the Improvised Explosive Devices (IEDs) Division. The next 9 class-days are spent studying improvised explosive device construction, effects, render safe, and disposal. Search techniques as well as methods of exploitation are also covered.

[Nuclear Weapons Division](#)

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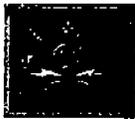
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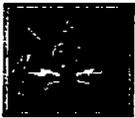
Phase II Links:



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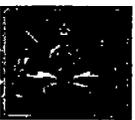
*Ground
Ordnance...*



Air Ordnance...



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Phase II...

Nuclear Weapons



The last division for surface students is the Nuclear Ordnance Division. A 21 class-day curriculum includes studying and testing on various aspects of nuclear physics, weapon design and effects, and EOD emergency response procedures. Also included is contamination detection, personnel protection, and contamination control. After completion of this division, surface students graduate and receive their "crab"! Navy students move on to their next block of instruction.

[Underwater](#)

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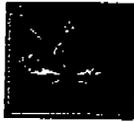
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Phase II Links:



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*Ground
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Weapons...*



Phase II...

Underwater



Instruction in the last division for Navy students takes place in the Underwater Ordnance Division. Here Navy students spend their last 62 training days learning all the intricacies of locating, rendering safe, exploitation, and disposal of all types of underwater ordnance including mines, torpedoes, limpet mines, and other miscellaneous devices. Practical problems involving use of SCUBA equipment and instruction in MK 16 influence ordnance diving techniques are included.

Phase II

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40 HOUR HAZWOPER

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	APPENDIX C-GLOSSARY

EMS SAFETY SERVICES FIRST AID/CPR

**Scene Assessment
Bloodborne Pathogens
Primary Assessment/Child Partial Obstruction Airway
Child Complete Obstruction Airway
Recovery Position/Child CPR
Infant CPR
Infant Obstructed Airway
Vital Signs
Bleeding
Shock
Illness Assessment
Illness Assessment Check Sheet
Injury Assessment
Injury Assessment Check Sheet
Head and Neck Injuries
One Person Log Roll
Fractures
Burns
Eye Injuries/Seizures
Poisoning
Heat and Cold Emergencies
Cold Emergencies
Diabetes
Asthma
Always Consult Pediatrician If:
Get Help Immediately If:
Exam Questions
Skills Performance Checklist
EMS Safety Services Student Agreement
Course Evaluation'**

**Paul Lepore - Captain/Paramedic
Book Design by AJ Graphics/Huntington Beach, CA**

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**EMS Safety Services, Inc.
800-215-9555 Fax 714-8442-6889**

RESPIRATOR TRAINING PROGRAM

- I. Experienced personnel (Certified Industrial Hygienists) will train Earth Tech employees in the appropriate use of respiratory protective equipment. Minimum training, shall include the following:
 - A. Identification of respiratory hazards (site specific);
 - B. The consequences of improper utilization of respiratory protective equipment;
 - C. The relationship between engineering and administrative controls and the application of respiratory protection;
 - D. Instruction in the selection, use, sanitary care, maintenance, proper storage, and limitations of each applicable respirator type; and
 - E. An explanation of the medical surveillance program as it relates to the use of respiratory protective equipment.

- II. Experienced personnel will properly fit test Earth Tech employees to ensure that they can properly wear a respirator. The fit test will provide:
 - A. An opportunity to handle the respirator and to wear it in a safe atmosphere for an adequate period of time to ensure that the wearer is familiar with the operational characteristics of the respirator; and
 - B. An opportunity to wear the respirator in a test atmosphere (such as atmospheres generated by smoke tubes or isoamyl acetate) to demonstrate that the respirator protects the worker.

- III. Trainers will also instruct Earth Tech employees of situations where a respirator will be needed and the decisions to be made such as:
 - A. Instructions in how to recognize and cope with emergency situations requiring respiratory protection;
 - B. An explanation of the requirement for a self-contained breathing device for work in unknown concentrations and IDLH atmospheres, and for fire fighting;
 - C. Equipment donning and doffing procedures; and
 - D. Selection of proper cartridges based on site-specific contaminants.

- IV. Earth Tech employees will be made aware of the limitations of respirators such as:
 - A. An explanation of the requirements for maintenance of the respirator gas-tight seal, including beard and facial hair policies, and the policy prohibiting the use of contact lenses while wearing respirators; and
 - B. Employee respirator training will be required on a minimum annual basis and will be documented in writing. Copies of training records will be retained at the division office.

ATTACHMENT G
HEALTH AND SAFETY FORMS

Supervisor's Report of Incident

This is an official document to be initiated by the injured employee's Supervisor. Please answer all questions completely. Fax to your Region's EHS Manager within 24 hours of the injury. See reverse side for instructions.

Section 1: Employee (Must complete each item or processing delays will occur) - Print Clearly

SCMS Claim#: _____		WC Location Code: _____	
SCMS: (877)261-8926			
Employee Data		S.S. No.	Sex
Injured's Name		Home Phone	Marital Status
Home Address		City	State
Job Title	Dept No.	Office Location/Address	
<input type="checkbox"/> Injury	<input type="checkbox"/> Illness	<input type="checkbox"/> Vehicle Injury	<input type="checkbox"/> Near Miss
Hire Date		Hourly Wage	

Section 2: Supervisor (Must complete each item or processing delays will occur) - Print Clearly

Date of Incident	Time	Date Reported	To Whom
Client Name	Job Assignment at Time of Incident		Time Shift Began
Exact Location & Address of Incident		Did injured leave work? <input type="checkbox"/> Yes <input type="checkbox"/> No	
When?		Did employee miss a regularly scheduled shift? <input type="checkbox"/> Yes <input type="checkbox"/> No	
Has injured returned to work? <input type="checkbox"/> Yes <input type="checkbox"/> No	Address of Hosp.		
Doctor/Hospital Name	Statements Attached <input type="checkbox"/> Yes <input type="checkbox"/> No		
Witness Name	Body Part		
Nature of Injury			
Medical Treatment Received			
Describe Incident			
What caused the incident?			
Corrective Action(s) to Prevent Future Occurrence:			
Supervisor/Foreman (Print Name)	Signature	Date	Telephone

Section 3: Manager

Comments on incident and corrective action			
Manager (Print Name)	Signature	Date	Telephone

Section 4: Environmental, Health and Safety

Concur with action taken? <input type="checkbox"/> Yes <input type="checkbox"/> No			
Remarks:			
OSHA Recordable <input type="checkbox"/> No <input type="checkbox"/> Pending <input type="checkbox"/> Yes - Type : <input type="checkbox"/> Incident only <input type="checkbox"/> First aid <input type="checkbox"/> Medical <input type="checkbox"/> Fatality			
Lost work days _____		Days of restricted activity _____	
EHS Professional (Print Name)	Signature	Date	Telephone

Supervisor's Report of Incident Instructions For Completion

The following types of incidents must be reported using this form:

1. Occupational Injury or Illness (includes first aid only, medical treatment, hospitalization, fatality)
2. Vehicle Accident Injuries
3. Near Miss (incident where employee(s) could have been injured)

INSTRUCTIONS

Immediate:

1. Employees must report such incidents to their Supervisor immediately.
2. The Supervisor must complete **Sections 1 and 2, Employee Data and the Supervisor Section** of the SRI. Incomplete items will delay timely processing. Any work-related injury or illness that requires medical treatment or care will require notifying SCMS at 877-261-8926 (Note: The WC Location Code is the employee's office's ET Office Code, preceded by the letter "C", e.g. Long Beach is C100).
3. The Supervisor must verbally notify his/her Manager, who in turn must sign **Section 3, Manager**, of the SRI. To avoid delaying SRI process, a separate copy of the SRI with the Manager's signature can be faxed within 3 days to the REHSM.
4. The Supervisor must verbally notify his/her REHSM with a follow-up SRI faxed within 24 hours (see below for fax numbers). The REHSM will review and complete **Section 4, Environmental Health and Safety**, and fax the SRI to the WCA at 804-515-8313.
5. For near-miss situations that could have resulted in an injury to an employee, the Supervisor must notify his/her Manager (see Item 3 above) and the REHSM with a follow-up SRI faxed within 24 hours.

PRIMARY CONTACTS

East REHSM: Dale Prokopchak, CIH, CSP
Telephone: 804-515-8556
Fax: 804-515-8313
Pager: 877-830-1981

WCA:
Telephone: 804-515-8557
Fax: 804-515-8313

Midwest REHSM: Jeff Grant, CIH
Telephone: 616-940-4426
Fax: 616-940-4396
Cell Phone: 734-516-5232

West REHSM: Bob Poll, CIH, CSP
Telephone: 562-951-2242
Fax: 562-495-9257
Cell Phone: 562-884-1414

ATTACHMENT H
MATERIAL SAFETY DATA SHEETS

International Chemical Safety Cards

2,4,6-TRINITROTOLUENE

ICSC: 0967

2,4,6-TRINITROTOLUENE
2-Methyl-1,3,5-trinitrobenzene
alpha-Trinitrotoluol
TNT
 $C_7H_5N_3O_6 / C_6H_2(CH_3)(NO_2)_3$
Molecular mass: 227.1

CAS # 118-96-7
RTECS # XU0175000
ICSC # 0967
UN # 0209
EC # 609-008-00-4

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Explosive.	NO open flames, NO sparks, and NO smoking.	Water in large amounts. Do not attempt to extinguish large fire, evacuate area.
EXPLOSION	Risk of fire and explosion upon rapid heating or strong shock.	Do NOT expose to friction or shock. Do not expose to heat.	In case of fire: keep drums, etc., cool by spraying with water. Combat fire from a sheltered position.
EXPOSURE		STRICT HYGIENE!	IN ALL CASES CONSULT A DOCTOR!
• INHALATION	Abdominal cramps. Blue lips or finger nails. Blue skin. Cough. Headache. Laboured breathing. Vomiting. Symptoms may be delayed (see Notes).	Local exhaust or breathing protection.	Fresh air, rest. Artificial respiration if indicated. Refer for medical attention.
• SKIN	MAY BE ABSORBED! Redness. Pain (further see Inhalation).	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention. Wear protective gloves when administering first aid.
• EYES	Redness. Pain.	Face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
• INGESTION	(further see Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Induce vomiting (ONLY IN CONSCIOUS PERSONS!). Wear protective gloves when inducing vomiting.
SPILLAGE DISPOSAL		STORAGE	PACKAGING & LABELLING
Evacuate danger area! Consult an expert! Wet spilled material before picking it up, do not attempt to sweep up dry material. Do NOT wash away		Fireproof. Separated from combustible and reducing substances, heavy metals and initiator explosives. Tightly closed. Cool. Dry.	Unbreakable packaging; put breakable packaging into closed unbreakable container. E symbol

into sewer. Sweep spilled substance into containers. Carefully collect remainder, then remove to safe place. Do NOT let this chemical enter the environment (extra personal protection: self-contained breathing apparatus).

T symbol
R: 2-23/24/25-33
S: 35-44
UN Hazard Class: 1.1D

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0967

Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities © IPCS CEC 1993

International Chemical Safety Cards

2,4,6-TRINITROTOLUENE

ICSC: 0967

I M P O R T A N T D A T A	<p>PHYSICAL STATE; APPEARANCE: YELLOW CRYSTALS.</p> <p>PHYSICAL DANGERS:</p> <p>CHEMICAL DANGERS: May explosively decompose on shock, friction, or concussion. Upon heating, toxic fumes are formed. Reacts violently with reducing agents causing fire and explosion hazard. Reacts with heavy metals. Explodes on heating to 240°C.</p> <p>OCCUPATIONAL EXPOSURE LIMITS (OELs): TLV: ppm; 0.5 mg/m³ (skin) (ACGIH 1991-1992). PDK not established.</p>	<p>ROUTES OF EXPOSURE: The substance can be absorbed into the body by inhalation of its aerosol, through the skin and by ingestion.</p> <p>INHALATION RISK: Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly.</p> <p>EFFECTS OF SHORT-TERM EXPOSURE: The substance irritates the eyes, the skin, and the respiratory tract. The substance may cause effects on the blood, resulting in hemolysis, formation of methaemoglobin. Exposure may result in death. The effects may be delayed (see Notes). Medical observation is indicated.</p> <p>EFFECTS OF LONG-TERM OR REPEATED EXPOSURE: The substance may have effects on the liver, blood and eyes, resulting in jaundice, anaemia, cataract.</p>
	<p>PHYSICAL PROPERTIES</p> <p>Boiling point (decomposes): 240°C Melting point: 80.1°C Relative density (water = 1): 1.65 Solubility in water: none</p>	<p>Vapour pressure, Pa at 20°C: <0.1 Relative vapour density (air = 1): 7.85 Octanol/water partition coefficient as log Pow: 1.60</p>
ENVIRONMENTAL DATA	This substance may be hazardous to the environment; special attention should be given to aquatic organisms.	
NOTES		
Combustion in a confined space may turn into detonation. Depending on the degree of exposure, periodic medical examination is indicated. Specific treatment is necessary in case of poisoning with this substance; the appropriate means with instructions must be available. Do NOT take working clothes home. Toluene, Tritol, Trotyl, Entsufoen are trade names.		
Transport Emergency Card: TEC (R)-10G03 NFPA Code: H 2; F 4; R 4;		
ADDITIONAL INFORMATION		
ICSC: 0967		2,4,6-TRINITROTOLUENE
© IPCS, CEC, 1993		

**IMPORTANT
LEGAL
NOTICE:**

Neither the CEC or the IPCS nor any person acting on behalf of the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use.

WATLOW GORDON -- IRON-JPX JP
MATERIAL SAFETY DATA SHEET
NSN: 343900F053034
Manufacturer's CAGE: 93768
Part No. Indicator: A
Part Number/Trade Name: IRON-JPX JP

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

Company's Name: WATLOW GORDON
Company's Street: 5710 KENOSHA ST
Company's P. O. Box: 500
Company's City: RICHMOND
Company's State: IL
Company's Country: US
Company's Zip Code: 60071-5000
Company's Emerg Ph #: 815-678-2211
Company's Info Ph #: 815-678-2211
Record No. For Safety Entry: 001
Tot Safety Entries This Stk#: 001
Status: SE
Date MSDS Prepared: 21MAY96
Safety Data Review Date: 25MAR97
MSDS Preparer's Name: ALAN HAMACKA
Preparer's Company: WATLOW GORDON
Preparer's St Or P. O. Box: 5710 KENOSHA ST
Preparer's City: RICHMOND
Preparer's State: IL
Preparer's Zip Code: 60071-5000
MSDS Serial Number: CDQYF

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

Proprietary: NO
Ingredient: RED IRON OXIDE/IRON (III) OXIDE/FERRIC OXIDE/YELLOW FERRIC
OXIDE/YELLOW IRON OXIDE/IRON OXIDE PIGMENT
Ingredient Sequence Number: 01
Percent: 99
NIOSH (RTECS) Number: NO7400000
CAS Number: 1309-37-1
OSHA PEL: 10 MG/CUM
ACGIH TLV: 5 MG/CUM (FE)

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

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

Flash Point: NONFLAMMABLE
Unusual Fire And Expl Hazrds: SPARKS FROM GRINDING/WELDING MAY IGNITE
FLAMMABLE/COMBUSTIBLE MATERIALS.

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

Stability: YES
Hazardous Decomp Products: METAL DUST/FUMES
Hazardous Poly Occur: NO

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

Route Of Entry - Inhalation: YES
Route Of Entry - Skin: NO
Route Of Entry - Ingestion: NO
Health Haz Acute And Chronic: IRRITATION TO THE NOSE, EYES, THROAT/SKIN.
CHRONIC EXPOSURE MAY CAUSE SEVERE LUNG DISEASES, LUNG FIBROSIS,
PNEUMOCONIOSIS/NEUROLOGICAL DAMAGE. SKIN SENSITIVITY MAY ALSO OCCUR.
Carcinogenicity - NTP: NO

Carcinogenicity - IARC: NO

Carcinogenicity - OSHA: NO

Explanation Carcinogenicity: NONE

Signs/Symptoms Of Overexp: DISCOMFORT, IRRITATION, NAUSEA, TIGHTNESS OF CHEST, DIZZINESS, WATERING OF EYES, HEADACHES, DIFFICULTY IN BREATHING, COUGHING, CHEST PAINS.

Med Cond Aggravated By Exp: THOSE HAVING PRE-EXISTING CONDITIONS/OTHER OCCUPATIONAL ILLNESSES BECAUSE OF THE WIDE VARIATION IN INDIVIDUAL SUSCEPTIBILITIES.

Emergency/First Aid Proc: INHALATION: MOVE TO FRESH AIR. SKIN: WASH W/ SOAP & WATER. EYES: IMMEDIATELY WASH W/LARGE AMOUNTS OF WATER, WASH FOR 15 MINS. OBTAIN MEDICAL ATTENTION IN ALL CASES.

=====
Precautions for Safe Handling and Use
=====

Waste Disposal Method: GRINDING PARTICLES/DUSTS/WELDING FUMES/CHEMICAL CLEANING SOLUTIONS MUST BE DISPOSED OF IN ACCORDANCE W/LOCAL, STATE & FEDERAL REGULATIONS.

Other Precautions: ARC/SPARK GENERATED WHEN WELDING/BURNING COULD BE A SOURCE OF IGNITION FOR COMBUSTIBLE & FLAMMABLE MATERIALS.

=====
Control Measures
=====

Respiratory Protection: REQUIRED WHEN EXPOSED TO LEVELS THAT EXCEED THOSE ESTABLISHED BY OSHA WHEN GRINDING/WELDING. USE NIOSH APPROVED RESPIRATORS. Ventilation: REQUIRED.

Protective Gloves: NIOSH APPROVED

Eye Protection: FACE SHIELDS

Other Protective Equipment: PROTECTIVE CLOTHING WHEN REQUIRED.

=====
Transportation Data
=====

=====
Disposal Data
=====

=====
Label Data
=====

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MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

MALLINCKRODT



24 Hour Emergency Telephone: 800-820-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-898-4488

Outside U.S. and Canada
Chemtrec: 202-463-7818

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-562-2537) for assistance.

LEAD METAL

MSDS Number: L2347 --- Effective Date: 12/08/96

1. Product Identification

Synonyms: Granular lead, pigment metal; C.I. 77575
CAS No.: 7439-92-1
Molecular Weight: 207.19
Chemical Formula: Pb
Product Codes: J.T. Baker: 2256, 2266 Mallinckrodt: 5668

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Lead	7439-92-1	95 - 100%	Yes

3. Hazards Identification

Emergency Overview

POISON! DANGER! MAY BE FATAL IF SWALLOWED OR INHALED. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. NEUROTOXIN. AFFECTS THE GUM TISSUE, CENTRAL NERVOUS SYSTEM, KIDNEYS, BLOOD AND REPRODUCTIVE SYSTEM. POSSIBLE CANCER HAZARD. MAY CAUSE CANCER BASED ON ANIMAL DATA. Risk of cancer depends on duration and level of exposure.

J.T. Baker SAF-T-DATA^(tm) Ratings (Provided here for your convenience)

Health Rating: 3 - Severe (Life)
Flammability Rating: 0 - None
Reactivity Rating: 0 - None

Contact Rating: 1 - Slight
Lab Protective Equip: GOGGLES; LAB COAT; VENT HOOD; PROPER GLOVES
Storage Color Code: Blue (Health)

Potential Health Effects

Inhalation:

Lead can be absorbed through the respiratory system. Local irritation of bronchia and lungs can occur and, in cases of acute exposure, symptoms such as metallic taste, chest and abdominal pain, and increased lead blood levels may follow. See also Ingestion.

Ingestion:

POISON! The symptoms of lead poisoning include abdominal pain and spasms, nausea, vomiting, headache. Acute poisoning can lead to muscle weakness, "lead line" on the gums, metallic taste, definite loss of appetite, insomnia, dizziness, high lead levels in blood and urine with shock, coma and death in extreme cases.

Skin Contact:

Lead and lead compounds may be absorbed through the skin on prolonged exposure; the symptoms of lead poisoning described for ingestion exposure may occur. Contact over short periods may cause local irritation, redness and pain.

Eye Contact:

Absorption can occur through eye tissues but the more common hazards are local irritation or abrasion.

Chronic Exposure:

Lead is a cumulative poison and exposure even to small amounts can raise the body's content to toxic levels. The symptoms of chronic exposure are like those of ingestion poisoning; restlessness, irritability, visual disturbances, hypertension and gray facial color may also be noted.

Aggravation of Pre-existing Conditions:

Persons with pre-existing kidney, nerve or circulatory disorders or with skin or eye problems may be more susceptible to the effects of this substance.

4. First Aid Measures

Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Ingestion:

Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention.

Skin Contact:

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

Eye Contact:

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

5. Fire Fighting Measures

Fire:

Not considered to be a fire hazard. Powder/dust is flammable when heated or exposed to flame.

Explosion:

Not considered to be an explosion hazard.

Fire Extinguishing Media:

Use any means suitable for extinguishing surrounding fire. Do not allow water runoff to enter sewers or waterways.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Can produce toxic lead fumes at elevated temperatures and also react with oxidizing materials.

6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Sweep up and containerize for reclamation or disposal. Vacuuming or wet sweeping may be used to avoid dust dispersal. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from incompatible substances. Areas in which exposure to lead metal or lead compounds may occur should be identified by signs or appropriate means, and access to the area should be limited to authorized persons. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:

For lead, metal and inorganic dusts and fumes, as Pb: -OSHA Permissible Exposure Limit (PEL): 0.05 mg/m³ (TWA) For lead, elemental and inorganic compounds, as Pb: -ACGIH Threshold Limit Value (TLV): 0.05 mg/m³ (TWA), A3 animal carcinogen ACGIH Biological Exposure Indices (BEI): 30 ug/100ml, notation B (see actual Indices for more information). For lead, inorganic: -NIOSH Recommended Exposure Limit

(REL): 0.1 mg/m³ (TWA)

Ventilation System:

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

Personal Respirators (NIOSH Approved):

If the exposure limit is exceeded, a half-face high efficiency dust/mist respirator may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece high efficiency dust/mist respirator may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. **WARNING:** Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:

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

Eye Protection:

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

Other Control Measures:

Eating, drinking, and smoking should not be permitted in areas where solids or liquids containing lead compounds are handled, processed, or stored. See OSHA substance-specific standard for more information on personal protective equipment, engineering and work practice controls, medical surveillance, record keeping, and reporting requirements. (29 CFR 1910.1025).

9. Physical and Chemical Properties

Appearance:

Small, white to blue-gray metallic shot or granules.

Odor:

Odorless.

Solubility:

Insoluble in water.

Density:

11.34

pH:

No information found.

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

0

Boiling Point:

1740C (3164F)

Melting Point:

327.5C (622F)

Vapor Density (Air=1):

No information found.

Vapor Pressure (mm Hg):

1.77 @ 1000C (1832F)

Evaporation Rate (BuAc=1):

No information found.

10. Stability and Reactivity

Stability:

Stable under ordinary conditions of use and storage.

Hazardous Decomposition Products:

Does not decompose but toxic lead or lead oxide fumes may form at elevated temperatures.

Hazardous Polymerization:

Will not occur.

Incompatibilities:

Ammonium nitrate, chlorine trifluoride, hydrogen peroxide, sodium azide, zirconium, disodium acetylide, sodium acetylide and oxidants.

Conditions to Avoid:

Heat, flames, ignition sources and incompatibles.

11. Toxicological Information

Toxicological Data:

Investigated as a tumorigen, mutagen, reproductive effector.

Reproductive Toxicity:

Lead and other smelter emissions are human reproductive hazards. (Chemical Council on Environmental Quality; Chemical Hazards to Human Reproduction, 1981).

Carcinogenicity:

EPA / IRIS classification: Group B2 - Probable human carcinogen, sufficient animal evidence.

-----\Cancer Lists\-----

---NTP Carcinogen---

Ingredient	Known	Anticipated	IARC Category
Lead (7439-92-1)	No	No	2B

12. Ecological Information

Environmental Fate:

When released into the soil, this material is not expected to leach into groundwater. This material may bioaccumulate to some extent.

Environmental Toxicity:

No information found.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste facility. Although not a listed RCRA hazardous waste, this material may exhibit one or more characteristics of a hazardous waste and require appropriate analysis to determine specific disposal requirements. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Not regulated.

15. Regulatory Information

-----\Chemical Inventory Status - Part 1\-----				
Ingredient	TSCA	EC	Japan	Australia
Lead (7439-92-1)	Yes	Yes	Yes	Yes

-----\Chemical Inventory Status - Part 2\-----				
Ingredient	Korea	DSL	--Canada-- NDSL	Phil.
Lead (7439-92-1)	Yes	Yes	No	Yes

-----\Federal, State & International Regulations - Part 1\-----				
Ingredient	-SARA 302- RQ	TPQ	-SARA 313- List	Chemical Catg.
Lead (7439-92-1)	No	No	Yes	No

-----\Federal, State & International Regulations - Part 2\-----			
Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8 (d)
Lead (7439-92-1)	10	No	No

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

Prop 65:

THIS PRODUCT CONTAINS CHEMICALS KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER AND BIRTH DEFECTS OR OTHER REPRODUCTIVE HARM.

Australian Hazchem Code: No information found.

Poison Schedule: S6

WHMIS:

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

16. Other Information

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

Label Hazard Warning:

POISON! DANGER! MAY BE FATAL IF SWALLOWED OR INHALED. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. NEUROTOXIN. AFFECTS THE GUM TISSUE, CENTRAL NERVOUS SYSTEM, KIDNEYS, BLOOD AND REPRODUCTIVE SYSTEM. POSSIBLE CANCER HAZARD. MAY CAUSE CANCER BASED ON ANIMAL DATA. Risk of cancer depends on duration and level of exposure.

Label Precautions:

Do not get in eyes, on skin, or on clothing. Do not breathe dust. Keep container closed. Use only with adequate ventilation. Wash thoroughly after handling.

Label First Aid:

If swallowed, induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. In all cases, get medical attention.

Product Use:

Laboratory Reagent.

Revision Information:

Pure. New 16 section MSDS format, all sections have been revised.

Disclaimer:

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

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MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865



24 Hour Emergency Telephone: 800-888-2161
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-693-9000

Outside U.S. and Canada
Chemtrec: 202-462-7819

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, explosion or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

Manganese, 1000 (u)g/mL (0.10% w/v)

MSDS Number: M0678 — Effective Date: 09/08/97

1. Product Identification

Synonyms: None
CAS No.: Not applicable to mixtures.
Molecular Weight: Not applicable to mixtures.
Chemical Formula: Mn and HNO₃ in H₂O
Product Codes: 6933

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Manganese	7439-96-5	< 1%	No
Nitric Acid	7697-37-2	1 - 2%	Yes
Water	7732-18-5	97 - 98%	No

3. Hazards Identification

Emergency Overview

DANGER! CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR INHALED. VAPOR IRRITATING TO EYES AND RESPIRATORY TRACT. INHALATION MAY CAUSE LUNG AND TOOTH DAMAGE.

J.T. Baker SAF-T-DATA^(tm) Ratings (Provided here for your convenience)

Health Rating: 2 - Moderate
Flammability Rating: 0 - None
Reactivity Rating: 1 - Slight
Contact Rating: 3 - Severe (Corrosive)

Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD;
PROPER GLOVES
Storage Color Code: White (Corrosive)

Potential Health Effects

Nitric acid is extremely hazardous; it is corrosive, reactive, an oxidizer, and a poison. The following hazards are for concentrated solutions. Hazards of less concentrated solutions may be reduced. Degree of hazard for reduced concentrations is not currently addressed in the available literature.

Inhalation:

Corrosive! Inhalation of vapors can cause coughing, choking, inflammation of the nose, throat, and upper respiratory tract, and in severe cases, pulmonary edema, circulatory failure, and death.

Ingestion:

Corrosive! Swallowing can cause immediate pain and burns of the mouth, throat, esophagus and gastrointestinal tract. May cause nausea, vomiting, and diarrhea, and in severe cases, death.

Skin Contact:

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

Eye Contact:

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

Chronic Exposure:

Long-term exposure to concentrated vapors may cause erosion of teeth and lung damage. Long-term exposures seldom occur due to the corrosive properties of the acid.

Aggravation of Pre-existing Conditions:

Persons with pre-existing skin disorders, eye disease, or cardiopulmonary diseases may be more susceptible to the effects of this substance.

4. First Aid Measures

Immediate first aid treatment reduces the health effects of this substance.

Inhalation:

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

Ingestion:

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

Skin Contact:

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

Eye Contact:

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

5. Fire Fighting Measures

Fire:

Not combustible, but concentrated material is a strong oxidizer and its heat of reaction with reducing agents or combustibles may cause ignition.

Explosion:

Concentrated material reacts explosively with combustible organic or readily oxidizable materials such as: alcohols, turpentine, charcoal, organic refuse, metal powder, hydrogen sulfide, etc. Reacts with most metals to release hydrogen gas which can form explosive mixtures with air.

Fire Extinguishing Media:

Use any means suitable for extinguishing surrounding fire.

Special Information:

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

6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Neutralize with alkaline material (soda ash, lime), then absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

7. Handling and Storage

Store in a cool, dry, ventilated storage area with acid resistant floors and good drainage. Protect from physical damage. Keep out of direct sunlight and away from heat, water, and incompatible materials. Do not wash out container and use it for other purposes. When diluting, the acid should always be added slowly to water and in small amounts. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:

For Nitric Acid:

OSHA Permissible Exposure Limit (PEL):

2 ppm (TWA)

ACGIH Threshold Limit Value (TLV):

2 ppm (TWA); 4 ppm (STEL)

Ventilation System:

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

details.

Personal Respirators (NIOSH Approved):

If the exposure limit is exceeded, wear a supplied air, full-facepiece respirator, airlined hood, or full-facepiece self-contained breathing apparatus. Canister-type respirators using sorbents are ineffective.

Skin Protection:

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

Eye Protection:

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

9. Physical and Chemical Properties

Appearance:

Clear, colorless liquid.

Odor:

Odorless.

Solubility:

Complete (100%)

Specific Gravity:

ca. 1.0

pH:

1.0 (0.1M HNO₃)

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

ca. 99

Boiling Point:

ca. 100C (ca. 212F)

Melting Point:

ca. 0C (ca. 32F)

Vapor Density (Air=1):

Essentially the same as water.

Vapor Pressure (mm Hg):

Essentially the same as water.

Evaporation Rate (BuAc=1):

Essentially the same as water.

10. Stability and Reactivity

Stability:

Stable under ordinary conditions of use and storage.

Hazardous Decomposition Products:

When heated to decomposition, emits toxic nitrogen oxides fumes and hydrogen nitrate.

Hazardous Polymerization:

Will not occur.

Incompatibilities:

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

Conditions to Avoid:

Heat and incompatibles.

11. Toxicological Information

For Nitric Acid: Investigated as a mutagen and reproductive effector.

-----\Cancer Lists\-----			
Ingredient	---NTP Carcinogen---		IARC Category
	Known	Anticipated	
Manganese (7439-96-5)	No	No	None
Nitric Acid (7697-37-2)	No	No	None
Water (7732-18-5)	No	No	None

12. Ecological Information

Environmental Fate:
No information found.
Environmental Toxicity:
No information found.

13. Disposal Considerations

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

14. Transport Information

Not regulated.

15. Regulatory Information

-----\Chemical Inventory Status - Part 1\-----				
Ingredient	TSCA	EC	Japan	Australia
Manganese (7439-96-5)	Yes	Yes	No	Yes
Nitric Acid (7697-37-2)	Yes	Yes	Yes	Yes
Water (7732-18-5)	Yes	Yes	Yes	Yes

-----\Chemical Inventory Status - Part 2\-----				
Ingredient	Korea	--Canada--		
		DSL	NDSL	Phil.
Manganese (7439-96-5)	Yes	Yes	No	Yes
Nitric Acid (7697-37-2)	Yes	Yes	No	Yes
Water (7732-18-5)	Yes	Yes	No	Yes

-----\Federal, State & International Regulations - Part 1\-----				
Ingredient	-SARA 302-		-----SARA 313-----	
	RQ	TPQ	List	Chemical Catg.
Manganese (7439-96-5)	No	No	Yes	No
Nitric Acid (7697-37-2)	1000	1000	Yes	No
Water (7732-18-5)	No	No	No	No

-----\Federal, State & International Regulations - Part 2\-----			
Ingredient	CERCLA	-RCRA-	-TSCA-
		261.33	8 (d)
Manganese (7439-96-5)	1	No	No
Nitric Acid (7697-37-2)	1000	No	No
Water (7732-18-5)	No	No	No

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

Australian Hazchem Code: No information found.

Poison Schedule: S5

WHMIS:

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

16. Other Information

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

Label Hazard Warning:

DANGER! CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR INHALED. VAPOR IRRITATING TO EYES AND RESPIRATORY TRACT. INHALATION MAY CAUSE LUNG AND TOOTH DAMAGE.

Label Precautions:

Do not get in eyes, on skin, or on clothing.

Do not breathe vapor or mist.

Use only with adequate ventilation.

Wash thoroughly after handling.

Keep container closed.

Label First Aid:

In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. In all cases get medical attention immediately.

Product Use:

Laboratory Reagent.

Revision Information:

Disclaimer:

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

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MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865



24 Hour Emergency Telephax: 800-852-2131
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-692-6999

Outside U.S. and Canada
Chemtrec: 302-493-7918

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, explosion or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-562-2537) for assistance.

Antimony

MSDS Number: A7152 — Effective Date: 09/08/97

1. Product Identification

Synonyms: Stibium, C.I. 77050
CAS No.: 7440-36-0
Molecular Weight: 121.75
Chemical Formula: Sb
Product Codes: 0848

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Antimony	7440-36-0	90 - 100%	Yes

3. Hazards Identification

Emergency Overview

POISON! DANGER! MAY BE FATAL IF INHALED. CAUSES IRRITATION.
TARGET ORGAN(S): Respiratory system, cardiovascular system, eyes, skin.

J.T. Baker SAF-T-DATA^(tm) Ratings (Provided here for your convenience)

Health Rating: 3 - Severe (Poison)
Flammability Rating: 1 - Slight
Reactivity Rating: 2 - Moderate
Contact Rating: 1 - Slight
Lab Protective Equip: GOGGLES; LAB COAT; VENT HOOD; PROPER GLOVES
Storage Color Code: Blue (Health)

Potential Health Effects

Inhalation:

Is harmful may be fatal.

Ingestion:

None identified.

Skin Contact:

Prolonged contact may cause dermatitis.

Eye Contact:

None identified.

Chronic Exposure:

Kidney damage, liver damage.

Aggravation of Pre-existing Conditions:

No information found.

4. First Aid Measures

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Prompt action is essential.

Ingestion:

If large amounts were swallowed, give water to drink and get medical advice.

Skin Contact:

In case of contact, flush skin with water.

Eye Contact:

In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

5. Fire Fighting Measures

Fire:

Not expected to be a fire hazard.

Explosion:

Can be an explosion hazard, especially when heated.

Fire Extinguishing Media:

Use extinguishing media appropriate for surrounding fire.

Special Information:

No information found.

6. Accidental Release Measures

Wear self-contained breathing apparatus and full protective clothing. With clean shovel, carefully place material into clean, dry container and cover; remove from area. Flush spill area with water.

7. Handling and Storage

Keep container tightly closed. Store in secure poison area. Keep product out of light.

Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:

-OSHA Permissible Exposure Limit (PEL):
0.5 mg/m³ (TWA)

-ACGIH Threshold Limit Value (TLV):
0.5 mg/m³ (TWA)

Ventilation System:

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

Personal Respirators (NIOSH Approved):

For conditions of use where exposure to the substance is apparent, consult an industrial hygienist. For emergencies, or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. **WARNING:** Air purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:

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

Eye Protection:

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

9. Physical and Chemical Properties

Appearance:

Silvery-white metal.

Odor:

No information found.

Solubility:

Negligible (< 0.1%)

Specific Gravity:

6.68

pH:

No information found.

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

0

Boiling Point:

1635C (2975F)

Melting Point:

630C (1166F)

Vapor Density (Air=1):

4.2

Vapor Pressure (mm Hg):

Not applicable.
Evaporation Rate (BuAc=1):
 No information found.

10. Stability and Reactivity

Stability:
 Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products:
 No information found.
Hazardous Polymerization:
 Will not occur.
Incompatibilities:
 Strong oxidizing agents, strong acids, halogen acids, chlorine, fluorine.
Conditions to Avoid:
 Heat, Light.

11. Toxicological Information

Ingredient	---NTP Carcinogen---		IARC Category
	Known	Anticipated	
Antimony (7440-36-0)	No	No	None

12. Ecological Information

Environmental Fate:
 No information found.
Environmental Toxicity:
 No information found.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste disposal facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Not regulated.

15. Regulatory Information

-----\Chemical Inventory Status - Part 1\-----
Ingredient TSCA EC Japan Australia

Antimony (7440-36-0) Yes Yes No Yes

-----\Chemical Inventory Status - Part 2\-----
Ingredient Korea DSL NDSL Phil.

Antimony (7440-36-0) Yes Yes No Yes

-----\Federal, State & International Regulations - Part 1\-----
Ingredient -SARA 302- -SARA 313-
RQ TPQ List Chemical Catg.

Antimony (7440-36-0) No No Yes Antimony com

-----\Federal, State & International Regulations - Part 2\-----
Ingredient CERCLA -RCRA- -TSCA-
261.33 8 (d)

Antimony (7440-36-0) 5000 No No

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

Australian Hazchem Code: No information found.

Poison Schedule: No information found.

WHMIS:

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

16. Other Information

Label Hazard Warning:

POISON! DANGER! MAY BE FATAL IF INHALED. CAUSES IRRITATION.

TARGET ORGAN(S): Respiratory system, cardiovascular system, eyes, skin.

Label Precautions:

Avoid contact with eyes, skin, clothing.

Do not breathe dust. Keep in tightly closed container. Use with adequate ventilation.

Wash thoroughly after handling.

Label First Aid:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Prompt action is essential. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse.

Product Use:

Laboratory Reagent.

Revision Information:

Disclaimer: