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NYSDEC SITE ID #36003

Field Sampling and Analysis Plan

for the

Magna Metals Site

Town of Cortlandt
Westchester County, New York

Prepared by

FOSTER WHEELER ENVIRONMENTAL CORPORATION

November 1994

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SECTION 1.0

1.0 INTRODUCTION

Presented herein is the Field Sampling and Analysis Plan (FSAP) for the site investigation to be undertaken by Foster Wheeler Environmental Corporation (FWENC) at the Magna Metals site, Town of Cortlandt, New York. The purpose of this investigation is to gather surface water and sediment, groundwater, subsurface soil and surface soil samples to provide a data base for delineation of the site contamination, and also, performance of a risk assessment and evaluation of remedial alternatives in a feasibility study, if required.

The FSAP presents the procedures to be followed during field investigation activities. Specifically, the FSAP addresses :

* Applicable Standard Operating Procedures;
* Responsibilities of Site Personnel;
* Sample Analytical Program;
* Sample Packaging and Shipment;
* Documentation;
* Procedures for Field Changes/Corrective Actions; and the
* Health and Safety Plan

The Quality Assurance Project Plan establishes the structure of the quality assurance plan for the FSP; it is a generic document applicable to all field sampling activities. Site-specific standard operating procedures (SOPs) or sampling protocols have been generated for this FSAP. Any modifications necessary in these SOPs due to field conditions or other unforeseen situations, shall be recorded in the site logbook, documented on the appropriate Field Change Request (FCR) forms by the Field Operations Leader (FOL), and be approved by the FWENC and NYSDEC Project Managers.

1.1 SITE LOCATION AND DESCRIPTION

The site is located in the Town of Cortlandt, Westchester County, New York near the intersection of Furnace Dock Road and Maple Avenue. Nearby towns include Peekskill, 2 miles northeast and Croton on the Hudson, 5 miles southwest. The Hudson River is located 3 miles west of the site. Road access to the site is more than adequate as several routes are available including Route 9/9A, Bear Mountain Parkway, and the Taconic Parkway.

Locally, the site is part of a larger commercial property having several operating businesses which currently include: Con Edison and Silverman Furniture. The Croton Egg Farm is located west of the site. To the north, south and east are residential areas. Also to the north-northwest is an inactive emery mine. A wetland area is located between the site and residential area south of the site. Domestic water supply usage data is unavailable at this time and is currently being obtained by the New York State Department of Environmental Conservation (NYSDEC).

1.2 ABBREVIATED SITE HISTORY AND COMPLETE SAMPLING DATA

Metal plating, polishing, and lacquering operations were conducted at the Magna Metals site from 1955 to 1979. During operation, iron, lead, copper, nickel, and zinc chlorides, cyanides, and sulfates were discharged to a series of nine leaching pits. Spent trichloroethylene (TCE) was drummed and removed, but some was allegedly discharged to the septic system.

A water pollution investigation was performed in October 1978 by the Westchester County Health Department (WCHD). Five standing/wastewater samples were taken on October 3, 1978 and analyzed for pH, iron, copper, zinc, cadmium, chromium, cyanide, lead, manganese, and nickel. Concentrations of nickel, cyanide, zinc, copper, and iron exceeded ground water standards. Lead concentrations exceeded groundwater standards in only one sample, however, the detection limit used in the lead analyses was higher than the groundwater standard. Thus, lead concentrations could have been above the ground water standards but below the detection limit. Results of this sampling episode are shown in Table 1-1. Soil and bottom sediment samples were collected on the site and upstream and downstream of the site on October 13, 1978. These samples were analyzed for the same parameters as the water samples taken earlier in the month. Zinc and copper were the only metals present above the common range for native soils and oral exposure health based criteria. These metals were found in the two soil samples downslope of the wastewater overflow or effluent site. Results of this sampling event are shown on Table 1-2.

WCHD returned on December 15, 1978 with the NYSDEC and took five core samples from the sewage overflow area. These samples were analyzed for lead, copper, zinc, chromium and manganese. Zinc concentrations were above the common range for native soils in two samples. Copper concentrations also exceeded the common range for native soils in two samples. The other metals were found in concentrations below or within their common range for native soils. The results of this sampling event are shown in Table 1-3.

Metal plating operations ceased in June 1979. That same month the NYSDEC ordered the industrial sludge to be removed from nine 1,000 gallon pits on site. By the end of 1979 the leach pits (not septic and holding tanks) had been emptied by suction hose. In 1982 a Consent Order for the Development and Implementation of Field Investigation Program was signed.

On August 19, 1982, William Cosulich collected leaching pit samples for selected trace metals, cyanides, phenols, sulfate, nitrates, and chlorides analyses by General Testing Corporation. The results of EP toxicity analysis (4 samples) indicated no apparent metal leaching problems. Sulfates, nitrates and chlorides were present at concentrations less than New York State (NYS) Ambient Water Quality Standards of 250, 10 and 250 mg/l, respectively (TOGS 85-W-38); in addition, these inorganics generally have low toxicity and are present as background constituents.

TABLE 1-1

WESTCHESTER COUNTY DEPARTMENT OF HEALTH WATER POLLUTION INVESTIGATION OF 10/3/78

CONCENTRATIONS IN ug/l

PARAMETER	GROUND WATER STANDARDS	1	2	3	4	5
pH		10.9	10.3	11.3	9.5	7.8
Iron	300	10,000	5,900	9,300	4,000	3,800
Copper	200	150,000	320,000	170,000	87,000	76,000
Zinc	300	49,000	18,000	46,000	10,000	8,900
Cadmium	10	(5)	(5)	(5)	(5)	(5)
Chromium	50	2,800	3,600	3,100	(30)	(30)
Cyanide	100	1,700,000	640,000	2,700,000	210,000	170,000 *
Lead	25	(30)	(30)	(30)	(30)	60
Manganese		120	110	120	90	110
Nickel	700	66,000	33,000	93,000	18,000	10,000

(5) Concentration less than detection limit shown in parentheses

SAMPLE	LOCATION
1	Ponded liquid near 1st leaching pit
2	Influent wastewater to industrial disposal system
3	Overflow or effluent from industrial disposal system
4	Influent wastewater
5	Overflow or effluent wastewater

TABLE 1-2

METALS ANALYSES FROM WESTCHESTER COUNTY DEPARTMENT OF HEALTH WATER POLLUTION INVESTIGATION SOILS AND BOTTOM SEDIMENT SAMPLING ON 10/13/78

CONCENTRATIONS IN mg/kg

PARAMETER	COMMON RANGE IN SOIL	ORAL EXPOSURE HEALTH BASED CRITERIA	A	B	1	2	3
Iron	5000-50,000		70	160	110	640	330
Copper	1-100		2.3	13	60	270	115
Zinc	10-300		2.9	95	240	980	320
Cadmium	0.01-0.7		(0.2)	(0.2)	0.2	0.7	0.4
Chromium	1-1000		0.2	0.6	23	24	7.7
Cyanide		300	0.7	9.2	38	14	20
Lead	2-200		(1.2)	(1.2)	5.8	3.3	(1.2)
Manganese	200-10,000		78	70	46	67	115
Nickel	5-500	300	15	35	75	31	80

(0.2) Concentration less than detection limit shown in parenthesis

SAMPLE	LOCATION
A	100 yds upstream of Magna Metals building
B	300 yds downstream in pond
1	Base of slope
2	150 feet from overflow site
3	250 feet from overflow site

TABLE 1-3

METAL ANALYSES FROM WESTCHESTER COUNTY DEPARTMENT OF HEALTH AND NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION CORE SAMPLING BELOW (WEST) OF FORMER OUTFLOW/OVERFLOW AREA (LAST LEACHING PIT) ON 12/15/78

CONCENTRATIONS IN mg/kg

PARAMETER	COMMON RANGE IN SOIL	Core 1A	Core 1B	Core 1C	Core 2A	Core 2B	Core 3A	Core 3B
Iron	5,000-50,000	1,200	230	680	1,320	170	700	70
Copper	1-100	520	30	160	100	10	60	10
Zinc	10-300	300	6	70	1,500	10	630	20
Chromium	1-1,000	10	0.6	3	25	0.6	10	1
Manganese	200-10,000	40	20	20	140	25	90	10

SAMPLE	LOCATION
Core 1A	Top inch
Core 1B	6"-7"
Core 1C	9"-10"
Core 2A	Top inch
Core 2B	7"-8"
Core 3A	Top inch
Core 3B	6"-7"

The NYSDEC collected four samples on November 16, 1982 for EP toxicity analysis by RECRA Environmental Laboratory. The results of both these 1982 sampling events are shown in Table 1-4.

On December 29, 1982 and February 1, 2, and March 15, 1983, the WCHD conducted additional water pollution investigations on the property and in Furnace Brook immediately to the west of the property. The results for the February and March 1983 sampling events are displayed in Tables 1-5, 1-6 and 1-7. Except for aesthetic considerations of iron and manganese concentrations at several locations, trace metals in surface water were not found to be elevated (i.e., when compared to NYS Ambient Water Quality Standards). However, several chlorinated volatile organics were detected in Furnace Brook; of major concern were the levels of trichloroethylene (TCE) in the septic tank, a leaching pit off the septic tank and at downstream locations along Furnace Brook and an unnamed tributary.

On May 15, 1984 the NYSDEC Division of Environmental Enforcement resampled the site, specifically for metals and volatile organic analytes (VOAs). Water samples were also analyzed for pesticides and PCBs. Sludge, sediment and/or surface water samples were collected at four locations along the Brook/tributary, the septic tank, and three sludge pits. The water and sediment/sludge sample results are summarized in Tables 1-8, 1-9, 1-10, and 1-11. By comparing sediment/sludge sample results to typical soil background levels and surface water sample results to NYS Ambient Water Quality Standards, several observations can be made. Analyses for 12 of the 13 priority pollutant metals analyzed in the surface water samples consistently resulted in low concentrations (i.e., mostly less than detection limits); water samples from the septic tank (05) and sludge pit A (08) did contain elevated As, Se, Cu, Ni, and Zn concentrations. Trace metals in sediment samples indicated similar trends, i.e, the 12 priority pollutants were essentially present at background levels (copper was slightly elevated). Sludge samples collected from Pits 4 (06) and 2 (07), however, contained elevated As, Se, Cd, Cr, Cu, Ni, Ag, and Zn. Pesticides and PCBs were not detected in any of the water samples. EP toxicity tests for the two sludge samples (Table 1-12) resulted in concentrations below the allowable maximum EP toxicity concentration (and mostly less than detection limit). The results of trace metal analyses for NYSDEC samples basically confirm findings by the WCHD that metals known to be in the leaching pits have apparently not reached Furnace Brook.

The results of VOA analyses on NYSDEC water samples show extremely elevated trichloroethene levels in the septic tank (15,000 ppb) as well as a high concentration (190 ppb) in Pit 4. Trans-1,2-dichloroethene was detected downstream and in the septic tank (see Table 1-10). Sediment and sludge samples also contained high levels of some volatiles; acetone, trichloroethene, and trans-1,2-dichloroethene were seen in the brook sediments. Xylenes, ethylbenzene, and trichloroethene were detected in sludge samples collected from Pits 2 and 4. Downstream elevated levels of vinyl chloride and trans-1,2-dichloroethene were detected (Table 1-11).

TABLE 1-4

COSULICH AND NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION EP TOXICITY EXTRACTS TAKEN ON 8/19/82, AND 11/16/82, RESPECTIVELY

CONCENTRATIONS IN mg/l

PARAMETER	TCL	Pit A	Pit 1	Pit 2	Pit 4	Pit 5	R001201	R001202	R001203EX	R001203
pH		7.9	9.4	8.2	6.4	6.9	8.89			7.22
Iron		5.5	0.9	(0.05)	(0.05)	0.82	1.9			37,000
Copper		3.66	23.9	176	38.4	0.60	16.8			490
Zinc		50	0.42	75	81	14	0.60			360
Cadmium	1.0	(0.025)	0.03	(0.025)	(0.025)	(0.025)	(0.004)		(0.004)	2.2
Chromium	5.0	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)				490
Chromium, HEX		(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	0.004		(0.004)	130
Cyanide		0.54	0.42	2.3	0.91	0.38		23		36
Lead	5.0	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	9.4		0.017	6,500
Manganese		3.3	0.04	1.52	1 .73	1.9	0.05			470
Nickel		10.4	4.2	26.6	94	8.3	4.1			500
Chlorides		4	62	44	9	3	42		2.9	88
Phenolics		0.015	0.009	0.015	0.010	0.012		0.07		3.1
Sulfates		(5)	42	134	182	(10)	40			
Nitrates		12.4	0.67	1.29	4.5	0.94	9.0		1.3	1.6
Arsenic	5.0						26		(0.005)	
Selenium	1.0						(20)		(0.005)	0.085
Mercury	0.2						(0.9)		(0.002)	
Barium	100.0						0.82		1.7	130
Silver	5.0						0.010		(0.004)	0.38

(0.025) Concentration less than detection limit shown in parenthesis.

COSULICH COLLECTED

SAMPLE	LOCATION
Pit A	Manhole cover, sand
Pit 1	Water only
Pit 2	Soil, sludge
Pit 4	Soil mix
Pit 5	Sand

NYSDEC COLLECTED

SAMPLE	LOCATION OR DESCRIPTION
R001201	Pit 1 Extraction
R001202	Pit 1 Extraction
R001203	Pit 5 Extraction
R001203EX	Pit 5 Extraction

TABLE 1-5

METALS ANALYSES FROM WESTCHESTER COUNTY HEALTH DEPARTMENT WATER POLLUTION INVESTIGATION OF 2/1/83 AND 2/2/83

CONCENTRATIONS IN ug/l

	NYS AWO STANDARD[1]		2/1/83					2/2/83			
PARAMETER	HUMAN HEALTH	AQUATIC LIFE	1	2	3	4	5	3	4A	6	7
IRON	300	300	330	400	210	280	320	300	340	700	580
COPPER	200	*	20	(20)	(20)	(20)	(20)	90	100	(20)	70
ZINC	300	30	(50)	(50)	(50)	(50)	(50)	(50)	50	(50)	(50)
CADMIUM	10	*	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
CHROMIUM	50	*	(10)	(10)	(10)	(10)	10)	(10)	(10)	(10)	(10)
CYANIDES	100	*	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)
LEAD	50	*	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)
MANGANESE	300	-	80	60	50	60	80	70	30	52	70
NICKEL	-	5.2	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)

[1] Human health-based and aquatic life-based Ambient Water Quality (AWQ) Standards for surface water (fresh)

*Aquatic life-based AWQ Standard or Guideline Value is dependent on water hardness.

(2) Concentration less than detection limit shown in parentheses

SAMPLE	LOCATION OR DESCRIPTION
1	Maple Ave
2	Field pond outlet
3	100' above field pond
4	Where Furnace Brook & brooklet meet
4A	In brooklet southwest of pits
5	Along brooklet 30' from where Furnace Brook & brooklet meet
6	Tributary behind Magna Metals building
7	Furnace brook above all Magna Metals Site drainage

TABLE 1-6

VOLATILE ANALYSES FROM WESTCHESTER COUNTY HEALTH DEPARTMENT WATER POLLUTION INVESTIGATION OF 2/1/83 AND 2/2/83

CONCENTRATIONS IN ug/l

PARAMETER	GROUND WATER STANDARDS	2/1/83					2/2/83			
		1	2	3	4	5	3	4A	6	7
trichloroethene	5	7	90	50	30	(1)	130	65	11	(1)
CIS 1,2-dichloroethene	5	1.5	20	8	7	(1)	15	7	4	(1)
1,1,1 trichloroethane	5	(1)	(1)	(1)	1.0	(1)	43	(1)	(1)	(1)

(1) Concentration less than detection limit shown in parentheses

SAMPLE	LOCATION OR DESCRIPTION
1	Maple Ave
2	Field pond outlet
3	100' Above field pond
4	Where Furnace Brook & brooklet meet
4A	In brooklet southwest of pits
5	Along brooklet 30' from where brook & brooklet meet
6	Tributary behind Magna Metals building
7	Furnace Brook above all Magna Metals Site drainage

TABLE 1-7

VOLATILE ANALYSES FROM WESTCHESTER COUNTY HEALTH DEPARTMENT WATER POLLUTION INVESTIGATION, 3/15/83

CONCENTRATIONS IN ug/l
(Except Sample P2 and Health Based Criteria)

PARAMETER	GROUND WATER STANDARDS	2	3	4	4A	4B	8	10	ST	11	P2	Health Based Criteria (Sample P2 only)
TCE	5	32	10.5	1.9	31	1.4	(1)	8.8	1,400	(1)	110 mg/kg	32 mg/kg
CIE 1,2,DCE	5	12	13	1.1	3.1	(1)	(1)	3	(1)	(1)		
1,1,1 TCA	5	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	110 mg/kg	61 mg/kg

(1) Concentration less than detection limit shown in parentheses.

SAMPLE	LOCATION OR DESCRIPTION
2	Field pond outlet
3	100' above field pond
4	Where Furnace Brook & brooklet meet
4A	In brooklet southwest of pits
4B	200' above #4
8	Well supply house, #480 Furnace Dock Road
10	Pond off Maple Ave.
11	Drainage Channel in front of #480
ST	Septic Tank
P2	Soil-Leachate Pit 2

TABLE 1-8

SUMMARY OF TOTAL METAL ANALYSES FROM NYSDEC SURFACE WATER SAMPLING ON 5/15/84

CONCENTRATIONS IN ug/l

COMPOUND	NYS AWQ STANDARD[1]		SAMPLE NO.						DETECTION LIMIT
	HUMAN HEALTH	AQUATIC LIFE	01	02	03	04	05	08	
pH				5	5-6	5	6-7	6	
Arsenic	50	190	(10)	(10)	(10)	(10)	550	(10)	10
Antimony	3[2]	-	(10)	(10)	(10)	(10)	(10)	(10)	10
Selenium	10	1.0	(10)	(10)	(10)	(10)	237	91	10
Thallium	4[2]	8	(10)	(10)	(10)	(10)	(10)	(10)	10
Mercury	2	0.2[2]	(0.4)	(0.2)	(0.2)	(0.4)	(0.2)	0.2	0.2-0.4
Beryllium	3[3]	11 or 1,100	(1)	(1)	(1)	(1)	(1)	(1)	1
Cadmium	10	*	(10)	(10)	(10)	11	(10)	(10)	10
Chromium	50	*	(4)	(4)	(4)	(4)	4.2	4	4
Copper	200	*	(4)	(4)	(4)	6.9[b]	7,810[b]	670[b]	4
Nickel	-	*	(15)	(15)	(15)	(15)	610	508	15
Silver	50	0.1	(3)	(3)	(3)	(3)	(3)	(3)	3
Zinc	300	30	21[b]	(10)[b]	(10[b])	17[b]	261	1,570[b]	10

[b] Blank corrected

[1] Human health-based and aquatic life-based Ambient Water Quality (AWQ) Standards are for surface water (fresh)

[2] Guidance Value .

* Aquatic life-based AWQ Standard or Guidance Value is dependent on water hardness.

(10) Concentration less than detection limit shown in parentheses.

SAMPLE	LOCATION OR DESCRIPTION
01	Upstream, north of Magna Metals
02	Mid-stream, west of Magna Metals
03	Marsh area southwest
04	Downstream southwest
05	Distribution tank adjacent to building
08	Leaching Pit A

TABLE 1-9

SUMMARY OF TOTAL METAL ANALYSES FROM NYSDEC SEDIMENT/SLUDGE SAMPLING ON 5/15/84

COMPOUND[1]	GLOBAL MEDIAN SOIL CONCENTRATION[2]	DETECTION LIMIT	CONCENTRATIONS IN mg/kg					
			01	02	03	04	06 (Sludge)	07 (Sludge)
Arsenic	6	0.5	(0.5)	0.65	(0.5)	(0.5)	27.5	5.0
Antimony	1	0.5	(0.5)	(0.5)	(0.5)	(0.5)	(0.5)	(0.5)
Selenium	0.4	0.5	(0.5)	1.8	0.61	(0.5)	7.55	13.0
Thallium	0.2	0.5	(0.5)	(0.5)	(0.5)	(0.5)	(0.5)	(0.5)
Mercury	0.06	0.1	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)
Beryllium	0.3	0.1	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)
Cadmium	0.35	1.0	(1)	(1)	1.2	(1)	3.1	1.6
Chromium	70	0.4	7.5	8.6	21.9	16.9	223	5.7
Copper	30	0.4	5.7[b]	115	36.5	100[b]	3,690[b]	15,800[b]
Nickel	50	1.5	30.1	40.3	56.2	39.8	27,500	13,800
Silver	0.05	0.3	0.30	(0.3)	(0.3)	(0.3)	0.81	0.70
Zinc	90	1.0	22.3[b]	28.2[b]	37.3	39.9	8,310[b]	9,500[b]

[b] Blank corrected

[1] Iron, lead, manganese, barium, chlorides, sulfates, and nitrates were not detected.

[2] Bowen (1979)

(0.5) Concentration less than detection limit shown in parentheses.

SAMPLE	LOCATION OR DESCRIPTION
01	Sed - Upstream north of Magna Metals
02	Sed - Mid-stream west of Magna Metals
03	Sed - Marsh area southwest
04	Sed - Downstream southwest
06	Sludge- Leaching pit 4
07	Sludge - Leaching pit 2

TABLE 1-10

SUMMARY OF VOLATILE ORGANIC ANALYSES FROM NYSDEC SURFACE WATER SAMPLING ON 5/15/84

	CONCENTRATIONS IN ug/l					
COMPOUND [1]	01	02	03	04	05	08
Acetone	(5)	(5)	(5)	(5)	(5)	(5)
Trans-1,2-dichloroethene	(5)	(5)	(5)	25	(5)	16
Trichloroethene	(5)	6.6	16	62	15,000	190
Vinyl chloride	(10)	(10)	(10)	(10)	(10)	(10)
Total xylenes	(5)	(5)	(5)	(5)	(5)	(5)
Ethylbenzene	(5)	(5)	(5)	(5)	(5)	(5)

1 Only those volatile compounds detected are listed.

(5) Concentration less than detection limit shown in parentheses.

SAMPLE	LOCATION OR DESCRIPTION
01	Upstream north of Magna Metals
02	Mid-stream west of Magna Metals
03	Marsh area southwest
04	Downstream southwest
05	Distribution tank adjacent to building
08	Leaching Pit A (septic tank)

TABLE 1-11

SUMMARY OF VOLATILE ORGANIC ANALYSES FROM NYSDEC SEDIMENT/SLUDGE SAMPLING ON 5/15/84

COMPOUND [1]	CONCENTRATIONS IN ug/l 01	02	03	04	06	07
Acetone	(5)	(5)	190	(5)	(5)	(5)
Trans-1,2-dichloroethene	(5)	(5)	300	1,400	(5)	(5)
Trichloroethene	(5)	(5)	30	(5)	680	2,600
Vinyl chloride	(10)	(10)	(10)	2,700	(10)	(10)
Total xylenes	(5)	(5)	(5)	(5)	42	7,100
Ethylbenzene	(5)	(5)	(5)	(5)	(5)	3,300

[1] Only those volatile compounds detected are listed.

(5) Concentration less than detection limit shown in parentheses.

SAMPLE	LOCATION OR DESCRIPTION
01	Sed - Upstream north of Magna Metals
02	Sed - Mid-stream west of Magna Metals
03	Sed - Marsh area southwest
04	Sed - Downstream southwest
06	Sludge - Leaching Pit 4
07	Sludge - Leaching Pit 2

TABLE 1-12

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION DIVISION OF ENVIRONMENTAL ENFORCEMENT EP TOXICITY EXTRACTS OF 5/15/84

		CONCENTRATIONS IN mg/l		
PARAMETER	DETECTION LIMIT	EP TOXICITY MAXIMUM CONCENTRATION	06	07
Arsenic	0.01	5.0	0.100	0.037
Barium	0.5	100.0	(0.5)	(0.5))
Cadmium	0.1	1.0	(0.1)	(0.1)
Chromium	0.2	5.0	(0.2)	(0.2)
Lead	0.5	5.0	(0.5)	(0.5)
Mercury	0.002	0.2	(0.002)	(0.002)
Selenium	0.01	1.0	0.220	0.180
Silver	0.01	5.0	(0.01)	(0.01)

(0.5) Concentration less than detection limit shown in parentheses.

SAMPLE	LOCATION OR DESCRIPTION
06	Leaching Pit 4 - Sludge
07	Leaching Pit 2 - Sludge

SECTION 2.0

2.3 PERSONNEL RESPONSIBILITIES

The project team will include the following personnel:

- Project Manager (PM) - final responsibility for the development of the FSAP and management of the project team;

- Field Operations Leader (FOL) - responsible for the management and supervision of the entire sampling program, provides consultation and decision-making on issues relating to sampling activities, and has authority to stop work if site conditions exceed allowable safety limits;

- Project Chemist - responsible for ensuring proper collection, packaging, preservation and shipping of samples is performed in accordance with NYSDEC standards;

- Project Hydrogeologist - responsible for the geological and hydrogeological investigation;

- Site Health and Safety Officer (HSO) - responsible for the safety of all site personnel as detailed in the HASP.

- Drilling Subcontractor - responsible for drilling permits, clearances, and supplying all services (including labor), equipment, and material required to perform the drilling, testing and well installation, in addition to all maintenance and quality control of such equipment. The drilling subcontractor will be responsible for decontamination procedures specified in the FSAP and HASP. Upon completion of the work, the drilling subcontractor will be responsible for demobilizing all equipment, cleaning any materials deposited on site during drilling operations, and properly backfilling any borings;

- Surveying Subcontractor - responsible for a detailed site survey upon completion of site operations. The survey will include on-site structural features such as fences, gates, buildings, and paved/unpaved areas and topographic features such as streams, wetlands, ridges, and hills, All of the monitoring wells will be surveyed for vertical and horizontal coordinates.

8 40

SECTION 3.0

3.0 FIELD INVESTIGATION ACTIVITIES

This section addresses the field investigation and sampling operations by matrix and type of procedures which include :

* sample tracking system
* mobilization
6+1 * septic tank/holding tank/ leach pit sampling
12+1 * surface water sampling
12+1 * sediment sampling
3 * surface soil sampling
4 * monitoring well installation
13 * subsurface soil sampling
4 * groundwater sampling - 1 ROUND? → 2 ROUNDS
* decontamination
* demobilization

A summary of all sampling analysis activities including analytical methods, sample preservation requirements, holding times, sample container and volumes, and sampling devices are summarized in Table 3-1.

3.1 SAMPLE TRACKING SYSTEM

3.1.1 Sample Identification System

Each sample will be designated by an alpha-numeric code which will identify the site, matrix sampled and contain a sequential sample number. The site code will be MM for Magna Metals Site. Location types will be identified by a two letter code, for example: SS (Surface Soil), SB (Soil Boring) etc. Each matrix sampling location will be identified with a two digit number. Sequential sample numbers at each location for each sample type will begin with 01 and increase accordingly. Sampling events, or rounds, will be numbered in a sequence beginning with "1".

The following is a general guide for sample identification :

FIRST SEGMENT			SECOND SEGMENT			THIRD SEGMENT		
AA	A	---	AA	NN	---	N	---	NN
SITE	SAMPLE TYPE		LOCATION TYPE	SPECIFIC LOCATION		SAMPLING EVENT		SAMPLE IDENTIFIER

Symbol Definition :

A = Alphabetic
N = Numeric

Site :

MM = Magna Metals Site

TABLE 3-1

SAMPLE COLLECTION AND ANALYSIS PROCEDURE

MATRIX	NUMBER OF SAMPLES	SAMPLE CONTAINER (1)	SAMPLE VOLUME (2)	SAMPLE PRESERVATION	SAMPLE HOLDING TIME (3)	NYSDEC APPROVED LABORATORY ANALYSES	METHOD DETECTION LIMITS
SEPTIC TANK AND LEACH PIT SOILS	7	Two 40 ml glass vials w/teflon septum caps	Fill Container	Cool to 4 degrees C	7 days to analysis	TCL Volatile Organics NYSDEC ASP91-9	Compound Specific (10 ug/kg)
	7	One 8 oz. glass w/teflon lined caps	Fill Container	Cool to 4 degrees C	5 days to extract, 40 days to analyze	NYSDEC ASP 91-2 (SVOA), 91-3 (Pest/PCB)	Compound Specific (330-800 ug/l)
	7	One 8 oz. glass bottle	Fill Container	Cool to 4 degrees C	6 months analysis (Hg - 26 days)	TAL Inorganics (SW-846 Method 1310-MCAWW 425.1)	Compound Specific (0.1-1000 mg/kg)
	7	One 8 oz. glass bottle	Fill Container	Cool to 4 degrees C	12 days	Cyanide	2 mg/kg
HOLDING TANK SLUDGE	1	Two 40 ml glass vial w/teflon septum caps	Fill	Cool to 4 degrees C	7 days to analysis	TCL Volatile Organics NYSDEC ASP91-9	Compound Specific (10 ug/kg)
	1	One 8 oz. glass w/teflon lined caps	Fill Container	Cool to 4 degrees C	5 days to extract, 40 days to analyze	NYSDEC ASP 91-2 (SVOA), 91-3 (Pest/PCB)	Compound Specific (330-800 ug/l)
	1	One 8 oz. glass bottle	Fill Container	Cool to 4 degrees C	6 months analysis (Hg - 26 days)	TAL Inorganics (SW-846 Method 1310-MCAWW 425.1)	Compound Specific (0.1-1000 mg/kg)
	1	One 8 oz. glass bottle	Fill Container	Cool to 4 degrees C	12 days	Cyanide	2 mg/kg
HOLDING TANK WATER	1	Two 40 ml glass vials w/teflon septum caps	Fill Container(4)	Cool to 4 degrees C	7 days to analysis	TCL Low Level Volatile Organics NYSDEC 91-1	Compound Specific (5-10 ug/l)
	1	Four 1L amber glass w/teflon lined lid	Fill Container	Cool to 4 degrees C	5 days extract. 40 days to analyze	NYSDEC ASP 92-2 (SVOA), 91-3 (Pest/PCB)	Compound Specific (330-800 ug/l)
	1	One 1L polyethylene bottle	Fill Container	NaOH pH <12	12 days	Cyanide	10 ug/l

TABLE 3-1

SAMPLE COLLECTION AND ANALYSIS PROCEDURE

MATRIX	NUMBER OF SAMPLES	SAMPLE CONTAINER (1)	SAMPLE VOLUME (2)	SAMPLE PRESERVATION	SAMPLE HOLDING TIME (3)	NYSDEC APPROVED LABORATORY ANALYSES	METHOD DETECTION LIMITS
	1	One 1L polyethylene bottle	Fill Container	HNO 3 to pH <2; Cool to 4 degrees C	6 months analysis (Hg - 26 days)	TAL Inorganic	Compound Specific (0.2-5000 ug/l
SURFACE WATER	13	Two 40 ml glass vials w/teflon septum caps	Fill Container(4)	Cool to 4 degrees C	7 days to analysis	TCL Low Level Volatile Organics NYSDEC 91-1	Compound Specific (5-10 ug/l)
	13	Four 1L amber glass w/teflon lined lids	Fill Container	Cool to 4 degrees C	5 days extract, 40 days to analyze	NYSDEC ASP 92-2 (SVOA), 91-3 (Pest/PCB)	Compound Specific (330-800 ug/l)
	13	One 1L polyethylene bottle	Fill Container	NaOH pH <12	12 days	Cyanide	10 ug/l
	13	One 1L polyethylene bottle	Fill Container	HNO 3 to pH <2; Cool to 4 degrees C	6 months analysis (Hg - 26 days)	TAL Inorganic	Compound Specific (0.2-5000 ug/L)
	13	One 1L polyethylene	Fill Container	Cool to 4 degrees C	6 months	Water Hardness MCAWW 130.1-.2	10 mg/l
SEDIMENT	13	Two 40 ml glass vials w/teflon septum caps	Fill Container	Cool to 4 degrees C	7 days to analysis	TCL Volatile Organics NYSDEC 91-1	Compound Specific (10 ug/kg)
	13	One 8 oz. glass w/teflon lined caps	Fill Container	Cool to 4 degrees C	5 days to extract, 40 days to analyze	NYSDEC ASP 91-2 (SVOA), 91-3 (Pest/PCB)	Compound Specific (330-800 ug/lkg)
	13	One 8 oz. glass bottle	Fill Container	Cool to 4 degrees C	6 months analysis (Hg - 26 days)	TAL Inorganics (SW-846 Method 1310- MCAWW 425.1)	Compound Specific (0.1-1000 mg/kg)
	13	One 8 oz. glass bottle	Fill Container	Cool to 4 degrees C	12 days	Cyanide	2 mg/kg
	13	one 8 oz. glass w/Teflon lined cap	Fill Container	Cool to 4 degrees C	14 days	TOC L. Kahn Method	100 mg/kg
SURFACE SOIL	4	Two 40ml glass vials w/teflon septum caps	Fill Container	Cool to 4 degrees C	7 days to analysis	TCL Volatile Organics NYSDEC ASP91-9	Compound Specific (10 ug/kg)

TABLE 3-1

SAMPLE COLLECTION AND ANALYSIS PROCEDURE

MATRIX	NUMBER OF SAMPLES	SAMPLE CONTAINER (1)	SAMPLE VOLUME (2)	SAMPLE PRESERVATION	SAMPLE HOLDING TIME (3)	NYSDEC APPROVED LABORATORY ANALYSES	METHOD DETECTION LIMITS
	4	One 8 oz. glass w/teflon lined caps	Fill Container	Cool to 4 degrees C	5 days to extract, 40 days to analyze	NYSDEC ASP 91-2 (SVOA), 91-3 (Pest/PCB)	Compound Specific (330-800 ug/lkg)
	4	One 8 oz. glass bottle	Fill Container	Cool to 4 degrees C	6 months analysis (Hg - 26 days)	TAL Inorganics	Compound Specific (0.1 - 1000 mg/kg)
	4	One 8 oz. glass bottle	Fill Container	Cool to 4 degrees C	12 days	Cyanide	2 mg/kg
MONITORING WELL SOILS	4	Two 40 ml glass vials w/teflon septum caps	Fill Container	Cool to 4 degrees C	7 days to analysis	TCL Volatile Organics NYSDEC 91-1	Compound Specific (10/ug/kg)
	4	One 8 oz. glass w/geflon lined caps	Fill Container	Cool to 4 degrees C	5 days to extract, 40 days to analyze	NYSDEC ASP 91-2 (SVOA), 91-3 (Pest/PCB)	Compound Specific (330-800 ug/lkg)
	4	One 8 oz. glass bottle	Fill Container	Cool to 4 degrees C	6 months analysis (Hg - 26 days)	TAL Inorganics	Compound Specific (0.1 - 1000 mg/kg)
	4	One 8 oz. glass bottle	Fill Container	Cool to 4 degrees C	12 days	Cyanide	2 mg/kg
	4*	One 8 oz. glass bottle	Fill Container	N/A	N/A	Grain Size ASTM D-422 or Atterburg Limit	N/A
GROUNDWATER	5	Two 40 ml glass vials w/teflon septum caps	Fill Container	Cool to 4 degrees C	7 days to analysis	TCL Low Level Volatile Organics NYSDEC 91-1	Compound Specific (0.5-1 ug/L)
	5	Four 1L amber. glass w/teflon lined lids	Fill Container	Cool to 4 degrees C	5 days to extract, 40 days to analyze	NYSDEC ASP 92-2 (SVOA), 91-3 (Pest/PCB)	Compound Specific (330-800 ug/lkg)
	5	One 1L polyethylene bottle	Fill Container	NaOH to pH <12	14 days	Cyanide	10 ug/l
	5	One 1L polyethylene bottle	Fill Container	HNO3 to pH <2; Cool to 4 degrees C	6 months analysis (HG - 26 days)	TAL Inorganics	Compound Specific (0.2-5000 ug/L)

* May increase based on number of stratigraphic changes.

TABLE 3-1

SAMPLE COLLECTION AND ANALYSIS PROCEDURE

MATRIX	NUMBER OF SAMPLES	SAMPLE CONTAINER (1)	SAMPLE VOLUME (2)	SAMPLE PRESERVATION	SAMPLE HOLDING TIME (3)	NYSDEC APPROVED LABORATORY ANALYSES	METHOD DETECTION LIMITS
FIELD, AND DISTILLED WATER BLANKS	2	Two 40 mL glass vials w/teflon septum caps	Fill Container	Cool to 4 degrees C	7 days to analysis	TCL Volatile Organics NYSDEC 91-1	Compound Specific (5-10 ug/L)
	2	Four 1L amber. glass w/teflon lined lids	Fill Container	Cool to 4 degrees C	5 days to extract, 40 days to analyze	NYSDEC ASP 92-2 (SVOA), 91-3 (Pest/PCB)	Compound Specific (330-800 ug/lkg)
	2	Two 40 mL glass vials w/teflon septum caps	Fill Container	Cool to 4 degrees C	7 days to analysis	TCL Low Level NYSDEC 91-1	Compound Specific (0.5-1 ug/L)
	2	One 1L polyethylene bottle	Fill Container	NaOH to pH >12	12 days	Cyanide	10 ug/l
	2	One 1L polyethylene bottle	Fill Container	HNO3 to pH <2; Cool to 4 degrees C	6 months analysis (Hg - 26 days)	TAL Inorganics	Compound Specific (0.2-5000 ug/L)
TRIP BLANKS	7	Two 40 mL glass vials w/teflon septum caps	Fill Container	Cool to 4 degrees C	7 days to analysis	TCL Low Level Volatile Orgaics NYSDEC 91-1	Compound Specific (0.5-1 ug/L)

Note:

(1) Sample containers for extractable organic analysis have teflon-lined caps. All sample containers must be of traceable quality (i.e., ICITEM 300, Eagle Pitcher, or equivalent).
(2) Triple volume required for TCL organic matrix spike/matrix duplicate analysis.
(3) Laboratory holding time is from Verified Time of Sample Receipt (VTSR).
Trip blank sample containers will be supplied by lab.

Sample Type :

S = Sample as required in the FSAP
D = Duplicate sample

Location Type :

LP = Leach Pit	FB = Field Blank
SP = Septic Tank	DI = Deionized Water
SB = Soil Boring	SS = Surface Soil
GW = Ground Water	MW = Monitoring Well
SW = Surface Water	SD = Sediment Sample
TB = Trip Blank	DB = Drilling Blank

For example, the first soil sample obtained at soil boring location 03 will be identified as MM-SB03-01. The next successive soil sample obtained at the same location will be identified as MM-SB03-02. The last number in the identification code is the sample identifier, the number that corresponds to a single sample. A duplicate sample from this location would be identified as MM D-SB03-02. A sample taken from a well during the first round of sampling would be MM-GW01-1-01. A sample taken from the same well during a second round of sampling would be MM-GW01-2-01.

A cumulative sampling master log will be maintained as the field program progresses. The samples taken will be referenced to each sampling location in the master log and will be maintained in the site logbook.

3.1.2 Sample Analytical Requirements

Table 3-1 summarizes the sample collection and analysis protocols and specifies location, number of samples and duplicates, matrix, sampling device, sample container requirements, sample preservation, holding times, laboratory analysis performed on each sample type.

3.1.3 QA/QC Blanks

Field blanks will be collected to assess the level of contamination resulting from the sampling process itself. The collection of field blanks requires two sets of identical sample containers, one filled with demonstrated analyte-free water provided by the laboratory performing the analyses, and one set of empty bottles. The sample containers must also be identical to those used for aqueous sample collection. The water is transferred from the full bottles, through the dedicated or field-decontaminated sampling equipment and into the empty set of bottles. Field blanks are then preserved in the same manner as environmental samples. This procedure must be performed in the field, within an area of suspected contamination if possible. Field blanks taken in conjunction with aqueous environmental samples must be analyzed for all parameters requested for any sample collected that day. Collection of field blanks in conjunction with non-aqueous samples is required only when volatile organic analyses will be requested, and these blanks need only be analyzed for volatile organic compounds.

Field blanks for aqueous samples will be collected at the rate of one per day, regardless of the number of environmental samples collected. For non-aqueous sampling events that last more than one day, one field blank must be collected for every 10 environmental samples, not to exceed one field blank per day.

Trip blanks will be collected to assess the potential for volatile organics contamination associated with: (1) laboratory reagent water, (2) sample containers, (3) shipment, bottle handling and storage, (4) ambient air or contact with analytical instrumentation during preparation and analysis at the laboratory and (5) reagents used in laboratory analytical procedures.

Trip blanks are required only in conjunction with the collection of aqueous samples for which volatile organic analyses will be requested. A sample container identical to those used for collection of environmental samples is filled with analyte-free reagent water by the laboratory that will perform the analyses. The trip blank is then shipped to the site along with empty sample containers and back to the laboratory along with the collected samples. The trip blank container is never open prior to analysis by the laboratory and may not be held on site for more than two calendar days. Trip blanks need only be analyzed for volatile organic compounds. Trip blanks must be included at a rate of one per sample shipment.

3.1.4 Sample Chain of Custody

A Chain of Custody (COC) record shall accompany all environmental samples from time of collection to receipt by the analytical laboratory. The laboratory shall maintain one file copy, and the completed original will be returned to the FWENC Project Manager.

3.1.5 Sample Packaging and Shipping

Each environmental sample will be properly identified and sealed in a polyethylene (PE) bag. The bag shall then be placed in a fiberboard cooler which also has been lined with a large polyethylene bag. Samples shall be packed with sufficient ice (sealed in PE bags) to cool the samples to 4°C. Enough non-combustible absorbent cushioning material shall be filled to minimize the possibility of container breakage. The large bag shall then be sealed and the container closed. Custody seals and strapping tape shall then be affixed. All samples will be shipped within 24 hours of collection via a common carrier.

3.1.6 Sample Documentation

The sample team or individual performing a particular sampling activity is required to maintain a field notebook. This field notebook will be a bound weatherproof logbook that shall be filled out at the location of sample collection immediately after sampling. It shall contain sample particulars including sample number, sample collection time, sample location, sample descriptions, sampling methods used, daily weather conditions, field measurements, name of sampler, and other site specific observations. It shall also contain any deviations from protocol, visitor's names or community contacts during sampling, and geologic and other site-specific information determined by the Field Operations Leader as noteworthy.

In the support zone, a sample logbook and site logbook will be maintained. The sample logbook is a loose-leaf notebook containing sample log sheets as shown in Figure 3-1. A sample log sheet will be filled out for each sample from the information recorded in the field notebook. A bound weather - proof site logbook will be kept by the Field Operations Leader or an otherwise designated holder. This site logbook will contain an abbreviated version of the notes listed in the team and individual field notebooks. In addition, field team members will use appropriate forms applicable to field activities. These include the boring log, the well purge data sheet, and the shallow unconsolidated monitoring well construction diagram as presented in Figures 3-2, 3-3 and 3-4, respectively.

3.2 MOBILIZATION

This subtask will consist of field personnel orientation, equipment mobilization, and staking of sampling locations.

Each field team member will attend an orientation meeting to become familiar with the history of the site, health and safety concerns, and field procedures.

Equipment mobilization will entail the ordering, purchase, and if necessary, fabrication of all sampling equipment needed for the field investigation. A field office trailer will be installed if required and the necessary utility connections will be established. The task will also include removal/clearance of obstructions at sampling locations.

A decontamination pad will be constructed at the site. The pad will consist of a PVC liner, a sump to collect runoff from the pad, and wooden planks to support the drilling rig without damaging the liner.

3.4 FIELD SAMPLING ACTIVITIES

All field sampling locations are presented on Figure 3-5.

3.4.1 Holding Tank/Septic Tank/Leaching Pit Sampling

Previous NYSDEC reports indicated a total of 9 septic tanks/and leach pits. During the initial site visit (1991) with NYSDEC and Ebasco (now FWENC) representatives, only four leach pits and two septic tank locations were found. This number was confirmed during a follow up site inspection by FWENC on October 27, 1994. These locations were inspected for the presence of standing water or sludge. All six locations were dry. However, a holding tank was located adjacent to the building with standing water and sludge present. It is currently planned that the four leach pits will be sampled for soil from each bottom using a tripod sampling apparatus or light track drilling rig. The 0-2' bottom soil interval will be collected. A collection of samples from below the septic and holding tank is not recommended due to potential breaching of the tank bottom. Therefore, one soil sample will be collected from each septic tank area. The selected sample will be from the visually most contaminated interval outside the tank or at the approximate tank bottom interval.

FIGURE 3-1
SAMPLE LOG SHEET

PROJECT SITE NAME: PROJECT SITE NO.:
CONTRACTOR: . PROJECT MANAGER:

I. SAMPLE IDENTIFICATION/COLLECTION INFORMATION

SAMPLE #: DATE: TIME: PHASE
DEPTH:
SAMPLE MATRIX: TYPE:
SAMPLED BY: SIGNATURE:

II. SAMPLE SOURCE

SOURCE DESCRIPTION

III. FIELD OBSERVATIONS/MEASUREMENTS

SAMPLE APPEARANCE:
ON-SITE SAMPLE ANALYSIS: (ABOVE BACKGROUND)
OVA: HNU: OTHER: ______________________
pH: CONDUCTIVITY: TEMPERATURE: SALINITY:
OTHER:
OBSERVATIONS:

IV. SAMPLE DISPOSITION

TRANSPORT:

COLLECT C#	DUPLICATE P**	TRAFFIC LAB	SHIPDATE	DATE	AIRBILL

C# = MATRIX CONCENTRATION LEVEL: (L)ow, (M)edium, (H)igh

p## = PRESERVATIVE: 1-ICED
2-ICED/HCl to pH<2
3-ICED/HNO_3 to pH <2
4-ICED/NaOH to pH >12
5-ICED/H2SO4 to pH <2

FIGURE 3-2

LOG OF BORING

PROJECT:
PROJECT NO:
LOCATION:
GEOLOGIST:
DRILLER:
DRILLING/SAMPLING METHOD:

BORING NUMBER:
DATE STARTED:
DATE COMPLETED:
GROUNDWATER DEPTH:
ELEVATION:

SAMPLE ID	DEPTH (feet)	BLOWS per 6"	RECO-VERY (inches)	MATERIAL DESCRIPTION	COLLECTION		VOA ppm	COMMENTS
					Time	Date		
	0							
	1							
	2							
	3							
	4							
	5							
	6							
	7							
	8							
	9							
	10							
	11							
	12							
	13							
	14							
	15							
	16							
	17							
	18							
	19							
	20							
	21							
	22							
	23							
	24							
	25							
	26							
	27							
	28							
	29							
	30							

NOTES:

PAGE 1 OF

FIGURE 3-3 (Sheet 1 of 2)

WELL PURGE SHEET

1. Obtain all available information on well construction (location, casing, screens, etc.).
2. Determine well or casing and borehole diameter.
3. Measure and record static water level (depth below ground level or top of casing reference point), using one of the methods described in 3.5.1.4.4.1.
4. Determine depth of well (if not known from past records) by sounding using a clean, decontaminated weighted tape measure.
5. Calculate number of linear feet of static water (total depth of length of well pipe minus the depth to static water level).
6. Calculate the total volume of water in the casing (Vc) and the volume of water in the filter pack (Vf).

$$Vc = \pi \, (di/2)^2 \qquad (TD - H)$$

$$Vf = \pi \left[\frac{dH^2}{4} - \frac{do^2}{4} \right] \; [TD - (S \; or \; H) \qquad (P)$$

If S > H use S, if S < H, use H

Vt = (Vc + Vf) (7.48)

Where,

Vc = Volume of water in casing, ft^3
Vf = Volume of water in filter pack, ft^3
Vt = Total volume, gal
di = inside diameter of casing, ft
do = outside diameter of casing, ft
dH = diameter of borehole, ft
TD = total depth of well, ft
H = depth to water, ft, from ground surface
S = depth to base of seal, ft, from ground surface
P = estimated porosity of filter pack (for most Ottawa, Morie #1 sand or glass beads this value is estimated at a ratio of 30 to 35%

FIGURE 3-3 (Sheet 2 of 2)

Water Quality:

	pH (SU)	Spec. Conductivity (umhos/cm)	Temp. (°C)	Eh (mV)	D.O. (ml/L)	Time
Initial	____	__________	____	____	______	
Volume 1	____	__________	____	____	______	
Volume 2	____	__________	____	____	______	
Volume 3	____	__________	____	____	______	
Volume 4	____	__________	____	____	______	
Volume 5	____	__________	____	____	______	

Purge Method:

___________ Suction Pump ___________ Submersible Pump _________ Bailer

___________________ Other

Notes/Observations:

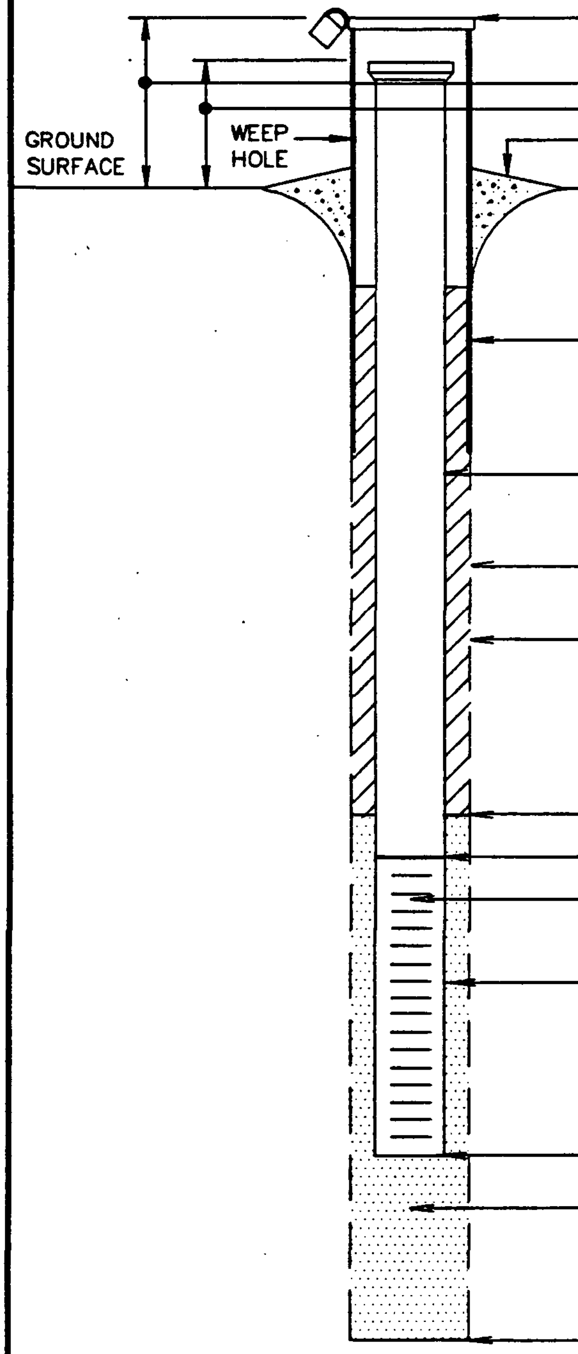
Sampler(s) Present:

FIGURE 3-4
SHALLOW UNCONSOLIDATED MONITORING WELL CONSTRUCTION DIAGRAM

WELL NO. MW-NS

PROJECT CHEVRON PERTH AMBOY REFINERY
PROJECT NO. ____
ELEVATION ____ DATE ____
FIELD GEOLOGIST ____

DRILLER ____
DRILLING METHOD HOLLOW STEM AUGER/ WATER ROTARY
DEVELOPMENT METHOD ____



ELEVATION OF TOP OF SURFACE CASING: ____
STICK-UP TOP OF SURFACE CASING: 2.5 FT.
STICK-UP TOP OF RISER PIPE: 2 FT.
TYPE OF SURFACE SEAL: CEMENT/BENTONITE MIX
GROUND SURFACE ELEVATION: ____

I.D. OF SURFACE CASING: 8-INCH
TYPE OF SURFACE CASING: STEEL

RISER PIPE I.D. 4-INCH
TYPE OF RISER PIPE: PVC

BOREHOLE DIAMETER: 8-1/4 INCH MINIMUM

TYPE OF BACKFILL: CEMENT/BENTONITE MIX

ELEVATION/DEPTH TOP OF SAND PACK: 2 FT. ABOVE SCREEN
ELEVATION/DEPTH TOP OF SCREEN: 3 FT. ABOVE WATER TABLE
TYPE OF SCREEN: PVC
SLOT SIZE X LENGTH: 0.010-INCH X 10 FT. 4-INCH
TYPE OF SAND PACK: MORIE NO. 00 OR EQUIVALENT

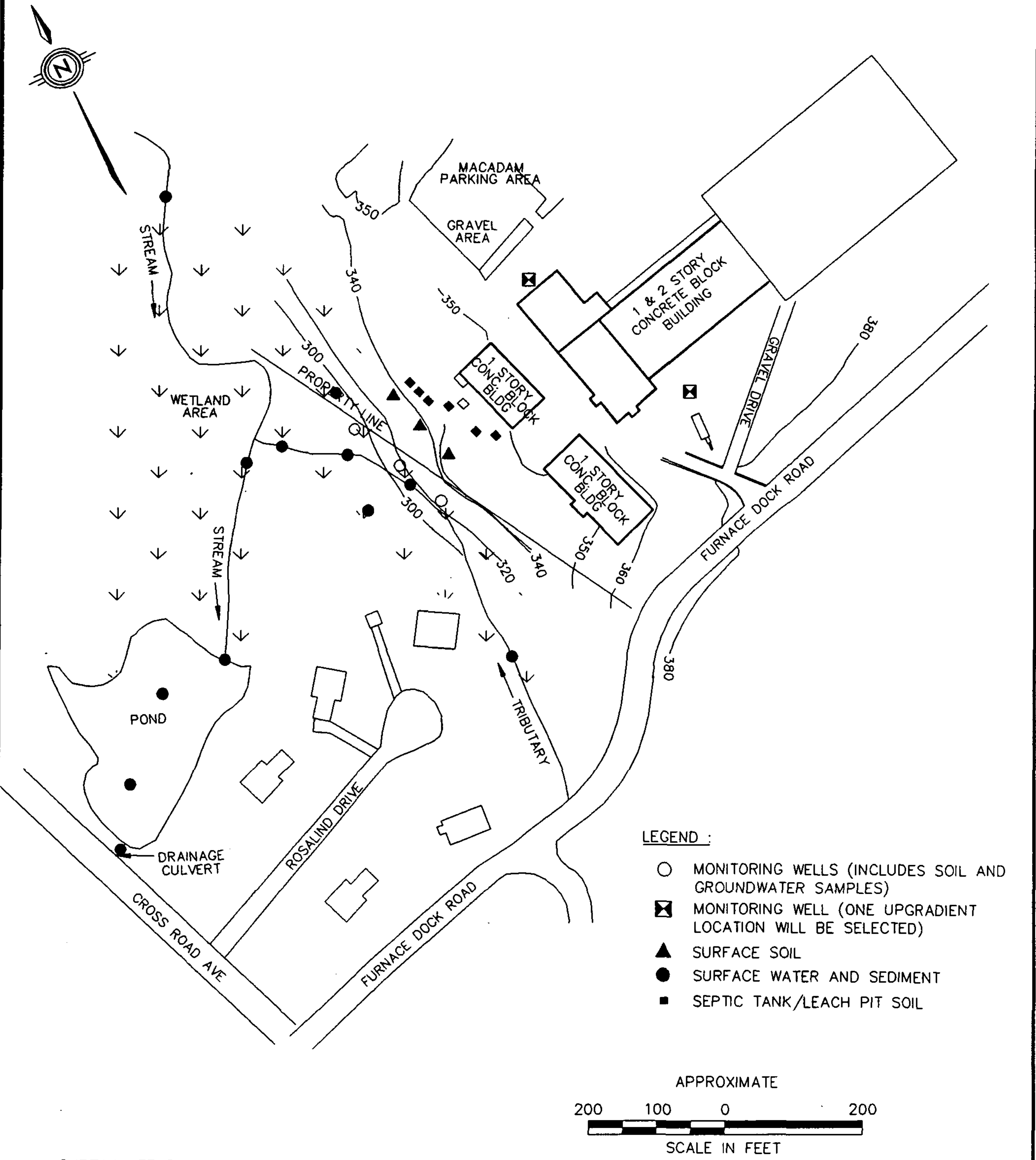
ELEVATION/DEPTH BOTTOM OF SCREEN: APPROX. 7 FT. BELOW WATER TABLE
ELEVATION/DEPTH BOTTOM OF SAND PACK: ____
TYPE OF BACKFILL BELOW OBSERVATION WELL: ____

ELEVATION/DEPTH OF HOLE ____

NOT TO SCALE

CAD FILE NAME: C0SA1.DWG DATE: 8/16/94 TIME: 12:01 PM
PLOT SCALE: 1=1

UNMW1.DWG



SURFACE FEATURES FROM
WESTCHESTER COUNTY, DEPARTMENT
OF PLANNING AERIAL PHOTOGRAPH, SPRING 1990

TOPOGRAPHIC INTERPRETATION
FROM NYSDEC, 1983

■ 6 TANKS/PITS LOCATED AS OF 3/28/91

EBASCO SERVICES INCORPORATED

DEPT 940 DR J.R.
DATE CH
SCALE 1"=200'

APPROVED

ISC PROPERTIES

MAGNA METALS SITE

SAMPLE LOCATION MAP

LIGH
2501.001

FIGURE 3-5

LIGHA.DWG 8.5X11

A light track rig is anticipated to be used for collection of soil samples outside the septic tank. Soil samples collected outside the septic tanks will be collected continuously (every 2 feet). The samples will be screened visually and with a HNu/OVA to select the potentially most contaminated soil sample for analysis. A total of 6 samples and one duplicate will be collected. Soil samples will be collecting using procedures outlined in Section 3.4.5.3.

3.4.1.1 Holding Tank-Sludge Pit Sampling Procedure

1. Gain access; remove cover. Wear appropriate health and safety equipment as outlined in the Health and Safety Plan. Don clean gloves for each new sample.
2. Use a decontaminated stainless steel scoop attached to an extension rod to obtain the sludge sample.
3. Repeat Step 2 at two or more different points inside the tank until enough sample volume is obtained. Take and record an HNu and/or OVA reading.
4. Use a stainless steel spatula or laboratory scoop to transfer the volatile sample fraction as quickly as possible without mixing. The sample should be packed tightly, but not at the risk of creating more volatile loss than is necessary.
5. Place collected sludge in a stainless-steel bowl and homogenize then with a stainless-steel spoon. Place samples in the appropriate bottles. Place chemical analysis samples in a cooler and chill to 4°C. Ship samples to the laboratory within 24 hours.
6. Fill out field notebook, sample log sheet, custody seals, labels, and chain of custody forms.

3.4.1.2 Holding Tank - Standing Water Sampling Procedure

Use a pond sampler with Teflon® or stainless-steel beaker or an equivalent dipper sampler to obtain the samples.

1. Gain access, and remove cover.
2. Standing at the edge of the tank, lower the sampler into the impoundment, slowly submerge the beaker with minimal surface disturbance. Collect the sample from just below the surface or at mid-depth
3. Retrieve the pond sampler from the surface water with minimal disturbance.
4. Remove the cap from the sample bottle and slightly tilt the mouth of the bottle below the dipper/device edge.
5. Empty the sampler slowly, allowing the sample stream to flow gently down the side of the bottle with minimal entry turbulence. Fill VOA vials first and fill to zero headspace. Then fill other bottle in order of decreasing parameter volatility.

6. Repeat steps 2 through 5 until sufficient sample volume is acquired.
7. Follow procedures for preservation and transport.
8. Replace cover.
9. Decontaminate the pond sampler or dipper between samples and when the sampling event is complete.

3.4.2 Surface Water Sampling

The surface water sampling program is designed to provide information on the following objectives:

- Determine if surface water contamination was introduced by the site, and;
- Determine the chemical composition of the contaminants, if any, in order to evaluate potential risks and feasible remedial alternatives.

One sampling round will be conducted at the locations displayed in Figure 3-5. Four samples will be collected from the tributary; two samples will be collected after the confluence of the stream and tributary, two samples will be collected from the pond, one sample will be collected at culvert along Cross Roads Avenue, two samples will be collected in the wetlands area if standing water is present (wetland sample locations may be modified as field conditions warrant), and one upgradient sample from the stream. A total of 12 samples (and one duplicate) shall be collected.

All samples will be taken prior to sediment samples and collected by moving in an upstream direction. Field analyses of pH, specific conductance, and temperature shall be taken at each sampling location.

All samples will be sent to a NYSDEC laboratory for the analyses specified in Table 3-1, within 24 hours of sampling.

3.4.2.1 Surface Water Sampling Procedure

The surface water sampling will be performed by the following procedure:

1. Wear appropriate health and safety equipment as outlined in the Health and Safety Plan. In addition, samplers will don new sampling gloves at each location prior to sampling.
2. The following equipment will be used to collect samples:
    - Laboratory cleaned sample bottles.
    - Decontaminated stainless-steel beakers.
3. Measure and record temperature, pH, and specific conductance.

4. Care should be exercised when pouring the water in the sample bottles. Samples for VOA analyses will be collected first. Other parameters will be collected in order of decreasing volatility.

5. The preservation procedure shall be:

   - VOAs - Determine the volume of HCl required to adjust the pH of the sample to less than 2 in an extra 40 ml glass vial prior to sampling. Volatile samples must be collected in a decontaminated stainless-steel beaker or a laboratory cleaned sample bottle. The sample will then be poured into a pre-preserved VOA vial. Check bottle for the presence of trapped air by tapping the bottle when filled and capped.

   - Other Parameters - Fill each container by the method specified. Preserve as required in Table 3-1. To test for pH, pour a minimal portion of sample onto broad range pH paper to verify if the appropriate pH has been obtained.

6. Place analytical samples in cooler and chill to 4°C. Samples will be shipped to the appropriate laboratory within 24 hours.

7. Decontaminate beaker or scoop.

8. Fill out field notebook, sample log sheet, labels, custody seals and Chain-of-Custody forms.

3.4.3 Sediment Sampling

The sediment sampling program is designed to provide information on the following objectives:

- Determine if sediment contamination was introduced by the site, and;

- Determine the chemical composition of the contaminants, if any, in order to evaluate potential risks and feasible remedial alternatives.

Twelve (12) surface sediment samples (and one duplicate) will be collected at the surface water and sediment locations displayed in Figure 3-5.

Field analyses of pH, specific conductance, and temperature shall be taken at each sampling location.

A stainless steel scoop will be used to obtain the sediment samples if the water above the samples is standing and is less than four inches deep. If the water above the sediment at the collection point is flowing or is greater than four inches deep, a corer will be used to collect the sample so that washing of the sample will be minimized. Samples for volatile analysis will be collected first, without homogenization. Samples will be collected moving in an upstream direction and surface water samples will be collected before sediment samples so as not to disturb sediments potentially containing contaminants.

All samples will be sent to a NYSDEC approved laboratory for the analyses specified in Table 3-1, within 24 hours of collection.

3.4.3.1 Sediment Sampling Procedure for Scoop Sampler

Sediment sampling with a scoop will be performed by the following procedure:

1. Wear appropriate protective equipment as specified in the Health and Safety Plan.
2. Use a decontaminated stainless steel scoop to scrape away organic material (grass, leaves etc.).
3. After organic materials have been scraped away, obtain a sediment sample by scooping sediment from the sediment water interface to 6 inches below in one smooth motion.
4. Take and record HNu and/or OVA reading.
5. Used stainless-steel spatula or laboratory scoop to transfer the volatile sample fraction to a 120 ml VOA vial as quickly as possible without mixing. The sample should be packed tightly, but not at the risk of creating more volatile loss then necessary.
6. Empty the remaining contents of the scoop into a decontaminated stainless steel pan.
7. Repeat steps 2 and 3 until enough sediment is collected to fill the required containers.
8. Homogenize remaining sediment in a pan using a decontaminated stainless-steel spoon. Remove any organic material larger than 1 mm in diameter.
9. Transfer sample for analyses into appropriate containers. Decant off excess liquid after the sediment has been placed in sample bottles.
10. Place analytical samples in cooler and chill to 4°C. Samples will be shipped to the laboratory within 24 hours.
11. Fill out field notebook, sample logsheet, custody seals, labels and chain of custody forms.
12. Stake location for survey.

3.4.3.2 Sediment Sampling Procedure for Core Sampler

Sediment sampling by a coring device or polytetrafluoroethene coring device liner or tube shall be performed by the following procedure. While it is possible to sample with a coring device, direct use of a core sampler liner or tube is recommended for shallow sediments. The core sampler liner or tube need only be approximately 12" long since only recent sediments will be sampled. The tube diameter should be approximately 2 inches and the wall thickness should be about 1/8 inch. The end of the tube may be tapered by filing it down to facilitate entry of the liner into the substrate.

1. Decontaminate the corer, liner, or tube prior to use.
2. Force sampler in 6 inches with a smooth, continuous motion.
3. Twist corer and withdraw in one motion.
4. Take and record HNu and/or OVA reading.
5. Use a stainless-steel spatula or laboratory scoop to transfer the volatile sample fraction to a 120 ml VOA vial as quickly as possible without mixing. The sample should be packed tightly, but not at the risk of creating more volatile loss than necessary.
6. Empty the remaining contents of the sampler into a decontaminated stainless steel pan.
7. Repeat Steps 2 and 3 until enough soil is collected to fill the required containers.
8. Homogenize remaining sediment in pan using a decontaminated stainless steel utensil. Follow the homogenization procedures under Step 7 of Section 3.4.5.2.
9. Transfer sample for analyses into appropriate containers.
10. Place analytical samples in cooler and chill to 4°C. Samples will be shipped to the laboratory within 24 hours.
11. Fill out field notebook, sample logsheet, custody seals, labels and chain of custody forms.
12. Stake location for survey.

3.4.4 Surface Soil Sampling

The surface soil sampling program is designed to provide information on the following objectives:

- Determine if surface soil contamination is present on site;
- Determine the chemical composition of the contaminants, if any, in order to evaluate potential risks and feasible remedial alternatives.

Three (3) surface soil samples will be collected at the locations displayed in Figure 3-5. Three samples will be collected from surface soil at the mid-point of the slope. One upgradient soil sample will be collected to establish background levels.

A material classification using the Burmeister Classification system shall be performed at each sampling location.

A stainless steel soil coring device/silver bullet sampler will be used to obtain the 0-1' depth samples. Volatile samples will be collected first without homogenization, from the 6"-12" interval.

All samples will be sent to a NYSDEC approved laboratory for the analyses specified in Table 3-1, within 24 hours of collection.

3.4.4.1 Surface Soil Sampling Procedure

The surface soil sampling will be performed by the following procedure:

1. Insert borosilicate collection tube into the sampler.
2. Place the sampler in position with the bit touching the ground.
3. Press down on the T-handle while rotating the sampler clockwise.
4. After reaching a depth of one foot, turn the sampler 360° counter clockwise and remove from the ground taking care not to lose any of the sample.
5. Remove the borosilicate glass collection tube from the corer, and remove soil core from tube. Place the core in a decontaminated stainless-steel pan.
6. Take and record on an HNu and/or OVA reading.
7. Use a stainless steel spatula or laboratory scoop to transfer the volatile sample fraction to a VOA vial as quickly as possible without mixing. The sample should be packed tightly, but not at the risk of creating more volatile loss than is necessary.
8. Repeat steps 1 through 5 until enough soil is collected to fill required containers.
9. Homogenize remaining sediment in pan using a decontaminated stainless steel utensil.
10. Transfer samples into the appropriate containers.
11. Place analytical samples in cooler, and chill to 4°C. Ship samples within 24 hours to the appropriate laboratory.
12. Fill out field notebook, sample log sheet, custody seals, labels, and Chain-of-Custody forms.
13. Backfill the excavation with the soil remaining from sampling and with the soil surrounding the hole.

14. Stake location for survey.

3.4.5 Monitoring Well Installation and Subsurface Soil Sampling

The monitoring well program is designed to provide ground water sampling points immediately downgradient of the potential source area (leach pits and septic tanks) and a sampling point upgradient to provide background data for comparative analytical purposes. Downgradient wells will be positioned to intercept groundwater flow from the disposal area in the overburden aquifer. Since the site area contains a large topographic low area which consists of wetlands, groundwater flow is anticipated to be in this southerly direction. Therefore, up to three monitoring wells, MW-1, MW-2, and MW-3 will be installed (depending upon access conditions) south of the site at the base of the slope in a spatial distribution pattern most likely to intercept ground water flow. Monitoring well MW-4, will be placed at a location upgradient of the source. Figure 3-5 shows two potential upgradient locations. One of these will be selected based on field conditions and access.

All monitoring wells will be installed in the overburden aquifer and will screen the water table. Screens will be 10 feet in length. Since groundwater is estimated to be within 5 feet of grade, the monitoring wells will have a maximum depth of approximately 13 feet.

Monitoring well borings will be drilled utilizing 6 1/4 hollow stem augers. In the event that hollow stem augering is not successful in advancing the borehole, mud rotary methods using bentonite drilling mud may be employed (or air rotary drilling techniques) upon the approval of the NYSDEC.

Split-spoon sampling will be performed continuously from the surface to the bottom of the boring (up to a depth of 15 feet if the water table is encountered) to provide a continuous boring log. These logs will include the following:

- Physical characteristics and grain size distribution of samples (using the Burmeister Soil Classification System),
- Blow counts for driving the sampler (standard penetration resistance),
- Presence of any visible contaminants,
- Color changes,
- Groundwater level,
- Thickness of individual units, and
- Any other conditions encountered during drilling.

Drilling and sampling methods will conform to the appropriate ASTM and regulatory agency standards, and to those discussed within this document.

A total of thirteen samples (including one duplicate) will be analyzed in the laboratory for volatile organics, cyanide, and metals. Soil samples will be collected continuously at all test borings. Soil samples will be taken from the center of each split-spoon, or sections of the split-spoon which are visibly contaminated, or sections which are found to be contaminated by use of direct reading instruments (i.e. HNu or OVA). Part of each split-spoon sample will be placed directly into the VOA container and part into the metals container. At least three samples will be collected for analysis at each location. Sample intervals will be from surface (0-2'), at the water table interface (approximately 4-6') and at the midpoint of the screened interval (10-12'). If elevated readings or visible contamination is encountered at other depth intervals, additional samples will be collected. Also, if the bedrock depth is greater than 15', the field geologist has the option to proceed with split-spoon sampling at 5' intervals.

One sample from each of the 4 well borings planned will also be analyzed for selected engineering parameters (Atterbergs Limit and particle size distribution).

Soil cuttings generated during the drilling process will be drummed and stored on-site if elevated HNu/OVA readings are encountered. Otherwise, soil cuttings will be reworked into the native surface soils.

Wells will be constructed in all boreholes using two (2) inch diameter stainless steel riser and No. 20 slot stainless steel screens. The selection of construction material is determined by the anticipated contamination type(s) and their reactivity with well construction material. Sand packed around the screens will be medium-size filter sand. A typical well installation is shown in Figure 3-4. The type of screening to be used will depend in part on the grain size of the subsurface soils. If extremely fine grained sediments are encountered, No. 10 slot screen may be employed. The exact screening intervals for monitoring wells will be determined in the field based on geologic considerations.

3.4.5.1 General Monitoring Well Installation Procedure

Proposed monitoring wells shall be installed in accordance with the following general procedures.

1. Drill well borehole using hollow stem auger methods (6-1/4 inch outside diameter). Mud or air rotary may be substituted if difficult drilling conditions are encountered. Temporary surface casing to the water table may be used to stabilize the upper portion of the drill hole, but casing must be removed as filter pack and bentonite-cement grout are installed.

2. Collect soil samples continuously to borehole completion by the split-spoon method in order to establish the best interval for screen placement.

3. Install well screen at the specified depth based on the water table elevation as approximated by split spoon sample data. The screened interval of the well should intersect the water table with approximately 8 feet of screen below and 2 feet of screen above the water table. Allow enough riser pipe to extend approximately two feet above the ground surface. Well screens will be .010 or .020 slot stainless steel. The driller shall have all necessary materials (screen filter pack, etc). The final decision on well screen size will be made by the Project Geologist based on samples taken during drilling. Riser pipe shall be Schedule 5 stainless steel.

4. Backfill the borehole and annular space from the bottom of the hole to approximately two feet above the well screen with a sand filter pack using a tremie pipe. The filter pack shall be #1 graded sand (or an appropriate size to retain most of the formation material). Install a bentonite seal, approximately three feet thick above the filter pack. Fill the remainder of the annular space with a tremie grouted or pressure installed bentonite-cement mixture past the uppermost aquifer. If extremely shallow water table conditions are encountered, modifications to this construction specification will be implemented in the field.

5. Install a steel security casing with a locking steel cap at the top of each well. The cap will be locked between times of well development, sampling, or water level measurement.

6. Construct a concrete pad around the security casing in such a way as to direct surface runoff from the casing.

7. Following installation and a sufficient time period for the grout to cure, each new well will be developed by overpumping and backwashing and/or surging depending on site conditions. Wells will not be developed prior to 24 hours after installation. If low permeability conditions exist, development may be performed by bailing methods.

3.4.5.2 Well Development Procedures

Well development will be accomplished using a combination of the techniques described below. Well development will not be attempted until at least 24 hours after well installation. Development will continue until the well responds to water level changes in the formation, and the well produces clear, sediment-free water to the extent possible. The wells will be developed with a goal of producing water of not more than 10% variation between successive field parameters.

Dispersing agents, acids, disinfectants, or other additives will not be used during development nor will they be introduced into the well at any other time. During development, water will be removed from the entire column of water standing in the well by periodically lowering and raising the pump intake.

Overpumping and Backwashing

Wells may be developed by alternatively drawing the water level down at a high rate (by pumping or bailing) and then reversing the flow direction (backwashing) so that water is passing from the well into the formation. This back and forth movement of water through the well screen and gravel pack serves to remove fines from the formation immediately adjacent to the well, while preventing bridging (wedging) of sand grains. Backwashing can be accomplished by several methods including pouring water into the well and then bailing, starting and stopping a pump intermittently to change water levels, or forcing water into the well under pressure through a water-tight fitting ("rawhiding"). Care should be taken when backwashing not to apply too much pressure, which could damage or destroy the well screen.

Surging with a Surge Plunger

NO

A surge plunger (also called a surge block) is approximately the same diameter as the well casing and is used to agitate the water, causing it to move in and out of the screen. This movement of water pulls fine materials into the well, where they may be removed by any of several methods, and prevents bridging of sand particles in the gravel pack. There are two basic types of surge plungers: solid and valved. In formations with relatively high water yields, a solid plunger is most effective as the surging action is greater. In formations with low yields, a valved surge plunger may be preferred, as solid plungers tend to force water out of the well at a greater rate than it will flow back in. Valved plungers are designed to produce a greater inflow than outflow of water during surging.

The water generated during the development process will be discharged to the ground at each well location unless elevated HNu or OVA readings are encountered upon which development water will then be drummed.

The following data will be recorded in the field logbook as part of the development procedures:

1. The static water level measured from the top of the well casing before, during and after, development is completed.
2. The calculated quantity of fluid standing in the well prior to development.
3. The sounded depth of the well before and after development to determine if silt has accumulated inside the well.
4. The physical character of water removed including changes during development such as water clarity, color, particulates and odor.
5. The pH, Eh, dissolved oxygen, and specific conductance of the discharge during development of the well.
6. The type and size/capacity of pump used.
7. The surging technique(s) used.
8. The quantity of fluid/water removed and the time for removal (both incremental and total values).

3.4.5.3 Split-Spoon Sampling Procedure for Monitoring Well Borings

The following procedure will be used for monitoring well boring split-spoon sampling:

1. Wear appropriate health and safety equipment as outlined in the Health and Safety Plan.

2. Drill borehole to the desired sampling depth

   Drive split-spoon into the undisturbed soil which is to be sampled.. A carbon steel 2 (or 3) inch O.D. split-spoon sampler will be driven with blows from a 140-lb (or 300-lb) hammer falling 30 inches until either approximately 2 feet has been penetrated or 100 blows within a six - inch interval have been applied. This process is referred to as the Standard Penetration Test (ASTM D 1586-74). A decontaminated split-spoon will be used for each sample collected for chemical analyses.

3. Record the number of blows required for each 6 inches of penetration or fraction thereof. The first 6 inches is considered to be a seating drive. The sum of the number of blows required for the second and third 6 inches of penetration is termed the penetration resistance. If the sampler is driven less than 2 feet, the penetration resistance is that for the last 1 foot of penetration. (If less than 1 foot is penetrated, the logs shall state the number of blows and the fraction of 1 foot penetrated).

4. Bring the sampler to the surface, place it on clean polyethylene sheeting and remove both ends and one half of the split-spoon so that the recovered soil rests in the remaining half of the barrel.

5. To reduce loss of volatile organic compounds, samples collected for volatile organic analysis shall be collected as discrete grab samples in two 120 ml VOA vials (or two 4 ounce, wide mouth soil jars) immediately upon opening the split-spoon and before homogenization. Volatile samples shall be collected according to the following procedure.

   a) Once the soil core has been retrieved use a stainless steel utensil to cut cross sectional slices of the core or score a longitudinal line the length of the core deep enough to expose a porous surface.

   b) Simultaneously place the probe of an air-monitoring device (PID or FID) into the incision or along the longitudinal score, being careful not to touch the sample.

   c) Take the sample from an undisturbed portion of the six inch interval of the core which shows the highest PID/FID reading.

   d) Using stainless steel utensils quickly transfer the sample without mixing it into two 120 ml wide mouth amber glass vials with Teflon®-lined septa. The sample should be packed tightly, and to the exclusion of headspace, but not at the risk of creating more volatile loss than necessary. Small rocks and vegetation should be avoided to the extent most practicable.

When sampling at the surface (0 to 2 feet), disregard the six inch interval closest to the surface. If field screening is not conducted, surface depth for volatile organic collection must be based on soil type using the following guidelines:

- Sample at six to twelve (6-12) inches if the soil consists of 50% or more silt/clay.
- Sample at eighteen to twenty-four (18-24) inches if soil consists of 15-50% silt/clay.'
- If surface soil consists of less than 15% silt/clay, sample the six (6) inch interval above the water table or a six (6) inch interval within the next lower soil horizon consisting of 15% or more silt/clay, or at nine and one-half-ten (9.5-10) feet, whichever is encountered first.

6. Describe thoroughly the approximate recovery (length), the Burmeister Soil Classification System. At a minimum, in addition to the soil classification, the following information will be recorded by the field geologist/engineer:
    - Soil sample interval
    - Sampling hammer weight and distance of fall
    - Blow count (per 6-inch interval)
    - Amount of sample recovered
    - Sample color
    - Sample texture
    - Sample moisture content (dry, moist, wet)
    - Organic vapor readings
    - Any unusual characteristics
    - Depth to water
    - Drill rig behavior and penetration rate
    - Total depth of boring.
7. Samples for metal analyses, must be homogenized in stainless steel bowls with stainless steel spoons prior to being put into containers. The following conning and quartering procedure will be used to homogenize all soil samples except those for volatile organic analysis:

a) Remove any rocks, twigs, leaves, and other debris if they are not considered part of the sample.

b) Remove soil from the sampling device and place it in a decontaminated stainless steel pan.

c) Thoroughly mix the soil with a decontaminated stainless steel spoon.

d) Scrape any sediment from the pan from the sides, corners, and bottom of the pan, then roll it in to the middle of the pan and mix.

e) Divide the sample into quarter and move each quarter to a separate corner of the pan.

f) Mix each quarter individually then roll it to the center of the container and mix the entire sample again.

g) Fill sample jars using a stainless steel spoon.

8. Place analytical samples in sample cooler and chill to 4°C. Samples will be shipped to the laboratory within 24 hours.

9. Upon completion of sampling, construct the well.

10. Fill out field notebook, sample log sheet, labels, custody seals, and Chain-of-Custody forms for analytical samples.

Information from soil samples will help to determine potential contaminant levels which may represent a health hazard. In addition, representative saturated soil samples from test borings will be taken and laboratory tested to determine the grain size distribution (sieve and possibly hydrometer analysis) to confirm field identifications.

3.4.6 Groundwater Sampling

The groundwater sampling program is designed to provide information on the following objectives:

- Obtain a more precise understanding of groundwater at the site; and
- Provide information on the extent of potential contamination plume originating at the site.

One round of sampling will be obtained from the 4 newly installed wells (see Figure 3-5). A total of 5 samples including one duplicate shall be collected.

Well purging will extract three to five well volumes from each well prior to sampling. Purge water will be discharged to the ground and not be allowed to run into surface drainage channels. Specific conductance, pH, and temperature will be measured at the start of purging operations and after each purged volume. Stabilization of these parameters of +/-10% from successive purged volumes indicates that the groundwater within the well is at equilibrium. Wells will be purged with a stainless steel or Teflon bailer, a centrifugal pump, or a submersible pump with a check value to prevent backflush. Pumps shall use polyethylene tubing dedicated to each well.

A stainless steel or Teflon bailer suspended on stainless steel Teflon-coated wire will be used to obtain the groundwater samples. Samples will be collected within three hours of purging or when water levels have recovered 90% from purging. In addition to total inorganic samples, dissolved metal samples and hexavalent chromium samples will be collected at a frequency of approximately 20% (or one sample per round).

All samples will be sent to a NYSDEC laboratory for the analyses specified in Tables 3-1, within 24 hours of sampling.

3.4.6.1 Monitoring Well Groundwater Sampling Procedure

The following procedure will be used for monitoring well groundwater sampling.

1. Wear appropriate health and safety equipment as outlined in the Health and Safety Plan. In addition, samplers will don new sampling gloves at each individual well prior to sampling.

2. Visually examine the exterior of the monitoring well for signs of damage or tampering and record in the field logbook.

3. Unlock well cap.

4. Take and record in field logbook HNu and/or OVA readings.

5. Measure the static water level in the well with a steel tape or electronic water level indicator. Rinse the tape or water level indicator with deionized water in between individual wells to prevent cross-contamination.

6. Calculate the volume of water in the well using the Well Purge Data Sheet shown in Figure 7-3.

7. Purge 3 to 5 well volumes of water from the well, using one of three methods described below. Purge water will be discharged to the ground surface in the immediate vicinity of the well.

    a) bail with a stainless steel or teflon bailer and teflon-coated stainless steel wire

    b) pump with a centrifugal pump with polyethylene tubing dedicated to each well. Set intake at the surface level of the groundwater and start pump; continue to lower the intake line through the well to just above screen depth ensuring that all standing water in the well has been purged.

    c) pump with a submersible pump equipped with a check valve to avoid backflush and polyethylene tubing dedicated to each well. Set intake at the surface level of the groundwater and start pump; continue to lower the intake line through the well to just above screen depth ensuring that all standing water in the well has been purged.

8. Measure and record temperature, pH, and specific conductance as each volume of well water is purged.

9. After purging, allow static water level to recover to approximate original level.

10. Place polyethylene sheeting around well casing to prevent contamination of sampling equipment in the event equipment is dropped.

11. Obtain sample from well with a stainless steel or teflon bailer suspended on a stainless steel, teflon-coated wire that has been cleaned. The maximum time between purging and sampling will be 3 hours. All the bailers for one day of sampling will be precleaned and dedicated to each individual well.

12. Sample for VOAs first by lowering the bailer slowly to avoid degassing, then collect inorganic samples by pouring directly into sample bottles from bailers.

13. Fill each container with sample to just overflowing so that no air bubbles are Fill each container and preserve immediately as required in Table 3-1. Filtered samples must be filtered prior to preservation To test for pH, pour a minimal portion of sample onto broad range pH paper to verify if the appropriate pH level has been obtained.

14. Place analytical samples in cooler and chill to 4°C. Samples will be shipped to the appropriate laboratory within 24 hours.

15. Decontaminate bailer and cord (and centrifugal or submersible pump, if used) as specified. If a centrifugal or submersible pump is used, discard pump suction line.

16. Re-lock well cap.

17. Fill out field notebook, sample log sheet, labels, custody seals and Chain-of-Custody forms.

3.5 HYDRAULIC CONDUCTIVITY

Four monitoring wells will be tested to develop hydraulic conductivity data for the screened intervals. The tests will be performed by rapidly displacing a known volume of water in each well with a Teflon® or stainless-steel slug and immediately monitoring the water level changes over time using either pressure transducers or manual measurements.

Each of the monitoring wells will be tested by monitoring the change in water level in the well from the initial injection of the slug, and upon withdrawal of the slug after sufficient recovery from the initial injection has occurred. These data will be analyzed using the methods outlined in the literature (Bouwer and Rice, 1976, Freeze and Cherry, 1979 or Ferris and Krowles, 1963).

The displacement slug will consist of a 1-inch diameter (approximate) Teflon® or stainless-steel cylinder. The cylinder will be approximately 5 feet long. A connector will be attached to one end so that the slug can be lowered rapidly into the well using a Teflon® coated stainless steel cable.

If electronic equipment is utilized, the cable that connects the pressure transducer to the readout/recording device at the wellhead may need to be protected from possible damage and/or entanglement as the slug is lowered and raised in the well casing. Polyethylene tubing, if necessary, will be used to house the connecting transducer cable during the tests. The readout device should provide a continuous calibrated visible display. In addition, the device should generate a durable, hard-copy, record of the changes in pressure as the slug is moved into and out of the water column.

Low permeability conditions may negate the necessity of electronic equipment (pressure transducers) and manual collection of water level measurements may be implemented. If manual measurements are performed, readings will be taken at 30 second intervals in conjunction with the below SOP.

<u>Procedure for In Situ Hydraulic Conductivity Testing</u>

The following procedure will be used for the permeability testing:

1. Clean the water level indicator, the transducer and cable, and the slug and cable with potable water (and alconox if rinsing is insufficient) and rinse with distilled/deionized water.

2. Measure and record the static water level within the casing.

3. If the Field Operations Leader determines that protection is needed for the transducer cable, (if a transducer is being used) lengths of polyethylene tubing will be installed. All tubing which contacts the ground water shall be dedicated to the well.

4. Install the transducer (if they are being used) 5 to 10 feet below the static water level, and calibrate the instrument readings to the approximate transducer setting.

6. Securely attach a Teflon®-coated, stainless-steel cord to the slug and lower the slug to the static water level. Confirm the water surface audibly and by checking the transducer or water level meter response.

7. Retract the slug about 0.5 foot above water level and allow the system to stabilize.

8. Activate the recorder (if being used) and lower the slug using a quick, smooth motion until the slug is fully submerged (use about 4-5 feet of cord length). Secure the line to prevent further movement of the slug.

9. Observe the recovery curve of this falling head slug test to at least 90% of full recovery; continue to 100% if it appears that full recovery might be established in 15-20 minutes. Measurements should be taken at least every half minute for the first ten minutes. After the first ten minutes, the frequency of measurements may be adjusted as deemed appropriate by the field geologist based on the expected rate of recovery. Record the measurements on the Pumping Well Data Sheet (Figure 3-6). Repeat the test if necessary to obtain usable data (if possible).

10. Rising-head slug test data will also be collected. Lower the slug to a point one to two inches below static water level and allow the system to stabilize.

11. When the system is stabilized ready, smoothly and quickly raise the slug out of the water in a smooth steady manner. Remove the slug from the riser.

12. Again observe the recovery curve, to 90-100% recovery, as above; repeat the test if necessary to obtain usable data (if possible). If using a water level meter, take water level measurements at least one every half minute for the ten minutes. After the first ten minutes, the frequency of the measurements may be adjusted as deemed appropriate by the field geologist based on the expected rate of recovery. Record the measurements on the Pumping Well Data Sheet (Figure 3-6).

13. Before terminating the test, the data should be evaluated by the site hydrogeologist to determine if additional tests are justified. Repeat the test if necessary to obtain usable data (if possible).

15. If data are satisfactory, the equipment and materials can be carefully removed from the well for cleaning or replacement in preparation for the next well to be tested.

3.6 SITE SURVEY

A licensed surveyor, acting as a subcontractor to FWENC, will survey the location and elevation of the newly installed wells and sample locations. Locations will be surveyed using New York Plan Coordinate System so that well location surveys will comply with any future permit requirements. Elevations to be surveyed to the nearest hundredth foot include ground surface, top of the steel protective casing and top of the stainless steel riser. The surveyor will permanently mark or etch the point of the elevation survey on the inner stainless steel riser. All surveying techniques employed in the field shall comply with commonly accepted professional survey practices and National Map Accuracy Standards which are appropriate for the task at hand.

In addition, an optional (pending the analytical findings) topographic map of 800' x 800' area shall be prepared using 5 foot contour intervals showing all major features such as wetland areas, streams, tributaries, drainage channels, and structural features such as roads, buildings, fences, etc.

FIGURE 3-6
PUMPING TEST DATA

SHEET______ OF______
WELL #________

BY____________ DATE____________
CHKD. BY____________ DATE____________
CLIENT____________
PROJECT____________
STATIC WATER LEVEL____________

MEASURING POINT____________ ELEV.________
DISTANCE FROM PUMPING WELL (r, ft)____________
PUMPING RATE (Q)____________
REMARKS____________

DATE	TIME (24 hr)	TIME PUMP START OR STOP (t, min)	WATER LEVEL			DRAWDOWN OR RECOVERY (s, Ft)	REMARKS
			HELD (Ft)	CORRECTION (Ft)	D.T.W. (Ft)		

3.7 EQUIPMENT DECONTAMINATION

3.7.1 Drill Rig and Equipment

As presented below, all equipment involved in field sampling activities, including drilling rigs, augers, downhole tools, pumps, and water and soil samplers will be decontaminated prior and subsequent to sampling and monitoring well installation events. Equipment leaving the site will also be properly decontaminated. The drill rig will be steam-cleaned prior to arrival and departure from the site, as well as upon completion of each monitoring well installation. All well screens and riser pipe will be steam cleaned prior to installation. All decontamination activities will occur in central decontamination area to be established on the site.

Drilling rigs, rods, bits, split-spoons (not used for collecting chemical samples), and other down-hole tools will be decontaminated by pressure (steam) washing. Stainless steel or Teflon bailers used for collecting groundwater samples for chemical analysis will be decontaminated..

3.7.2 Sampling Equipment

Sampling equipment used for collecting samples for chemical analysis will be thoroughly decontaminated using the following procedures:

1. Potable water rinse.
2. Alconox/Liquinox detergent wash.
3. Tap water rinse.
4. Distilled/deionized water rinse.
5. 10% nitric acid rinse (trace metal or higher grade diluted with distilled/deionized water) (only when sampling for metals).
6. Distilled/deionized water rinse (only when sampling for metals).
7. Methanol rinse.
8. Distilled/deionized water rinse.
9. Air Dry.
10. Wrap in aluminum foil, shiny side out, until ready to sample. Store decontaminated equipment away from potential contamination sources (i.e., gasoline tanks, vehicle emissions).

NOTE: While sampling, decontaminated equipment may rest on but never be wrapped in polyethylene sheeting.

3.7.3 Groundwater Level Measuring Equipment

The following procedures will be followed to decontaminate groundwater level measuring equipment:

1. Wipe with clean paper towels to remove water and any visible contamination.
2. Potable water rinse and non-phosphate detergent water.
3. Potable water rinse.
4. Distilled/deionized water rinse.

Personnel directly involved in equipment decontamination will wear proper protective clothing and respiratory equipment as specified in the site-specific Health and Safety Plan.

3.8 DEMOBILIZATION

This subtask will consist of equipment demobilization and will be performed at the completion of each phase of field activities as necessary. Equipment demobilization may include but will not be limited to sampling equipment, drilling subcontractor equipment, health and safety decontamination equipment, and field office trailer and utility hook ups.

SECTION 4.0

4.0 HABITAT BASED ASSESSMENT

As part of the Field Sampling Plan for the Magna Metals site, Foster Wheeler Environmental Corporation (FWENC) proposes to perform a Habitat-Based Assessment (HBA) in accordance with guidance provided by the New York State Department of Environmental Conservation (NYSDEC) in *Fish and Wildlife Impact Analysis for Inactive Hazardous Waste Sites* (NYSDEC, 1991). The NYSDEC 1989 *Habitat Based Assessment, Guidance Document for Conducting Environmental Risk Assessment at Hazardous Waste Sites* has been superseded by the *Fish and Wildlife Impact Analysis for Inactive Hazardous Waste Sites*. This revised guidance requires a four step process in analyzing impacts to fish and wildlife resources. The analysis is a graduated approach where the need for subsequent investigation is evaluated after the completion of each step. The initial steps required to address environmental concerns at the Magna Metals site are Step I - Site Description and Step II - Contaminant-Specific Analysis, Part A and B.

The objectives of a Step I - Site Description are to identify wildlife resources that may be affected by site-related contaminants and to provide appropriate information for designing remedial investigation of these resources. Step I provides information in the form of maps, site descriptions and resource value (e.g. recreational, significant habitat) descriptions. Objective of the Step II - Contaminant-Specific Analysis is to determine the impacts of site-related contaminants on fish and wildlife resources. The goal of a Step II analysis is either to demonstrate that impacts on resources due to contaminants are minimal or, if significant impacts exist, to determine the impacts site-related contaminants on productivity and diversity of fish and wildlife resources.

FWENC proposes to conduct a screening level analysis by comparing applicable fish and wildlife regulatory criteria and ecological benchmark values to concentrations of contaminants found in on-site environmental media. To accomplish this only parts IIA - Pathway Analysis and IIB - Criteria-Specific Analysis of the Step II analysis need be completed.

4.1 STEP I - SITE DESCRIPTION

The objectives of Step I - Site Description are (1) to identify fish and wildlife resources that may potentially be affected by site-related contaminants, and (2) if such resources exist, to provide the necessary information for designing a remedial investigation of these resources (NYSDEC, 1991a). Step I is divided into four subtasks, IA - Site Maps, IB - Description of Fish and Wildlife Resources, IC - Value of Fish and Wildlife Resources, and ID - Applicable Fish and Wildlife Regulatory Criteria.

4.1.1 Step IA - Site Maps

A site map will be prepared using a topographic map as a base and will encompass the site and the area within a two-mile radius of the site's perimeter. This detailed map will show the location and boundaries of the site; the two-mile radius surrounding the site; and the location of fish and wildlife resources, including NYSDEC Significant Habitats as defined by the NYS Natural Heritage Program, habitats known to support endangered and threatened species, rare species, species of concern, regulated wetlands, wild and scenic rivers, streams, lakes, and other major resources within a two-mile radius of the site's perimeter. If major fish and wildlife resources, that may potentially be affected by site-related contaminants, exist outside of the downstream two-mile radius, they will also be evaluated and included on the topographic map. The information for the map will be collected during a site visit and through agency correspondence. Agencies to be contacted will include, but will not necessarily be limited to, appropriate NYSDEC programs and offices, including the Regional Field Office, the Division of Fish and Wildlife, the Natural Heritage Program, the Significant Habitat Unit, and the Bureau of Fisheries, the U.S. Fish and Wildlife Service (USFWS), and the National Marine Fisheries Service (NMFS) (jurisdiction over threatened and endangered fish species in U.S. waterways). The base map will be drafted from existing U.S. Geological Survey (USGS) topographic quadrangles and aerial photography, if available, using AutoCAD. The topographic map will be prepared at a scale of one inch equals 1000 feet (1" = 1000').

4.1.2 Covertype Map

A covertype map will also be prepared depicting major vegetative communities including wetlands, aquatic habitats, NYSDEC Significant Habitats, and areas of special concern as identified from agency correspondence and the site visit by qualified ecologists. The covertype map will be prepared for the site and the area within a 0.5-mile radius from the perimeter of the site. The covertype map will also be prepared using AutoCAD at a scale of one inch equals 500 feet (1" = 500').

4.1.3 Description of Fish and Wildlife Resources

The fish and wildlife resources identified in Step IA will be described and pertinent information will be collected through agency correspondence to further characterize the resources in the vicinity of the site. Sources of additional information may include NYSDEC, the U.S. Geological Survey (USGS), the U.S. Environmental Protection Agency (USEPA), local bird clubs, and local colleges and universities. Terrestrial and aquatic habitats will be described. Typical vegetative species and their abundance, distribution, and densities will be quantitatively described. For aquatic habitats, the description shall include a discussion of chemical and physical parameters such as water chemistry, temperature, dissolved oxygen, depth, substrate composition, discharge, flow rates, and streambed morphology. Information will be obtained from data measured in the field during the site visit and from the sources mentioned above. Submergent aquatic vegetation will be identified and its abundance and distribution described. Stream and wetland classifications will also be provided. The fish and wildlife species associated with each aquatic habitat and covertype will be identified, including endangered and threatened species, rare species, and species of concern.

During the site visit, observations of any stress to ecological receptors and the environment will be recorded. Obviously contaminated areas such as stained soils, leachate seeps, outfalls, and exposed waste will be described. Alterations in species distribution and assemblages, reduced vegetative growth and density, stressed vegetation, or obvious absence of expected species that may be related to exposure to site-related contamination will be noted. Photodocumentation of covertypes, habitats, and other observations will be completed during the site visit. Records of documented fish and wildlife contamination and/or mortality potentially related to the sites will be obtained from appropriate sources such as USEPA, and the following NYSDEC offices: the

Wildlife Pathology Unit, the Environmental Disturbance Investigation Unit, the Toxic Substances Monitoring Program, the Department of Health, and the Regional Field Office.

4.1.4 Value of Fish and Wildlife Resources

A qualitative assessment of the habitat value of the area within a 0.5-mile radius the site will be conducted. The areas will be assessed for their ability to provide seasonal cover, bedding areas, breeding and roosting sites, and to meet food requirements, etc. Qualitative assessments of fish and wildlife species population densities and diversity supported by habitats within the 0.5-mile radius will also be included.

The value of fish and wildlife resources to humans will be assessed, for the area on-site, within 0.5 miles of the site, and for documented resources within 2 miles of the site and for those downstream of the site that may be affected by site-related contaminants. Human use of resources includes hunting, fishing, wildlife observation (*i.e.*, bird watching, photography), scientific study, agriculture, forestry, and other recreational and economic activities.

4.1.5 Applicable Fish and Wildlife Regulatory Criteria

Federal and NYS regulatory criteria and ecological screening values associated with the remediation of fish and wildlife resources will be identified and summarized. Contaminant-specific and site-specific criteria will be identified. Applicable criteria and screening values may include water quality standards/guidance values for the protection of aquatic life (6NYCRR Part 701, TOGS 1.1.1, USEPA 1991 Ambient Water Quality Criteria), sediment criteria developed by the NYSDEC Division of Fish and Wildlife (December 1989), USEPA Interim Sediment Quality Criteria (1988), and the NOAA Effects Range Concentrations for sediment (Long and Morgan, 1990). Site-specific regulations include the NYS Freshwater Wetlands Act and implementing regulations (Article 24 ECL, 6NYCRR Part 663 and 664), and the NYS laws and regulations regulating streams and navigable water bodies (Article 15 ECL, 6NYCRR Part 608), among others. Criteria for the regulation of maintenance of fish and wildlife resources for human use will also be identified, as applicable.

4.2 STEP II - CONTAMINANT-SPECIFIC IMPACT ANALYSIS

The development of the Contaminant-Specific Impact Analysis follows a stepwise progression. Step II consists of three steps of increasing complexity that assess the impacts of site-related contaminants to fish and wildlife resources. Each step relies on more specific information and fewer conservative assumptions in the analysis of impacts. If at the completion of any one step the analysis does not demonstrate a minimal impact on fish and wildlife resources, the collection of additional information may be required to complete the impact analysis. The level of effort proposed here will include only a Step IIA - Pathway Analysis) and Step IIB - Criteria-Specific Analysis. Step IIC - Analysis of Toxicological Effects is beyond the scope of this proposal.

4.2.1 Step IIA - Pathway Analysis

A pathway analysis will be conducted. Fish and wildlife resources, contaminants of concern, sources of contaminants, and potential pathways of contaminant migration and exposure will be identified. If no significant resources or potential pathways are present, impact on resources will be considered minimal. Demonstration of minimal impact using a pathway analysis will eliminate the need for additional analyses.

4.2.2 Step IIB - Criteria-Specific Analysis

If the presence of contaminated resources and pathways of migration from site-related contaminants are established, a criteria-specific analysis will be conducted. This analysis requires the use of numerical criteria for contaminants of concern associated with specific media and biota. Numerical data either directly available or derived according to methods established as part of the criteria (e.g. ARAs, SCGs, TBCs) will be used. Impact is assessed by comparing contaminant levels with numerical criteria. If contaminant levels are below criteria, impact on the resource is considered minimal and additional analysis is not required. If numerical criteria are exceeded or do not exist and cannot be developed through the application of methodology that is consistent with the criteria, an analysis of toxicological effects is required to demonstrate the degree of impact. If the need for a Step IIC - Analysis of Toxicological Effects is demonstrated upon completion of the preceding portions of this assessment, a scope of work will be prepared for this activity and submitted to the client for NYSDEC approval.

SECTION 5.0

5.0 PROCEDURES FOR FIELD CHANGES AND CORRECTIVE ACTION

5.1 FIELD CHANGES AND CORRECTIVE ACTION

The Project Manager or his/her designee is responsible for all site activities. The Project Manager may be required to modify site programs to accommodate site-specific needs or unforseeable events. When it becomes necessary to modify a program, the Field Operations Leader will notify the Project Manager of the anticipated change and implement these changes. The NYSDEC and ISC Properties will be notified. All field changes will be jointly approved by the Project Manager and the NYSDEC Project Manager prior to implementation If these changes are subsequently determined to be unacceptable, the actions taken during this period of deviation from the program will be evaluated for their significance.

The changes in the program are documented on a Field Change Request Form (FCR) which is signed by the initiator and Project Manager. A typical FCR form is shown on Figure 5-1. The FCRs for each change shall be numbered sequentially starting with the Number "1".

The Project Manager is responsible for the control, tracking and implementation of the identified changes. Completed FCRs are distributed to affected parties which will include, as a minimum, the NYSDEC and ISC Properties.

FIGURE 5-1

FWENC FIELD CHANGE REQUEST FORM
-TYPICAL-

Work Assignment No.	Work Charge	Field Charge No. Number

To ______________________________ Location ____________________ Date ________________

Description:

Recommended Disposition:

Field Operation Leader (Signature) Date

Disposition:

Site Manager Date

Distribution:	Regional Manager	Others as required	________________
	Quality Assurance Manager		________________
	Site Manager		________________
	Field Operations Leader		________________

SECTION 6.0

6.0 REFERENCES

NYSDEC, 1984. Use and Protection of Waters. Article 15 ECL. 6NYCRR Part 608. November 30, 1984.

NYSDEC, 1989. Sediment Criteria (Guidance). Division of Fish and Wildlife. December 1989.

NYSDEC, 1991a. Fish and Wildlife Impact Analysis for Inactive Hazardous Waste Sites. Division of Fish and Wildlife. June 18, 1991.

NYSDEC, 1991b. Ambient Water Quality Standards and Guidance Values. Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1. November 15, 1991.

NYSDEC, 1991c. Water Quality Regulations for Surface Waters and Groundwaters. 6NYCRR Parts 700-705. September 1, 1991.

SECTION 7.0

EBASCO SERVICES

HEALTH AND SAFETY PLAN
REMEDIAL INVESTIGATION

MAGNA METALS SITE
TOWN OF CORTLANDT
WESTCHESTER COUNTY, NEW YORK

April 1991

Prepared by:

Virginia Barnett

Virginia Barnett
Health & Safety Officer
Ebasco Services Incorporated

Approved by:

William Beckett

William Beckett
Manager of Health & Safety
Ebasco Services Incorporated

4471K

TABLE OF CONTENTS

SECTION I: APPROVALS

By their signature, the undersigned certify that this Health and Safety Plan will be utilized for the protection of the health and safety of personnel during field activities at the Lightron Project Site.

Health and Safety Officer Virginia Barnett	Virginia Barnett Signature	4/10/91 Date
Project Manager Les Skoski	Les Skoski Signature	4/11/91 Date
Health and Safety Manager William Beckett	William Beckett Signature	4/11/91 Date
Vice President EBASCO William Kitto	/W.K. Signature	4/11/91 Date

SECTION II: GENERAL

2.0 Project Information

This plan has been prepared in conformance with the Ebasco Health and Safety Program. It addresses all those activities associated with monitoring well installation, soil, sediment, surface water and leach pit sampling activities at the Magna Metals Site and will be implemented during site work. Compliance with this Health and Safety Plan (HASP)* is required of all workers and third parties who enter this site.**

SITE: Magna Metals/ISC Property
PLAN DATE: June 1991

SITE MANAGER	HEALTH AND SAFETY OFFICER	MANAGER OF HEALTH & SAFETY
Les Skoski	Virginia Barnett	William Beckett
(201) 460-6178	(201) 460-6297	(201) 460-6255

2.1 Emergency Phone Numbers

Town of Cortlandt Police	(914) 528-8071
Town of Cortlandt Fire	(914) 528-8026
N.Y. State Police, (Annsvil)	(914) 737-7171
Town of Cortland Ambulance	(914) 528-8026
Peekskill Community Hospital	(914) 737-9000
Phelps Memorial Hospital	(914) 631-5100
EPA National Response Center	(800) 424-8802
Poison Control Center (Nyack Hospital)	(914) 353-1000
NYSDEC (Molly Gallagher)	(914) 255-5453
Westchester County Dept. of Health (Natasha Court)	(914) 285-5053
NYS Dept of Health (Joe Crua)	(518) 458-6310
Division of Environmental Enforcement (Alice McCarthy)	(914) 761-3575

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* This plan is an intermediate step which addresses the specific requirements of site reconnaissance as well as generally addressing work activities. The content of the HASP may change or undergo revision based upon results of reconnaissance/survey operations or upon additional information made available when the specific work programs have been developed.

** Responsibility for adherence to the contents of this HASP shall be limited to Ebasco personnel, their contractors and subcontractors.

SECTION III: HEALTH AND SAFETY PERSONNEL

3.0 Health and Safety Personnel Designations

The following briefly describes the health and safety designations and general responsibilities which will be employed at the Magna Metals Site during monitoring well installations and sampling activities.

3.1 Health and Safety Officer (HSO)

The Ebasco HSO has the responsibility to develop and implement this site-specific Health and Safety Plan (HASP) in accordance with the Ebasco Corporate Health and Safety Program. The Ebasco HSO will execute appropriate monitoring techniques to ensure adequate protection for site personnel and conduct on-site inspections for safety and health hazards. The Ebasco HSO will investigate all accidents and incidents occurring on this site and will conduct safety briefings and site-specific training for all on-site personnel. The Ebasco HSO will accompany all EPA, OSHA, NYSDEC and other government agency representatives visiting the site in response to health and safety issues. The Ebasco HSO is responsible for modifying and/or developing new procedures, after consultation with the Ebasco Health & Safety Manager, when site or environmental conditions change or new operations are conducted.

The Ebasco HSO has stop-work authorization if an imminent hazard or potentially dangerous situation exists during the course of on-going site activities. Authorization to again proceed with work will be verified by the Ebasco Health & Safety Manager. The Ebasco HSO will be responsible for implementing evacuation procedures, including the shutting down of appropriate equipment, removing equipment from downrange areas and coordinating emergency services on-site.

SECTION III: HEALTH AND SAFETY PERSONNEL

3.2 Health & Safety Manager (HSM)

The Ebasco HSM has primary responsibility for ensuring that the policies and procedures of this HASP are implemented by the Ebasco HSO. The Ebasco HSM ensures that all personnel designated to work at the Magna Metals Site are qualified according to Ebasco Medical Surveillance and Health and Safety training requirements. The Ebasco HSM is responsible for authorizing the appropriate monitoring, safety equipment and other resources necessary in implementing the Magna Metals Site HASP.

The Ebasco HSM or his designee will be contacted immediately after a stop-work order is issued by the Ebasco HSO. The HASP and significant changes to the HASP must be approved by the Ebasco HSM. The Ebasco HSM has the authority to resolve outstanding H&S issues that arise during site operations.

3.3 Site Manager (SM)

The SM has the responsibility for the safe conduct of operations and use of equipment during field work. He has direct responsibility for the safety of Ebasco personnel on-site and for the safe conduct of Ebasco subcontractors on-site as contract terms dictate. The SM shall assure that an HSO or designated HSO is on-site when Ebasco personnel or subcontractors are on site, and that the CHSS has approved the HSO or designee. The SM shall inform the HSO prior to changes or additions to the plan of work addressed in this HASP.

The SM or his on-site designee and the Field Operations Lead (FOL), shall direct field operations, equipment use and personnel actions so that they comply with this Health and Safety Plan and all applicable government regulations.

3.4 Personnel

Ebasco personnel and sub-contractor personnel on-site shall be familiar with their specific task requirements prior to the startup of field work. Responsibility on-site shall include knowledge of equipment and safety practices, the buddy system/line-of sight and hand signals, emergency procedures and responsibilities, HASP requirements and decontamination procedures for job-specific tasks.

In addition, it is the responsibility of all on-site personnel to discuss their health and safety concerns at safety briefings and report all violations, near misses and incidents to the HSO and FOL as soon as possible following the occurrence.

SECTION IV: SITE LOCATION

4.1 Location and Physical Description

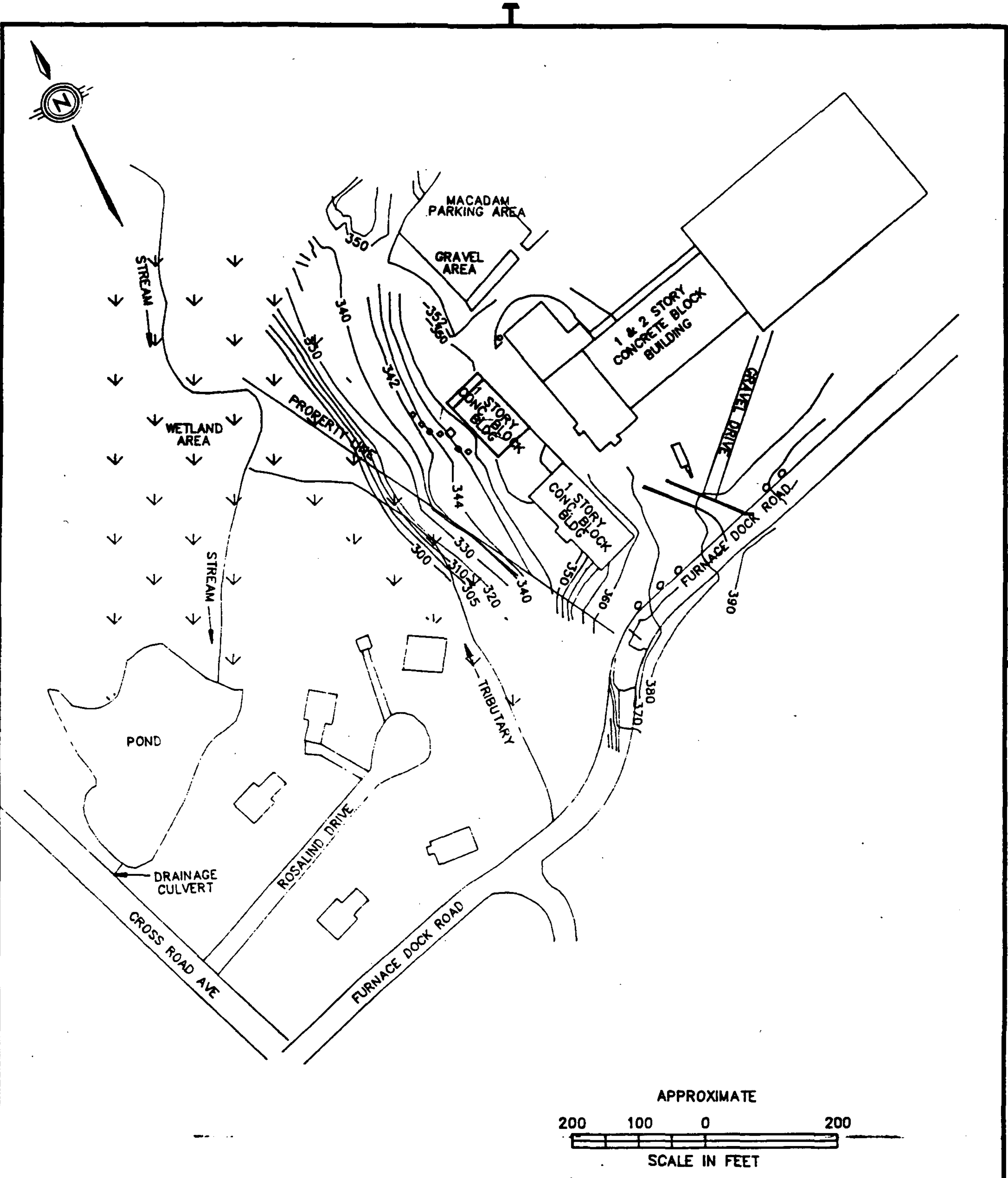
The proposed area of investigation at the Magna Metals Site encompasses approximately 15 acres, located in the Town of Cortlandt, Westchester County, New York. The site is bounded on the east by Furnace Dock Road and on the north by Croton Avenue. The south side of the property contains a wooded and brambled area and has an approximate 15-20' vertical dropoff that slowly levels out to an area of distressed vegetation, including dead trees and a marsh area. Approximately 12 private homes occupy the area at the foot of this slope. An undisturbed wooded area that also includes Furnace Brook, bounds the west side of the site. Exhibit 4-1.

The main part of the site contains several buildings, some paved and grassy areas, in addition to 9 (inactive) leach pits and 2 septic tanks.

Indian Point is located nearby, approximately 2 miles southwest of the City of Peekskill

4.2 History

The property in question was previously owned by ISC Properties, Inc. Plating operations were conducted through June 1979. Process waste from the plant was disposed of in nine leaching pits located on the property. The site had been identified by NYSDEC as an inactive hazardous waste disposal site under the provisions of the New York Environmental Conservation Law. Under a 1982 Consent Order, ISC Properties conducted a field investigation program to assess the heavy metals concentrations in the leaching pits on the property. During 1983, NYSDEC conducted additional investigations on the property and in Furnace Brook immediately to the west of the property. The results of this survey indicated the presence of trichloroethylene on-site and in Furnace Brook downstream from the site. Additional sampling in 1984 verified the presence of concentrations of solvents on-site and on the adjacent property downstream from the site. These solvents included trichloroethylene, acetone, trans-1,2-dichloroethane, xylenes and ethylbenzene. NYSDEC considered that the elevated concentration of solvents may have potentially posed a significant threat to the environment. A full-scale investigation was suggested at that time in order to assess the nature and extent of the wastes disposed of at the site, the transport or migration of the materials on and off site and evaluation of the environmental impacts of the contaminants.



*6 PITS LOCATED AS OF 3/28/91

EBASCO SERVICES INCORPORATED

DEPT 940 DR J.R.
DATE ____ CH ____
SCALE 1"=200'

APPROVED

U.S. ENVIRONMENTAL PROTECTION AGENCY

LIGHTRON SITE

SITE MAP
COMPOSITE NYDEC AND EBASCO

LIGH
2501.001

EXHIBIT 4-1

00

2.DWG 8.5X11

SECTION V: WASTE DESCRIPTION/CHARACTERIZATION

5.1 General

The following information is presented in order to describe the contaminants to be potentially encountered at the Magna Metals Site. The detailed information on this material was obtained from NIOSH/OSHA Occupational Health Guidance for Chemical Hazards; TLV Values and Biological Indices 1990-1991; SAX-Dangerous Properties of Industrial Materials.

5.2 Chemical Data Sheets

Appendix A includes Chemical Data Sheets for the compounds listed below; providing information such as the chemical characteristics, health hazards, protection and exposure limits.

vinyl chloride
trans-1,2-dichloroethene
trichloroethene
total xylenes
ethylbenzene
nitric acid[1]
acetone [1,2]

---

[1] Used as decontamination solutions
[2] Potential contaminant

5.3 Waste Types: Liquid X Solid ____ Gas ____
Sludge X Semi-solid ____ Other ____

5.4 Characteristics: Corrosive X Flammable X
Explosive X Volatile X
Radioactive ____ Inert ____
Toxic X

SECTION V: WASTE DESCRIPTION/CHARACTERIZATION

5.5 Containment:	Pit X	Pond _____	Lagoon _____
	Lake _____	Process Vessel _____	
	Tank _____	Piping _____	Drum _____
	Sediments X		Groundwater X
	Soil X		Storage Tanks __
			Septic Tank X

SECTION VI: HAZARD ASSESSMENT

The previous round of sampling at the Magna Metals Site was in May 1984 (NYSDEC). At that time, sludge, sediment and surface water samples were taken on and off-site (the Furnace Brook/tributary, the septic tanks and the leach pits). Analyses revealed trace metals in surface water and sediment samples below detection or at background levels for 12 of the 13 priority pollutant metals. Sludge samples from 2 of the leach pits contained some inorganics, but although EP Tox results determined concentrations below detection limits. Cyanide was found in one sludge sample at Leach Pit #1. Analysis of volatile organics indicated elevated (TCE) levels in a septic tank, 1 leach pit, sediment and sludge samples. Brook sediment contained elevated levels of acetone and trans-1,2-dichloroethene and sludge samples in 2 leach pits contained xylenes and ethylbenzene.

Sample analyses also indicated the presence of vinyl chloride in the sludge sample (2700 ug/kg) at Leach Pit #4. This contaminant was not found in any other samples taken. Vinyl chloride is a carcinogen (OSHA), 29 CFR 1910.1017, with a permissible exposure limit of 1 ppm (TWA) and an action level of 0.5 ppm. Although vinyl chloride is not used as a degreasing agent, this contaminant is a possible breakdown product of chlorinated solvents. As a precautionary measure, in addition to real-time organic vapor monitoring (FID/PID) and prior to sampling, the Health and Safety Officer, in Level C respiratory protection, will initially screen for the presence of vinyl chloride as an airborne contaminant by use of detector tubes. In addition, there will be continuous organic vapor monitoring during sampling activities at the leach pits, together with on-going use of the detector tubes.

Laboratory analyses of samples taken by the NYSDEC in May 1984 did not include field or trip blanks nor was the data validated.

Because of the seven year elapsed time since last sampling at the site, the (potential) presence, migration and transport pattern of contaminants is unknown. Although the planned field investigation will initially begin in Level D for all activities, provision has been made to upgrade to Level C if levels recorded on the FID and/or PID approach action levels (Section 9.2).

NIOSH has identified trichloroethene (TCE) as an occupational carcinogen although OSHA has not identified this compound as such. However, TCE does have the lowest TLV (50 ppm) of the contaminants identified during the May 1984 sampling* (Appendix A). Therefore, a conservative approach for upgrading action levels will be taken. For the duration of this initial phase of investigative activities, the action level for upgrading to Level C respiratory protection will be 1/2 the TLV for trichloroethene, i.e., 25 ppm 15 minute duration (TWA) above background in the breathing zone (BZ). Decision for upgrading or downgrading levels of respiratory protection will be made by the Field HSO.

Although several physical hazards are anticipated including use of heavy moving equipment, hazards will mainly consist of 'slip-trip' due to the generally uneven sloping terrain characteristic of this site. The thick brambles are expected to be removed prior to startup of site activities by an outside contractor. However, hidden boulders, debris, tree roots and tree stumps may be present in addition to the approximately 9 (inactive) leach pits and 2 septic tanks. Extreme caution, awareness of the area and use of hard hats and steel-toe/steel shank field shoes, the buddy system and line-of-sight will be mandatory at all times.

Because field activities are expected during the warm weather months in (potentially) wooded areas, the tic carrying Lyme Disease may present a problem. Field personnel will wear long sleeves, protective gloves and pants shall be tucked inside socks at all times when on-site. A tic spray will also be used for protection. Awareness by the field team for each other should eliminate the risk of tic bite.

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* Excluding the (potential) presence of vinyl chloride from 1 leach pit sample.

SECTION VII: TRAINING AND MEDICAL SURVEILLANCE REQUIREMENTS

7.0 Fundamental H&S Training Required

All employees who are scheduled to perform field work at the Lightron Project Site are required to complete the basic EBASCO Hazardous Waste Training Program or its equivalent. This training will include instruction and practice in using protective clothing, air purifying respirators, self-contained breathing apparatus (SCBA), supplied air systems, air tank change operations and decontamination procedures specific for each level of protection. This 40-hour course includes classroom instruction in physical and chemical properties of hazardous materials, toxicology, hazard control, site safety, fire protection, confined space entry, instrumentation and heat stress.

Personnel whose activities are limited solely to the support zone may be waived from this training requirement. Such a waiver must be determined by the HSM.

7.1 Site-Specific Training

On-site training will be conducted on this HASP regarding construction activities, procedures, monitoring and equipment for the site operations. This training will include reviewing site and facility layout, hazards and emergency services at the site and procedures contained within this HASP. This training will ensure field personnel understand their responsibilities regarding safety for their particular activity.

7.2 Safety Briefings

Project personnel will be given briefings by the Site H&S Officer as needed prior to start-up of work, when new operations are to be conducted, if changes in work practices must be implemented due to newly available information, or if site or environmental conditions change. Briefings will also be given to facilitate conformance with prescribed safety practices, when conformance with these practices is not being met, or if deficiencies have been identified during safety audits.

7.3 First Aid and CPR

The HSO will identify those individuals possessing this training in order to ensure emergency treatment is available at field activities. It is expected that at least one field team member will have First Aid training and CPR training. These certifications will be consistent with the requirements of the American Red Cross Association.

7.4 Medical Surveillance

All personnel and subcontractors who will be performing field work at the Magna Metals Site will be required to have passed a medical surveillance examination or equivalent within one year prior to reporting to the site. This physical examination shall include tests to ensure the person qualified to wear respiratory protection. A copy of the Physician's Statement and Disclosure Agreement must be sent to Ebasco's Health and Safety Manager. Other tests in the examination include CBC, a SMAC Profile, EKG, periodic chest X-rays (3-5 years), urinalysis, GGTP, audiometry and visual acuity.

Additional medical testing may be required if an overt exposure occurs, or if other site conditions warrant further medial surveillance.

A Medical Data Sheet (Section XVI) will be completed by all on-site personnel upon initial entry to the site. This form does not substitute for the medical exam requirements.

SECTION VIII: ZONES, PERSONNEL PROTECTION AND COMMUNICATIONS

8.0 Site Zonation

Ebasco employs a three zone approach to site operations to control the potential spread of contamination from the site. The three zones include the Exclusion Zone, the Contamination Reduction Zone (CRZ) and the Support Zone.

8.0.1 Exclusion Zone

The areas that contain, or is suspect of containing, hazardous materials will be considered the Exclusion Zone. This zone is to be clearly flagged and delineated by a "Hotline." The HSO may also establish more than one restricted area within the Exclusion Zone. No personnel are allowed in the Exclusion Zone without: 1) a buddy, 2) the proper personal protective equipment, 3) medical authorization and 4) training certification.

If a work area is expected to encroach upon private property, prior notification and signed consent by the homeowner(s) for the proposed monitoring well and sampling activities shall be made.

8.0.2 Contamination Reduction Zone

A Contamination Reduction Zone (CRZ) will be established between the Exclusion Zone and the Support Zone. The CRZ will contain the contamination reduction corridor (CRC) and will provide for full personnel and portable equipment decontamination. The CRZ is to be used for general site entry and egress in addition to access for heavy equipment and for investigation activities. The CRZ will also contain appropriate safety and emergency equipment such as an emergency eyewash, fire extinguisher, stretcher and first aid kit.

8.0.3 Support Zone

The Support Zone is considered the uncontaminated area and will be separated from the CRZ by the "Contamination Control Line." It will contain the Command Post which will provide for team communications and emergency response. Appropriate sanitary facilities, safety and support equipment will be located in this zone. The majority of site operations will be controlled from this location as well as site access of authorized persons. The Command Post shall be located upwind of site operations, if possible, and could be used as a potential evacuation point. No potentially contaminated personnel or materials will be allowed in this zone unless appropriately decontaminated. Meteorological conditions should be observed and noted from this zone, as well as those factors pertinent to heat stress.

8.1 Personnel Protection

8.1.1 General

Because engineering controls are not feasible at each work location, personnel protective equipment (PPE) will be employed for worker protection. The level of protection to be worn by field personnel will be defined and controlled by the site Health and Safety Officer. Basic levels of protection for general operations are provided below and are defined in this section. Where more than one level is indicated, further definition will be provided by review of site hazards, conditions, proposed activities and monitoring at each work location. It should be noted that levels of protection may be upgraded or downgraded, as conditions warrant.

SECTION VIII: ZONES PERSONNEL PROTECTION COMMUNICATIONS

8.1.2 Site Evaluation

Prior to initial entry, the site is to be evaluated using all background information/data available to determine the level(s) of protection necessary and any special equipment or procedures necessary. Factors to be considered in this evaluative process include site history, location, topography, potential contaminants, planned activities and weather.

Task	Levels of Protection	
	Respiratory	PPE
Surveying	D	D
Monitoring Well Installation	D/C	D
Sampling Activities		
Groundwater	D/C	D/C
Sediment	D/C	D/C
Soil	D/C	D/C
Sludge	D/C	C
Decontamination		
Personnel	D	D
Equipment	D	D/C

8.1.4 Initial Levels of Protection

A Health and Safety Survey will be conducted prior to start up of on-site activities to allow for the selection of appropriate levels of protection, decontamination procedures, site layout, sampling strategies and general safety planning. It should be noted that this Health and Safety Plan (HASP) allows for upgrading or downgrading of levels of protection according to operational and environmental conditions. During the Health and Safety Survey, the following tasks will be performed: 1) monitoring of the ambient environment using an FID and/or PID in order to identify the presence of potential contaminants and 2) visual assessment of the integrity and safety of the site for proposed activities:

8.1.4 Personnel Protective Equipment

The following describes the equipment necessary for the levels of protection indicated. For specific site conditions or work tasks, modifications or alterations for each level may be necessary and these changes will be implemented by the EBASCO HSO.

A) Respiratory Protection

1) Level C - Full Face Air Purifying respirator with combination Dust Filter (HEPA) and organic vapor cartridge.
2) Level D - No respirator will be worn. Certain operations may require a face shield, or a respirator be carried by personnel.

B) Personnel Protective Equipment (PPE)

1) Levels C:

- Chemical protective suit (e.g., polycoated TYVEK);
- Coveralls;
- Gloves, inner (surgical type);
- Gloves, outer (chemical protective);
- Boots (chemical protective, steel toe/steel shank);
- Nuke Booties; and
- Hard hat.

2) Level D:

- Coveralls;
- Gloves (chemical resistant);
- Boots/shoes (chemical protective, steel toe/steel shank);
- Safety glasses;
- Face shield (optional)
- Nuke Booties (optional); and
- Hard hat.

8.2 Safety Equipment

Basic emergency and first aid equipment will be available at the Support Zone and/or the CRC. It will include communications such as an intrinsically safe 2-way radio, first aid kit, emergency eyewash, fire extinguishers and other safety-related equipment.

8.3 Communications

- Walkie-Talkies - Hand held units may be utilized by field teams for communication between downrange operations and the Command Post base-station.
- Telephones - A mobile telephone may be located in the Support Zone for communication with emergency support services or the nearest public phones will be identified if one is not available in the Support Zone.
- Air horns - These may be carried by downrange field teams and maintained in the Support Zone and used for initiation of emergency evacuation procedures (see Section XIV) and backup for other forms of communications.
- Hand signals - To be employed by the downrange field team while utilizing the buddy system. These signals are very important and will become familiar to all members of the field team before field activities begin.

SECTION VIII: ZONES, PERSONNEL PROTECTION, COMMUNICATIONS

Signal	Meaning
o Hand gripping throat	Out of air; can't breathe
o Grip partner's wrist	Leave area immediately; no debate
o Hands on top of head	Need assistance
o Thumbs up	OK; I'm all right; I understand
o Thumbs down	No; negative

Signs - Danger signs will be used where an immediate hazard exists. Caution signs will be used to warn against potential hazards and to caution against unsafe practices. Barricades will be used as needed.

SECTION IX: MONITORING PROCEDURES FOR SITE OPERATIONS

9.0 Monitoring During Site Operations

On-site monitoring serves in order to assist to establish and reaffirm levels of protection, and identify hazards to identify the areas of contamination.

9.1 Sampling/Drilling Operations

Monitoring will be performed continuously by the Site Health & Safety Officer or designee during all field operations. A photoionization detector (PID) and/or flame ionization detector (FID) will be utilized to monitor the breathing zone (BZ), boreholes and geological samples upon their retrieval. Drill cuttings will also be monitored. A combustible gas indicator (CGI) with oxygen alarm will be used to monitor for the presence of combustible gases at the point of operation and in the general work area. A dust suppressant shall be used during drilling operations as needed.

9.2 Action Levels

Instrument	Action Levels	Level of Protection
PID/FID*	0-25 ppm 15 minute duration (TWA) above Bkg in Breathing Zone	Level D
PID/FID*	25-50 ppm 15 minute duration (TWA) above Bkg in Breathing Zone	Level C
PID/FID*	>50 ppm 15 minute duration (TWA) above Bkg in Breathing Zone	Withdraw from area, allow to vent

---

* For the FID, concentrations expressed are the "methane equivalent." For the PID, concentrations expressed are the "benzene equivalent."

SECTION IX: MONITORING PROCEDURES FOR SITE OPERATIONS

Instrument	Within the Borehole	Action
CGI	0-25% LEL	Proceed normally
CGI	25-50% LEL	Proceed, Continuous Monitoring
CGI	50% LEL	Stop work, allow to vent

Instrument	General Work Area	Action
CGI	<10% LEL	Continue monitoring with caution.
CGI	10-20% LEL	Continue monitoring, but with extreme caution, if higher levels are encountered.
CGI	≥20% LEL	Evacuate area immediately

SECTION X: SAFETY CONSIDERATIONS FOR SITE OPERATIONS

10.0 GENERAL

All drilling and sampling activities will be performed under the level of protection described in Section VIII assigned by the HSO. The level of protection will be established by review of facility history, available data and by the results of the health and safety monitoring performed at each task location.

10.1 General Safety Considerations Operations

During field activities, the following procedures shall be strictly adhered to by personnel:

- The buddy system shall be used at all times when on site.
- Contamination avoidance shall be practiced by all field personnel.
- If field personnel perceive an unsafe condition or situation, the HSO and FOL shall be notified immediately.
- All activities will be planned and discussed with field personnel prior to the startup of operations.

10.2 Hand Auger Sampling

Prior to beginning sampling activities, an exclusion zone shall be established around each proposed location. Background readings shall be taken with a PID and/or FID. Personnel within the exclusion zone shall be dressed in the level of protection adequate for the potential hazards that may be present. Refer to Sections 8.1.2. During sampling operations, continuous monitoring shall be conducted using a PID and/or FID to monitor organic vapor concentrations in the breathing zone and on sampled materials. In addition, a combustible gas indicator with oxygen alarm shall be used.

10.3 Monitoring Well Installation

The Ebasco Health and Safety Officer will be present on-site during well installation and shall provide all monitoring and health and safety support in order to ensure the adequacy of protective equipment and safety procedures.

The proximity of water, sewer and electrical lines will be identified prior to subsurface activity. The possibility for the presence of underground conduits or vessels containing materials under pressure will also be investigated before attempting any intrusive operation.

The location of safety equipment and evacuation procedures will be established prior to initiation of operations. Use of protective clothing especially hard hats and boots will be required during all heavy equipment operations.

During drilling, continuous monitoring shall be conducted using a PID and/or FID to monitor of the borehole, breathing zone, drill cuttings and all samples upon retrieval. A combustible gas indicator with oxygen alarm shall also be used. In addition, a dust suppressant will be used as needed.

10.4 Sampling Handling

Personnel responsible for the taking and handling of samples shall wear the designated level of protection. Samples should be identified as to their hazard and packaged as to prevent spillage or breakage. Any unusual sample conditions should be noted. Lab personnel should be advised of sample hazard level and the potential contaminants present. This is to be accomplished when necessary by a phone call to lab coordinator and/or including a written statement included with the samples.

SECTION XI: DECONTAMINATION

11.0 CONTAMINATION PREVENTION

One of the most important aspects of decontamination is the prevention of contamination. Good contamination prevention should minimize worker exposure and help ensure valid sample results by precluding cross-contamination. Procedures for contamination avoidance include:

Personnel

- Do not walk through areas of obvious or known contamination.
- Do not handle or touch contaminated materials directly.
- Make sure all PPE has no cuts or tears prior to donning.
- Fasten all closures on suits, covering with tape if necessary.
- Particular care should be taken to protect any skin injuries.
- Stay upwind of airborne contaminants.
- Do not carry cigarettes, gum or drinks into contaminated areas.

Sampling/Monitoring

- Cover instruments with clear plastic, leaving openings for sampling ports, sensor points.

- Sample containers shall be bagged after filling with sample material.

Heavy Equipment

- Care should be taken to limit the area a piece of equipment comes in contact with, after it comes in contact with potential contamination.

- If contaminated tools are to be placed on non-contaminated equipment for transport to the decon pad, plastic should be used to keep the equipment clean.

- Spoils from excavation work should be placed so as not to be in the expected paths of travel.

- Drilling cuttings should be kept shoveled up within a limited area , out of the way of personnel. Liquids generated during drilling should be contained out of the way to limit the amount of mud created around the rig.

11.1 DECONTAMINATION PROCEDURES

All personnel and equipment exiting the exclusion zone shall be thoroughly decontaminated. Figures 11-1 and 11-2 should be used to illustrate the decontamination procedures for personnel and portable equipment for the various protection levels. Heavy equipment may become contaminated and will have prescribed decontamination procedures to prevent hazardous materials from leaving the site. They may include excavating a shallow pit to collect waste cleaning solution and screens, set up if required, to prevent the spread of air contaminants. The pit will be cleaned, wastes disposed of, filled in, and covered with clean soil when its use is terminated. The surface area of the pit shall be sufficient to accommodate the washwater generated by the largest piece of machinery. Equipment needed may include a steam generator with high pressure water, empty containers, screens, screen support structures, pit liner, sump pump, and shovels.

EXHIBIT 11-1

LEVEL D DECONTAMINATION PROCEDURES

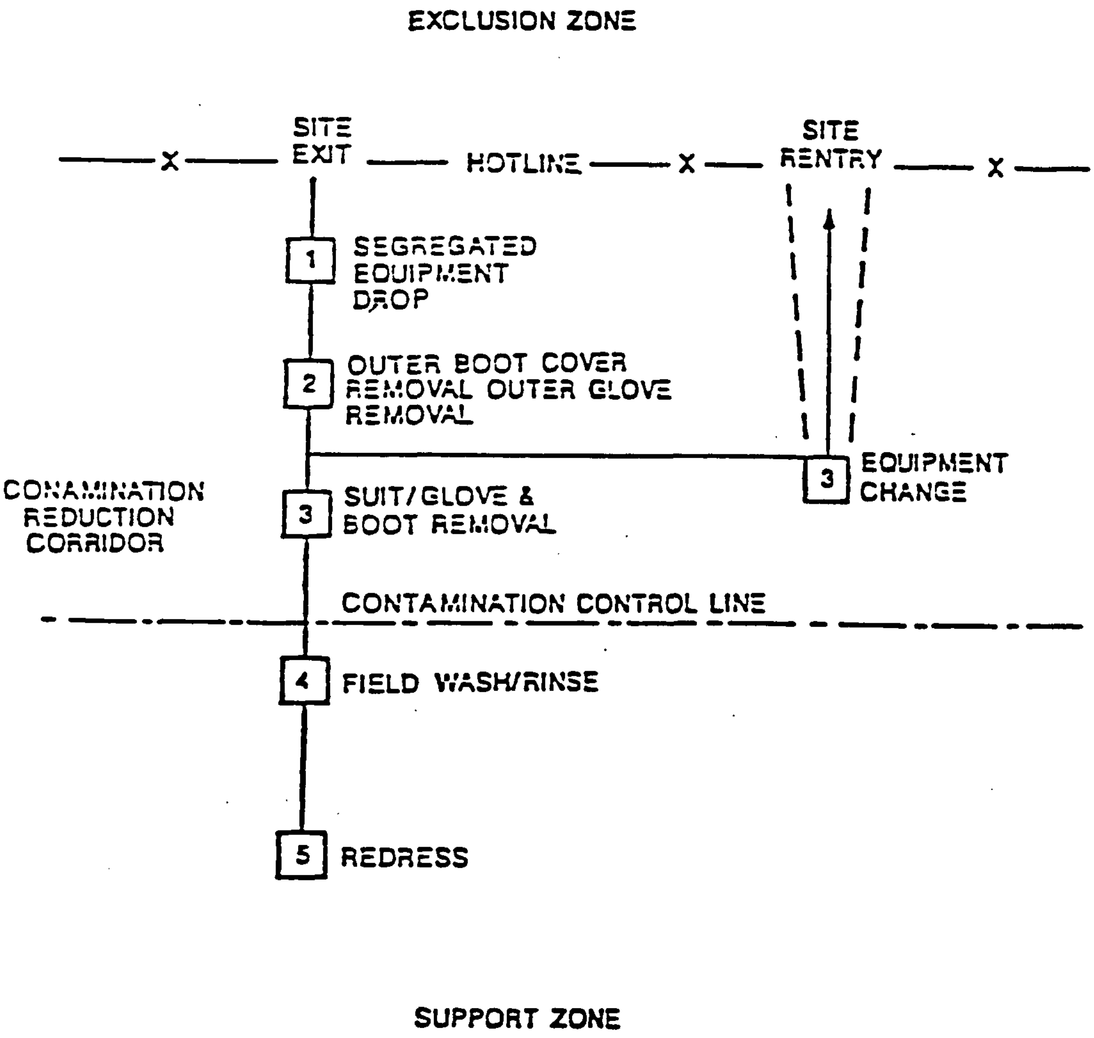
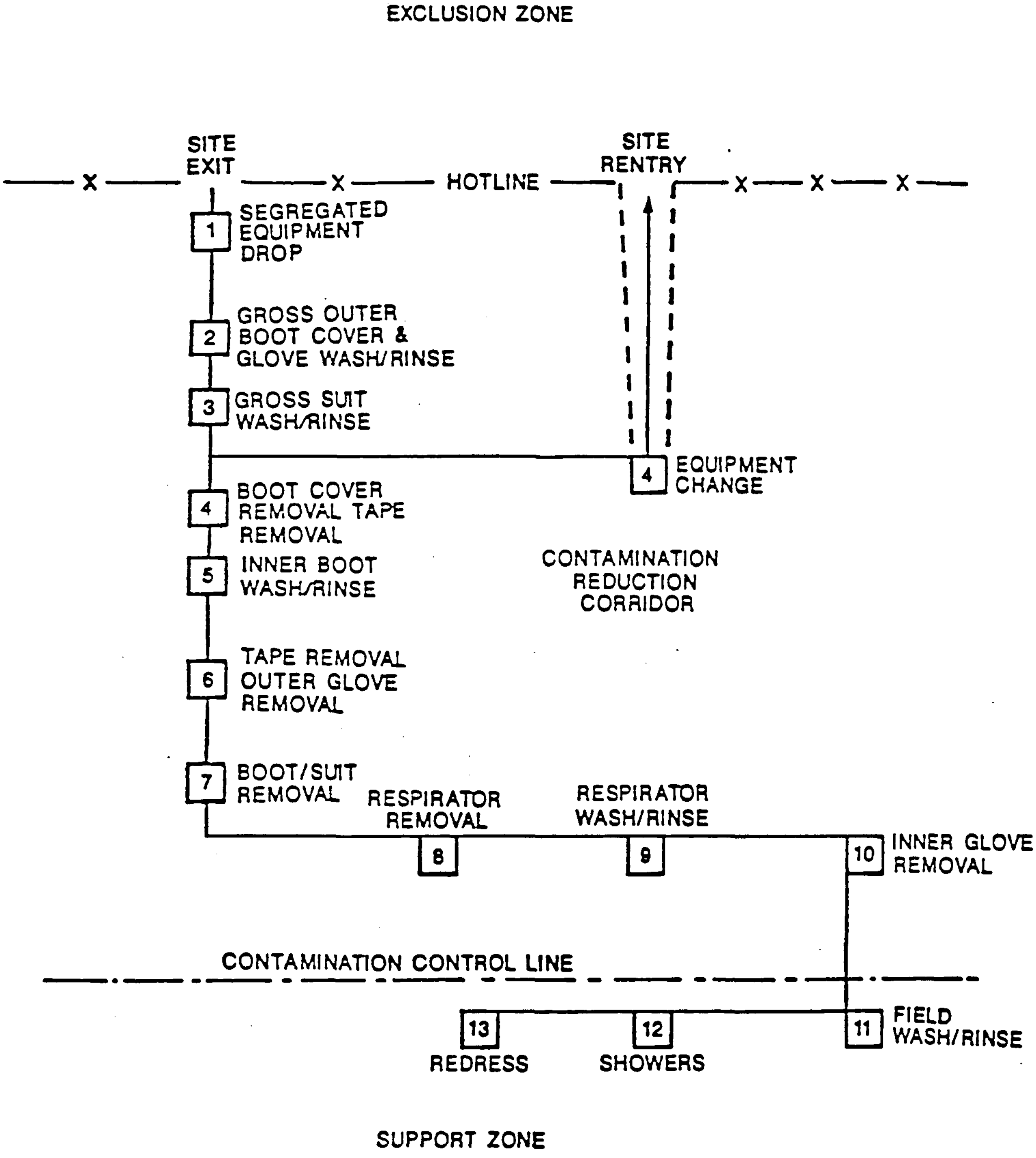


EXHIBIT 11-2

LEVEL C DECONTAMINATION PROCEDURES



SECTION XI: DECONTAMINATION

11.2 PERSONNEL DECONTAMINATION

All personnel and equipment exiting the exclusion zone must be thoroughly decontaminated.

Personnel decontamination will consist of:

- Gross boot and glove wash and rinse, suit wash (where appropriate);
- Tape removal (where appropriate);
- Outer glove removal;
- Boot removal;
- Suit removal (where appropriate);
- Respirator/hard hat removal (where appropriate);
- Respirator wash (where appropriate);
- Inner glove wash/rinse/removal;
- Inner clothing removal; and
- Field wash and redress.

11.3 EQUIPMENT DECONTAMINATION

Heavy equipment such as the drill rig will be high pressure washed or steam cleaned prior to proceeding to the next location. Care and effort will be taken to minimize spread of contamination, either airborne or from wash water, between monitoring well locations. Heavy equipment decontamination will be accomplished at the excavation location if practical. In the event a central heavy equipment decontamination area has to be set up, standard procedures of drainage control will be used to minimize spread of contamination.

SECTION XI: DECONTAMINATION

Sampling equipment shall be decontaminated in accordance with procedures outlined in the Field Sampling Plan. All boots and gloves will be deconned using alconox and water solution and scrub brushes or simple removal and disposal. When Level C protection has been used, the protective suit will be subject to a gross wash and rinse using a spray applied soap and water solution or simple removal and disposal. Respirators will be decontaminated and sanitized daily.

All drums generated as a result of decontamination drilling or well development activities will be stored at a designated secured area at the Lightron Project Site until the materials can be disposed of permanently in accordance with Federal Regulations.

All nonexpendable sampling equipment will be decontaminated following the procedures identified in the Field Sampling Plan. This usually entails the use of alconox, solvent and distilled/deionized water rinses to eliminate contaminants. The solvent rinse will be segregated from the water rinse.

11.4 ADDITIONAL PROCEDURES

Site personnel will be responsible for assuring all sampling equipment, heavy equipment, and personnel are properly decontaminated. This will be verified by the HSO. Sample decontamination will be the responsibility of the sampler indicated on the Chain-of-Custody form.

- Sampling equipment will be brushed clean and rinsed with distilled water or other appropriate cleaning material.
- Heavy equipment will be high pressure washed at a predetermined location on-site.
- Samples will be dry wiped prior to packaging.

SECTION XI: DECONTAMINATION

- Monitoring equipment will be wiped down.

- Vehicles used downrange which are contaminated with native soil will be cleaned prior to leaving the site. The wheel wells, tires, and sides of vehicles, will be high pressure washed at a location on-site to be determined by the HSO.

- Spent decon solutions may be required to be drummed and disposed of as hazardous waste and solvent solutions used in the decontamination process will be segregated from water rinses.

- Decontamination will be performed in a manner to minimize the amount of waste generated.

SECTION XII: ADDITIONAL WORK PRACTICES

Refer to the site Health & Safety Officer for specific concerns regarding individual site tasks.

- Do not climb over obstacles.
- Always use the buddy system.
- Practice contamination avoidance both on and off-site.
- Plan activities ahead of time.
- Apply immediate first aid to any and all cuts, scratches and abrasions.
- Report all accidents, no matter how minor, immediately to the HSO.
- Be alert to your own physical condition. Watch your buddy for signs of fatigue and/or exposure.
- Initiate a work/rest regime if ambient temperatures and protective clothing create a potential heat stress situation.
- Do not proceed with work unless adequate natural light exists and appropriate supervision is present.
- Safety briefings will be held prior to the onset of field operations activities and regularly during the progress of site activities.

SECTION XIII: DISPOSAL PROCEDURES

All discarded materials, waste materials or other objects will be handled in such a way as to preclude the potential for spreading contamination, creating a sanitary hazard or allowing litter to be left on-site. All potentially contaminated disposable materials, e.g. nuke boots, gloves, tyvek, will be double-bagged, drummed, labeled and segregated in a designated and secured area on-site for future disposal. All contaminated waste materials will be disposed of consistent with regulatory provisions. All non-contaminated materials will be collected and bagged for appropriate disposal as normal domestic waste.

SECTION XIV: EMERGENCY/CONTINGENCY PROCEDURES

14.0 Emergency Procedures

As a result of the potential hazards at the site and the conditions under which operations are conducted, there is potential for an emergency situation to develop. An emergency contingency plan is to be implemented at all EBASCO Hazardous Waste Sites.

14.1 The Site Emergency Coordinator Is: Les Skoski
The Site Health & Safety Officer is: Virginia Barnett

The emergency coordinator shall implement the contingency plan if conditions at the site warrant such action. The emergency coordinator and HSO will be responsible for ensuring a safe evacuation, emergency treatment and transport of site personnel to the designated medical facility. In addition, they will notify the appropriate emergency response units and Management staff.

14.2 Evacuation

In the event of an emergency situation, an air horn or other appropriate device will be sounded for approximately 10 seconds indicating the initiation of evacuation procedures. Communication by walkie-talkies or hand signals may suffice. All personnel in both the restricted and nonrestricted areas will evacuate and assemble near the Support Zone or other safe area as identified by the Site H&S Officer. The location shall be upwind of the source. The Site HSO or his/her designee, will have authority to initiate proper action if outside services are required. Under no circumstances will non-emergency response personnel be allowed to proceed into the area once the emergency signal has been given.

SECTION XIV: EMERGENCY/CONTINGENCY PROCEDURES

The Site Health & Safety Officer or designee must ensure that access for emergency equipment is provided and that all moving equipment has been shut down and secured once the alarm has been sounded. As the safety of all personnel is being established, emergency response groups will be notified by telephone of the emergency.

Fire Dept.	(914) 528-8026
Police Dept.	(914) 528-8071
NYDEC	(914) 255-5453
NYS Dept. of Health	(518) 458-6310

14.3 Personnel Injury

Emergency first aid will be applied on-site and transport of the individual to the designated facility will be made as needed. The Site Health & Safety Officer will supply medical data sheets to appropriate medical personnel and he/she shall complete an incident report as soon as possible following the incident. Selected emergency response and medical personnel will to be notified prior to the startup of site activities of the work to be conducted on-site and the potential hazards that may be encountered by field personnel during well installation and sampling activities.

Peekskill Community Hospital	(914) 737-9000
Phelps Memorial Hospital	(914) 631-5100
Rescue	(914) 528-8071

14.4 Hospital Routes (Figure 14-1, 14-2)

Primary Hospital

Peekskill Community Hospital

From site, make left turn onto Furnace Dock Rd. Bear left at Croton Ave. to Crompond Rd. Make left turn onto Crompond Rd. (Rte 202). Peekskill Community Hospital is on right. Follow signs to Emergency Room.

Backup Hospital

Phelps Memorial (North Tarrytown)

From site, make right turn onto Furnace Dock Rd. to Rte 9 (South) make left turn onto Rte 9S to North Tarrytown. Hospital will be on the right. Follow signs to Emergency Room.

EXHIBIT 14-1
PRIMARY HOSPITAL ROUTE
PEEKSKILL COMMUNITY HOSPITAL

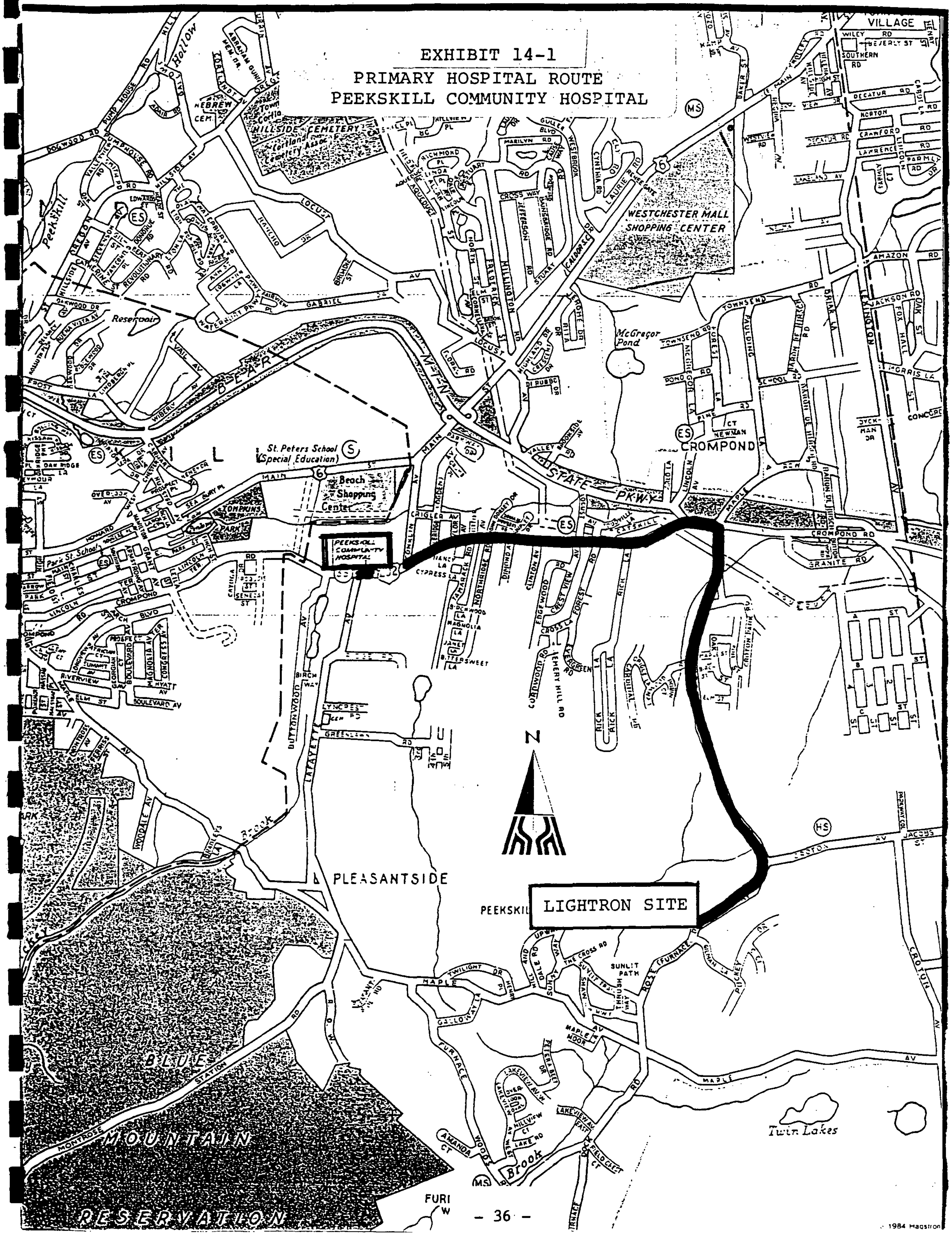
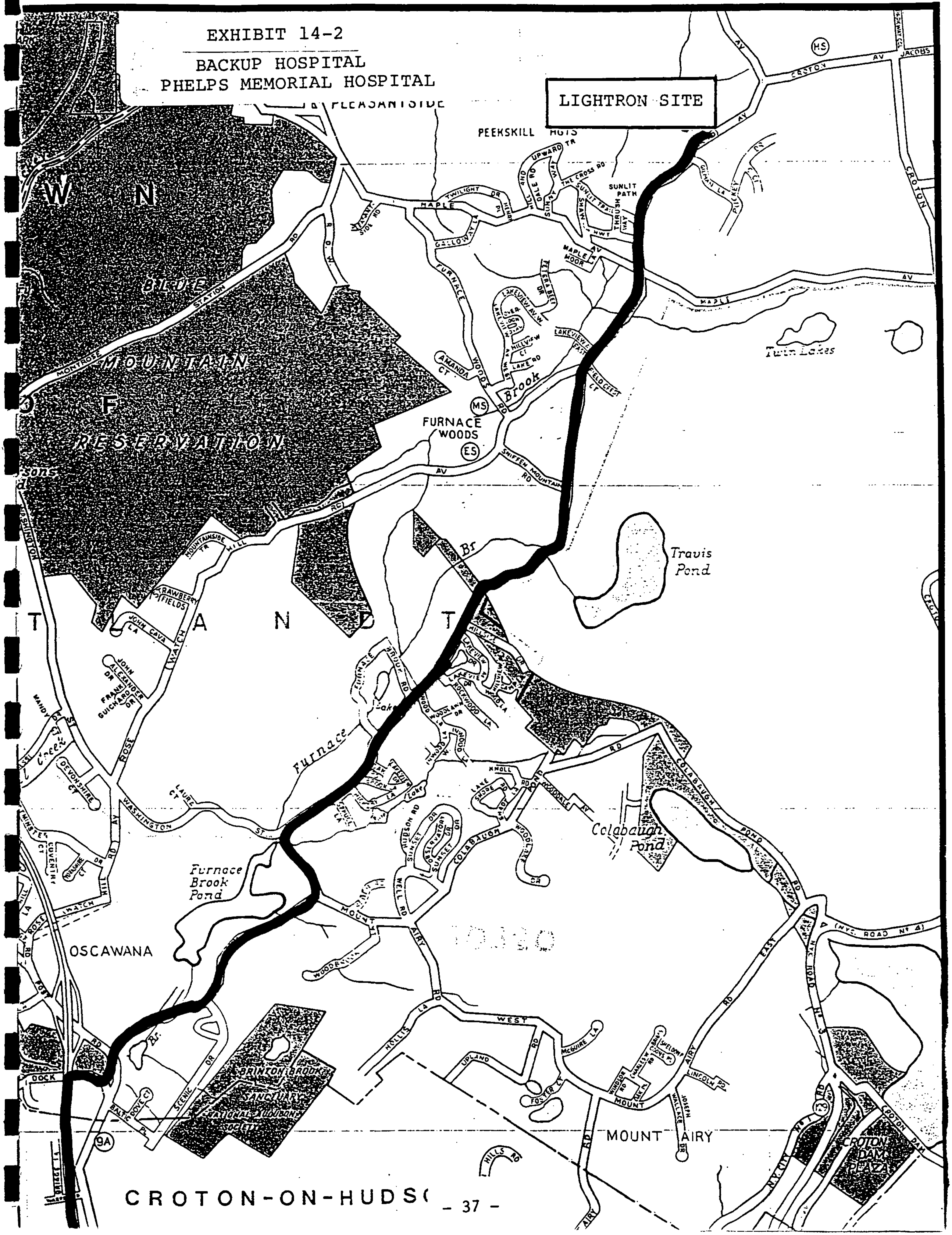


EXHIBIT 14-2

BACKUP HOSPITAL
PHELPS MEMORIAL HOSPITAL



14.5 In the Event of Acute Personnel Exposure to Toxic Materials

SKIN CONTACT: Use copious amounts of soap and water. Wash/rinse affected area for at least 15 minutes, decon; then provide appropriate medical attention. Eyewash and emergency shower or drench system shall be provided on-site at the CRZ and/or Support Zone.

INHALATION: Move to fresh air and, as necessary, decon/transport to hospital.

INGESTION: Decon/transport to hospital.

INOCULATION: Decon and transport to hospital.

The site Health and Safety Officer shall provide medical sheets to appropriate medical personnel.

Peekskill Community Hospital	(914) 737-9000
Phelps Memorial Hospital	(914) 631-5100

14.6 Adverse Weather Conditions

In the event of adverse weather conditions, the Site Health and Safety Officer will determine if field work can continue without sacrificing the health and safety of field personnel. Some of the prevailing conditions to be considered are:

SECTION XIV: EMERGENCY/CONTINGENCY PROCEDURES

o Potential for heat stress
o Treacherous weather-related working conditions
o Limited visibility
o Potential for electrical storms

SECTION XV: COMMUNITY RELATIONS

15.0 General

Activities at the Magna Metals Site will involve the installation of monitoring wells, the sampling of soil, sediment, sludge and surface and groundwater.

15.1 Project Description

Off-site activities will consist of:

- Installation of 4 monitoring wells
- Soil sampling
- Sediment sampling
- Ground and surface water sampling

On-site activities will consist of:

- Sampling of (9) inactive leach pits
- Soil sampling

The proposed installation of 4 monitoring wells at the base of the slope is expected to infringe upon one backyard residential property.

In addition, off-site sampling locations have been proposed on private property. Affected homeowners shall be informed in advance of expected activities and written signed consent by the homeowner(s) will be necessary before Ebasco and their subcontractors may enter these properties.

Since potentially hazardous materials may be present, the necessary safety precautions will be implemented. This will include the use of Level D or C personnel protective equipment to be worn by operating personnel and the establishment of an exclusion and contamination reduction zone around each work location.

SECTION XV: COMMUNITY RELATIONS

The primary Ebasco contact is Les Skoski and enquiries regarding specific project questions should be directed to him at: 201-460-6178

SECTION XVI: MEDICAL DATA SHEET/FIELD TEAM REVIEW

This brief Medical Data Sheet will be completed by all on-site personnel and will be kept in the Support Zone during ongoing construction operations. This Data Sheet is not a substitute for the Medical Surveillance Program requirements consistent with the Ebasco Health and Safety Program for Hazardous Waste Sites. This data sheet will accompany any personnel if medical assistance or transport to hospital facilities is required. If more information is required, use the back of this sheet.

Project Magna Metals

Name ______________________ Employee No. __________

Address ______________________ Home Telephone __________

Age __________ Height __________ Weight __________

Emergency Contact ______________________ Telephone __________

Allergies ______________________

Particular Sensitivities ______________________

Do You Wear Contacts? ______________________

Provide a Checklist of Recent Illnesses or Exposures to Hazardous Chemicals ______________________

____

____

What medications are you presently using? ______________________

____

____

Do you have any particular medical restrictions? ______________________

Name of Personal Physician ______________________ Telephone __________

I have read and reviewed the Site-Specific Health and Safety Plan and understand the information contained therein and will comply.

Name: ______________________

Signature: ______________________

Date: ______________________

Site/Project: ______________________

Appendix A

Chemical Data Sheet

Date: 3/90
#: 70

CHEMICAL DATA SHEET

I. Chemical/Compound Name: Ethyl benzene
A. Synonyms: Phenylethane, ethylbenzol
B. CAS # 100-41-4

II. Physical Characteristics
A. X Liquid ___ Solid ___ Powder X Gas
B. Color: Colorless
C. Odor- Aromatic, gasoline-like
D. LEL 1.0% Flash Pt. 59 °F
E. Boiling Point 277 °F Melting Point 139 °F
Ionization Potential 8.76 eV
F. Other ___

III. Recommended Air Purifying Cartridge:
___ Dusts, Fumes, Mists
X Organic Vapors
___ HEPA
___ Ammonia/Amines
___ Acid Gases
___ Pesticides
___ Air Purifying is Inappropriate
___ Other ___

IV. Health Hazards Data
A. Routes of Entry: X Inhalation ___ Skin Absorption ___ Ingestion
B. OSHA Listed Carcinogen: X No ___ Suspect ___ Yes
C. Sensitizer: ___ No X No Data ___ Suspect ___ Yes
D. Acute Toxicity:
Eye Contact: Irritant at 200 ppm, higher levels, can produce burning, tearing, injury
Skin Contact: Inflammation, blisters, burns
Inhalation: Headaches, dizziness, sense of constriction of chest, nose and throat irritant, vertigo, unconsciousness at very high levels (>200 ppm)
E. Chronic toxicity:
Target Organs: Eyes, upper respiratory system, skin, CNS
Long-Term Effects: skin rash; eye, nose, throat irritation

V. Exposure Limits
A. OSHA PEL: 100 ppm (TWA)
B. ACGIH TLV: 100 ppm (TWA)
C. IDLH 2000 ppm TWA
D. NIOSH REL none established
E. STEL 125 ppm

VI. Other Pertinent Information/Special Precautions: The TLV established to prevent eye irritation (1977)

Date: 10/88
#: 3

CHEMICAL DATA SHEET

I. Chemical/Compound Name: Trans - 1,2-Dichloroethylene
   A. Synonyms: Acetylene Dichloride, CDE, 1,1-dichloroethene
   B. CAS #: 540-59-0

II. Physical Characteristics
   A. __X__ Liquid ______ Solid ______ Powder _____ Gas
   B. Color Clear
   C. Odor- ether-like
   D. LEL 9.7 % Flash Pt. 36-39 °F
   E. Boiling Point 113-140 °F Melting Point -56 - -115 °F
   Ionization Potential 9.65 eV
   F. Other Vapor Pressure 180 to 265 mm Hg

III. Recommended Air Purifying Cartridge:

_____Dusts, Fumes, Mists	_____Acid Gases
__X__Organic Vapors	_____Pesticides
_____HEPA	_____Air Purifying is Inappropriate
_____Ammonia/Amines	_____Other

IV. Health Hazards Data
   A. Routes of Entry: __X__Inhalation __X__Skin Absorption ____Ingestion
   B. OSHA Listed Carcinogen: _X_No ___Suspect ___Yes
   C. Sensitizer: _X_No ___No Data ___Suspect ___Yes
   D. Acute Toxicity:
      Eye Contact May cause irritation and/or reversible corneal clouding.
      Skin Contact May cause irritation and redness of skin.
      Inhalation May cause irritation to the respiratory system and CNS depression. In milder exposures may cause nausea, vomiting, weakness tremors and epigastric cramps, vertigo, unconsciousness at high level. Recovery usually rapid.
   E. Chronic Toxicity:
      Target Organs Respiratory system, eyes, Central Nervous System
      Long-Term Effects Dermatitis

V. Exposure Limits
   A. OSHA PEL 200 ppm; 790 mg/m^3
   B. ACGIH TLV 200 ppm; 790 mg/m^3
   C. IDLH 4000 ppm
   D. NIOSH REL None
   E. STEL None

VI. Other Pertinent Information/Special Precautions:

Date: 2/13/89
#: 9

CHEMICAL DATA SHEET

I. Chemical/Compound Name: Trichloroethylene (Trichloroethene)

A. Synonyms: TCE, Ethylene Trichloride, Triclene, Acetylene Trichloride

B. CAS #: 79-01-6

C. Formula: $CHC1=CC1_2$ Mol. Weight: 131.4

II. Physical Characteristics:

A. X Liquid ____ Solid ____ Powder ____ Gas

B. Color: Clear, Colorless

C. Odor: Chloroform - like, sweet

D. LEL: 11 % Flash Pt.: None °F

E. Boiling Point: 188 °F Melting Point -123 °F

Ionization Potential: 9.47 eV

F. Other: Vapor Pressure - 58 mm Hg

III. Recommended Air Purifying Cartridge:

____ Dusts, Fumes, Mists ____ Acid Gases
X Organic Vapors ____ Pesticides
____ HEPA ____ Air Purifying is Inappropriate
____ Ammonia/Amines X Other SCBA-at any detectable concentration (NIOSH)

IV. Health Hazards Data:

A. Routes of Entry: X Inhalation ____ Skin Absorption
X Ingestion

B. OSHA Listed Carcinogen: ___ No ___ Suspect X Yes

C. Sensitizer: ___ No X No Data ___ Suspect ___ Yes

D. Acute Toxicity:

Eye Contact-Eye Irritant.

Skin Contact-Mildly irritating. Alcohol intake may potentiate cutaneous vasodilation (redness of the skin). Prolonged use can cause drying of skin.

Inhalation-CNS Depressant, sometimes preceded by headache, nausea, mental confusion, fatigue, incoordination, excitation or euphoria; a mild irritant to respiratory system. Other effects are arrhythmias, liver and kidney lesions, hypertension, coma or death.

E. Chronic Toxicity:

Target Organs-Liver, kidneys, respiratory system, skin, CNS

Long-Term Effects-CNS despression, intolerance to alcohol and increased cardiac output; symptoms abate when TCE is removed. Dermatitis, liver and kidney damage.

V. Exposure Limits:

A. OSHA PEL: 100 ppm, TWA; 200 ppm, Ceiling; 300 ppm, 5 min/2 hr.peak

B. ACGIH TLV: 50 ppm, TWA; 270 mg/m^3

C. IDLH: 1000 ppm (NIOSH, (1978)

D. NIOSH REL: 25 ppm, 10-hr TWA

E. STEL: 200 ppm; 1080 mg/m^3 (ACGIH)

VI. Other Pertinent Information/Special Precautions: NIOSH listed potential carcinogen. Odor threshold determined as low as 22 ppm.

Date: 3/90
#: 78

CHEMICAL DATA SHEET

I. Chemical/Compound Name: Xylene (o-, m-, and p-isomers)
A. Synonyms: 1-2-; 1,3-; and 1,4-dimethyl-benzene
B. CAS # 1330-20-7

II. Physical Characteristics
A. X Liquid ______ Solid ______ Powder ______ Gas
B. Color: Colorless
C. Odor- Aromatic
D. LEL 1.1% Flash Pt. 81°F
E. Boiling Point 281°F Melting Point 55°F
Ionization Potential 8.44eV
F. Other ______

III. Recommended Air Purifying Cartridge:
______ Dusts, Fumes, Mists
X Organic Vapors
______ HEPA
______ Ammonia/Amines
______ Acid Gases
______ Pesticides
______ Air Purifying is Inappropriate
______ Other ______

IV. Health Hazards Data
A. Routes of Entry: X Inhalation X Skin Absorption ______ Ingestion
B. OSHA Listed Carcinogen: X No ___ Suspect ___ Yes
C. Sensitizer: ___ No X No Data ___ Suspect ___ Yes
D. Acute Toxicity:
Eye Contact: irritant
Skin Contact: dryness, defatting
Inhalation: Irritant of mucous membranes, CNS depressant. (shallow breathing/weak pulse), Intoxication -like symptoms: dizziness, drowsi-ness staggering gait, headache, nausea
E. Chronic toxicity:
Target Organs: CNS, eyes, blood, liver, kidneys, skin
Long-Term Effects: dizziness, headache, nausea, liver and kidney damage, GI tract disturbances, CNS, despression

V. Exposure Limits
A. OSHA PEL: 100 ppm TWA
B. ACGIH TLV: 100 ppm TWA
C. IDLH 1,000 ppm
D. NIOSH REL 100 ppm (10-hr TWA) 200 ppm 10-min ceiling
E. STEL 150 ppm

VI. Other Pertinent Information/Special Precautions: ______

Date: 3/90
#: 66

CHEMICAL DATA SHEET

I. Chemical/Compound Name: Vinyl Chloride
A. Synonyms: Chloroethene, choroethylene
B. CAS # 75-01-4

II. Physical Characteristics
A. X Liquid ___ Solid ___ Powder X Gas
B. Color: Colorless
C. Odor- Ethereal, with faintly sweet odor
D. LEL 3.5% Flash Pt. -108 °F
E. Boiling Point 7 °F Melting Point -245 °F
Ionization Potential 9.995
F. Other ___

III. Recommended Air Purifying Cartridge:
___ Dusts, Fumes, Mists
X Organic Vapors
___ HEPA
___ Ammonia/Amines
___ Acid Gases
___ Pesticides
___ Air Purifying is Inappropriate
X Other: Any chemical cartridge respirator with an organic vapor cartridge providing a service life of at least 1 hour concentration up to 10ppm. (29 CFR 1910.1017(g)(4)

IV. Health Hazards Data
A. Routes of Entry: X Inhalation X Skin Absorption ___ Ingestion
B. OSHA Listed Carcinogen: ___ No ___ Suspect X Yes
C. Sensitizer: ___ No ___ No Data ___ Suspect ___ Yes
D. Acute Toxicity:
Eye Contact: Severe and immediate irritation
Skin Contact: Contact with liquified gas can cause frostbite; Contact with vapor may cause irritation & rash
Inhalation: Dizziness, lightheadedness, nausea in high concentrations; Numbness and tingling of fingers and toes, abdominal pain, coughing, sneezing, irritability, loss of appetite and weight
E. Chronic toxicity:
Target Organs: Liver, CNS, respiratory system, hepatic system
Long-Term Effects: Angiosarcoma of the liver, CNS depression lesions in the fingers, weakness, abdominal pain, club-like swelling and shortening of fingertips

V. Exposure Limits

A. OSHA PEL: 1 ppm (TWA)
B. ACGIH TLV: 5 ppm (TWA) 1987
C. IDLH
D. NIOSH REL Lowest detectable limit (< 1ppm)
E. STEL 5 ppm

VI. Other Pertinent Information/Special Precautions: "No employee may be exposed to vinyl chloride by direct contact with liquid vinyl chloride." (29CFR 1910.1017(c)(3))
Odor threshold - 260ppm

Appendix B

Material Safety Data Sheet

NITRIC ACID
NITRIC ACID
NITRIC ACID

MATERIAL SAFETY DATA SHEET

FISHER SCIENTIFIC
CHEMICAL DIVISION
1 REAGENT LANE
FAIR LAWN NJ 07410
(201) 796-7100

EMERGENCY NUMBER: (201) 796-7100
CHEMTREC ASSISTANCE: (800) 424-9300

SUBSTANCE IDENTIFICATION

CAS-NUMBER 7697-37-2

SUBSTANCE: **NITRIC ACID**

TRADE NAMES/SYNONYMS:
AQUA FORTIS; WFNA; RFNA; HYDROGEN NITRATE; AZOTIC ACID; NITRYL HYDROXIDE; NITAL; STCC 4918528; UN 2031;
A-200; A-200-C; A-200-S; A-202; A-206-C; A-509; A-467; HNO3; /4;

CHEMICAL FAMILY:
INORGANIC ACID

MOLECULAR FORMULA: H-N-O3

MOLECULAR WEIGHT: 63.01

CERCLA RATINGS (SCALE 0-3): HEALTH=3 FIRE=0 REACTIVITY=1 PERSISTENCE=0
NFPA RATINGS (SCALE 0-4): HEALTH=3 FIRE=0 REACTIVITY=0

COMPONENTS AND CONTAMINANTS

COMPONENT: NITRIC ACID PERCENT: 70

COMPONENT: WATER PERCENT: 30

OTHER CONTAMINANTS: NONE

EXPOSURE LIMITS:
NITRIC ACID:
2 PPM (5 MG/M3) OSHA TWA; 4 PPM (10 MG/M3) OSHA STEL
2 PPM (5 MG/M3) ACGIH TWA; 4 PPM (10 MG/M3) ACGIH STEL
2 PPM NIOSH RECOMMENDED 10 HOUR TWA

1000 POUNDS SARA SECTION 302 THRESHOLD PLANNING QUANTITY
1000 POUNDS SARA SECTION 304 REPORTABLE QUANTITY
1000 POUNDS CERCLA SECTION 103 REPORTABLE QUANTITY
SUBJECT TO SARA SECTION 313 ANNUAL TOXIC CHEMICAL RELEASE REPORTING

PHYSICAL DATA

DESCRIPTION: COLORLESS TO PALE YELLOW LIQUID WITH A SUFFOCATING ODOR.

BOILING POINT: 181 F (83 C) MELTING POINT: -44 F (-42 C)

SPECIFIC GRAVITY: 1.5027 @ 25 C VAPOR PRESSURE: 47.9 MMHG @ 20 C

EVAPORATION RATE: NOT AVAILABLE SOLUBILITY IN WATER: VERY SOLUBLE

VAPOR DENSITY: 3.2

SOLVENT SOLUBILITY: SOLUBLE IN ETHER.

FIRE AND EXPLOSION DATA

FIRE AND EXPLOSION HAZARD:
NEGLIGIBLE FIRE HAZARD WHEN EXPOSED TO HEAT OR FLAME.

OXIDIZER: OXIDIZERS DECOMPOSE, ESPECIALLY WHEN HEATED, TO YIELD OXYGEN OR OTHER GASES WHICH WILL INCREASE THE BURNING RATE OF COMBUSTIBLE MATTER. CONTACT WITH EASILY OXIDIZABLE, ORGANIC, OR OTHER COMBUSTIBLE MATERIALS MAY RESULT IN IGNITION, VIOLENT COMBUSTION OR EXPLOSION.

FIREFIGHTING MEDIA:
WATER, DRY CHEMICAL OR SODA ASH
(1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4).

FOR LARGER FIRES, FLOOD AREA WITH WATER FROM A DISTANCE
(1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4).

FIREFIGHTING:
MOVE CONTAINER FROM FIRE AREA IF POSSIBLE. COOL CONTAINERS EXPOSED TO FLAMES WITH WATER FROM SIDE UNTIL WELL AFTER FIRE IS OUT. STAY AWAY FROM STORAGE TANK ENDS. FOR MASSIVE FIRE IN STORAGE AREA, USE UNMANNED HOSE HOLDER OR MONITOR NOZZLES; ELSE WITHDRAW FROM AREA AND LET FIRE BURN (1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4, GUIDE PAGE 44).

USE FLOODING AMOUNTS OF WATER AS FOG. COOL CONTAINERS WITH FLOODING AMOUNTS OF WATER, APPLY FROM AS FAR A DISTANCE AS POSSIBLE. AVOID BREATHING CORROSIVE VAPORS, KEEP UPWIND. CONSIDER EVACUATION OF DOWNWIND AREA IF MATERIAL IS LEAKING.

TRANSPORTATION DATA

DEPARTMENT OF TRANSPORTATION HAZARD CLASSIFICATION 49CFR172.101:
OXIDIZER

DEPARTMENT OF TRANSPORTATION LABELING REQUIREMENTS 49CFR172.101 AND SUBPART E:
OXIDIZER AND CORROSIVE

DEPARTMENT OF TRANSPORTATION PACKAGING REQUIREMENTS: 49CFR173.268
EXCEPTIONS: NONE

TOXICITY

NITRIC ACID:
TOXICITY DATA:
  ANHYDROUS: 110 MG/KG UNREPORTED-MAN LDLO; REPRODUCTIVE EFFECTS DATA (RTECS).
  MONOHYDRATE: NO DATA AVAILABLE.
  TRIHYDRATE: NO DATA AVAILABLE.
CARCINOGEN STATUS: NONE.
LOCAL EFFECTS: CORROSIVE- INHALATION, SKIN, EYES, INGESTION.
ACUTE TOXICITY LEVEL: INSUFFICIENT DATA.
TARGET EFFECTS: NO DATA AVAILABLE.
AT INCREASED RISK FROM EXPOSURE: PERSONS WITH IMPAIRED PULMONARY FUNCTION, PRE-EXISTING EYE AND SKIN DISORDERS.

HEALTH EFFECTS AND FIRST AID

INHALATION:
NITRIC ACID:
CORROSIVE. 100 PPM IMMEDIATELY DANGEROUS TO LIFE OR HEALTH.

ACUTE EXPOSURE- INHALATION OF ACIDIC SUBSTANCES MAY CAUSE SEVERE RESPIRATORY IRRITATION WITH COUGHING, CHOKING, AND POSSIBLY YELLOWISH BURNS OF THE MUCOUS MEMBRANES. OTHER INITIAL SYMPTOMS MAY INCLUDE DIZZINESS, HEADACHE, NAUSEA, AND WEAKNESS. PULMONARY EDEMA MAY BE IMMEDIATE IN THE MOST SEVERE EXPOSURES, BUT MORE LIKELY WILL OCCUR AFTER A LATENT PERIOD OF 5-72 HOURS. THE SYMPTOMS MAY INCLUDE TIGHTNESS IN THE CHEST, DYSPNEA, DIZZINESS, FROTHY SPUTUM, AND CYANOSIS. PHYSICAL FINDINGS MAY INCLUDE HYPOTENSION, WEAK, RAPID PULSE, MOIST RALES, AND HEMOCONCENTRATION. IN NON-FATAL CASES, COMPLETE RECOVERY MAY OCCUR WITHIN A FEW DAYS OR WEEKS OR, CONVALESCENCE MAY BE PROLONGED WITH FREQUENT RELAPSES AND CONTINUED DYSPNEA AND OTHER SIGNS AND SYMPTOMS OF PULMONARY INSUFFICIENCY. IN SEVERE EXPOSURES, DEATH DUE TO ANOXIA MAY OCCUR WITHIN A FEW HOURS AFTER ONSET OF THE SYMPTOMS OF PULMONARY EDEMA OR FOLLOWING A RELAPSE.

CHRONIC EXPOSURE- DEPENDING ON THE CONCENTRATION AND DURATION OF EXPOSURE, REPEATED OR PROLONGED EXPOSURE TO AN ACIDIC SUBSTANCE MAY CAUSE EROSION OF THE TEETH, INFLAMMATORY AND ULCERATIVE CHANGES IN THE MOUTH, AND POSSIBLY JAW NECROSIS. BRONCHIAL IRRITATION WITH COUGH AND FREQUENT ATTACKS OF BRONCHIAL PNEUMONIA MAY OCCUR. GASTROINTESTINAL DISTURBANCES ARE ALSO POSSIBLE.

FIRST AID- REMOVE FROM EXPOSURE AREA TO FRESH AIR IMMEDIATELY. IF BREATHING HAS STOPPED, GIVE ARTIFICIAL RESPIRATION. MAINTAIN AIRWAY AND BLOOD PRESSURE AND ADMINISTER OXYGEN IF AVAILABLE. KEEP AFFECTED PERSON WARM AND AT REST. TREAT SYMPTOMATICALLY AND SUPPORTIVELY. ADMINISTRATION OF OXYGEN SHOULD BE PERFORMED BY QUALIFIED PERSONNEL. GET MEDICAL ATTENTION IMMEDIATELY.

SKIN CONTACT:
NITRIC ACID:
CORROSIVE.

ACUTE EXPOSURE- DIRECT CONTACT WITH LIQUID OR VAPOR MAY CAUSE SEVERE PAIN, BURNS AND POSSIBLY YELLOWISH STAINS. BURNS MAY BE DEEP WITH SHARP EDGES AND HEAL SLOWLY WITH SCAR TISSUE FORMATION. DILUTE SOLUTIONS OF NITRIC ACID MAY PRODUCE MILD IRRITATION AND HARDEN THE EPIDERMIS WITHOUT DESTROYING IT.

CHRONIC EXPOSURE- EFFECTS DEPEND ON THE CONCENTRATION AND DURATION OF EXPOSURE. REPEATED OR PROLONGED CONTACT WITH ACIDIC SUBSTANCES MAY RESULT IN DERMATITIS OR EFFECTS SIMILAR TO ACUTE EXPOSURE.

FIRST AID- REMOVE CONTAMINATED CLOTHING AND SHOES IMMEDIATELY. WASH AFFECTED AREA WITH SOAP OR MILD DETERGENT AND LARGE AMOUNTS OF WATER UNTIL NO EVIDENCE OF CHEMICAL REMAINS (AT LEAST 15-20 MINUTES). IN CASE OF CHEMICAL BURNS, COVER AREA WITH STERILE, DRY DRESSING. BANDAGE SECURELY, BUT NOT TOO TIGHTLY. GET MEDICAL ATTENTION IMMEDIATELY.

EYE CONTACT:
NITRIC ACID:
CORROSIVE.

ACUTE EXPOSURE- DIRECT CONTACT WITH ACIDIC SUBSTANCES MAY CAUSE PAIN AND LACRIMATION, PHOTOPHOBIA, AND BURNS, POSSIBLY SEVERE. THE DEGREE OF INJURY DEPENDS ON THE CONCENTRATION AND DURATION OF CONTACT. IN MILD BURNS, THE EPITHELIUM REGENERATES RAPIDLY AND THE EYE RECOVERS COMPLETELY. IN SEVERE CASES, THE EXTENT OF INJURY MAY NOT BE FULLY APPARENT FOR SEVERAL WEEKS. ULTIMATELY, THE WHOLE CORNEA MAY BECOME DEEPLY VASCULARIZED AND OPAQUE RESULTING IN BLINDNESS. IN THE WORST CASES, THE EYE MAY BE TOTALLY DESTROYED. CONCENTRATED NITRIC ACID MAY IMPART A YELLOW COLOR TO THE EYE UPON CONTACT.

CHRONIC EXPOSURE- EFFECTS DEPEND ON THE CONCENTRATION AND DURATION OF EXPOSURE. REPEATED OR PROLONGED EXPOSURE TO ACIDIC SUBSTANCES MAY CAUSE CONJUNCTIVITIS OR EFFECTS AS IN ACUTE EXPOSURE.

FIRST AID- WASH EYES IMMEDIATELY WITH LARGE AMOUNTS OF WATER, OCCASIONALLY LIFTING UPPER AND LOWER LIDS, UNTIL NO EVIDENCE OF CHEMICAL REMAINS (AT LEAST 15-20 MINUTES). CONTINUE IRRIGATING WITH NORMAL SALINE UNTIL THE PH HAS RETURNED TO NORMAL (30-60 MINUTES). COVER WITH STERILE BANDAGES. GET MEDICAL ATTENTION IMMEDIATELY.

INGESTION:
NITRIC ACID:
CORROSIVE.

ACUTE EXPOSURE- ACIDIC SUBSTANCES MAY CAUSE CIRCUMORAL BURNS WITH YELLOW DISCOLORATION AND CORROSION OF THE MUCOUS MEMBRANES OF THE MOUTH, THROAT AND ESOPHAGUS. THERE MAY BE IMMEDIATE PAIN AND DIFFICULTY OR INABILITY TO SWALLOW OR SPEAK. EPIGLOTTAL EDEMA MAY RESULT IN RESPIRATORY DISTRESS AND POSSIBLY ASPHYXIA. MARKED THIRST, EPIGASTRIC PAIN, NAUSEA, VOMITING AND DIARRHEA MAY OCCUR. DEPENDING ON THE DEGREE OF ESPOHAGEAL AND GASTRIC CORROSION, THE VOMITUS MAY CONTAIN FRESH OR DARK PRECIPITATED BLOOD AND LARGE SHREDS OF MUCOSA. SHOCK WITH MARKED HYPOTENSION, WEAK, RAPID PULSE, SHALLOW RESPIRATION, AND CLAMMY SKIN MAY OCCUR. CIRCULATORY COLLAPSE MAY ENSUE AND IF UNCORRECTED, LEAD TO RENAL FAILURE. IN SEVERE CASES, GASTRIC, AND TO A LESSER DEGREE, ESOPHAGEAL PERFORATION AND SUBSEQUENT PERITONITIS MAY OCCUR AND BE ACCOMPANIED BY FEVER AND ABDOMINAL RIGIDITY. ESOPHAGEAL, GASTRIC ANC PYLORIC STRICTURE MAY OCCUR WITHIN A FEW WEEKS, BUT MAY BE DELAYED FOR MONTHS OR EVEN YEARS. DEATH MAY RESULT WITHIN A SHORT TIME FROM ASPHYXIA, CIRCULATORY COLLAPSE OR ASPIRATION OF EVEN MINUTE AMOUNTS. LATER DEATH MAY BE DUE TO PERITONITIS, SEVERE NEPHRITIS OR PNEUMONIA. COMA AND CONVULSIONS SOMETIMES OCCUR TERMINALLY.

CHRONIC EXPOSURE- DEPENDING ON THE CONCENTRATION, REPEATED INGESTION OF ACIDIC SUBSTANCES MAY RESULT IN INFLAMMATORY AND ULCERATIVE CHANGES IN THE MUCOUS MEMBRANES OF THE MOUTH AND OTHER EFFECTS AS IN ACUTE INGESTION. REPRODUCTIVE EFFECTS HAVE BEEN REPORTED IN ANIMALS.

FIRST AID- DO NOT USE GASTRIC LAVAGE OR EMESIS. DILUTE THE ACID IMMEDIATELY

BY DRINKING LARGE QUANTITIES OF WATER OR MILK. IF VOMITING PERSISTS, ADMINISTER FLUIDS REPEATEDLY. INGESTED ACID MUST BE DILUTED APPROXIMATELY 100 FOLD TO RENDER IT HARMLESS TO TISSUES. MAINTAIN AIRWAY AND TREAT SHOCK. (DREISBACH, HANDBOOK OF POISONING, 12TH ED.). GET MEDICAL ATTENTION IMMEDIATELY. IF VOMITING OCCURS, KEEP HEAD BELOW HIPS TO HELP PREVENT ASPIRATION.

ANTIDOTE:
NO SPECIFIC ANTIDOTE. TREAT SYMPTOMATICALLY AND SUPPORTIVELY.

REACTIVITY

REACTIVITY:
REACTS EXOTHERMICALLY WITH WATER.

INCOMPATIBILITIES:
NITRIC ACID:
ACETIC ACID: MAY REACT EXPLOSIVELY.
ACETIC ANHYDRIDE: EXPLOSIVE REACTION BY FRICTION OR IMPACT.
ACETONE: MAY REACT EXPLOSIVELY.
ACETONITRILE: EXPLOSIVE MIXTURE.
4-ACETOXY-3-METHOXYBENZALDEHYDE: EXOTHERMIC REACTION.
ACROLEIN: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
ACRYLONITRILE: EXPLOSIVE REACTION AT 90 C.
ACRYLONITRILE-METHACRYLATE COPOLYMER: INCOMPATIBLE.
ALCOHOLS: POSSIBLE VIOLENT REACTION OR EXPLOSION; FORMATION OF EXPLOSIVE COMPOUND IN THE PRESENCE OF HEAVY METALS.
ALKANETHIOLS: EXOTHERMIC REACTION WITH POSSIBLE IGNITION.
2-ALKOXY-1,3-DITHIA-2-PHOSPHOLANE: IGNITION REACTION.
ALLYL ALCOHOL: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
ALLYL CHLORIDE: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
AMINES (ALIPHATIC OR AROMATIC): POSSIBLE IGNITION REACTION.
2-AMINOETHANOL: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
2-AMINOTHIAZOLE : EXPLOSIVE REACTION.
AMMONIA (GAS): BURNS IN AN ATMOSPHERE OF NITRIC ACID VAPOR.
AMMONIUM HYDROXIDE: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
AMMONIUM NITRATE: FORMS EXPLOSIVE MIXTURE.
ANILINE: IGNITES ON CONTACT.
ANILINIUM NITRATE: FORMS EXPLOSIVE SOLUTION.
ANION EXCHANGE RESINS: POSSIBLE VIOLENT EXOTHERMIC REACTION.
ANTIMONY: VIOLENT REACTION.
ARSINE: EXPLOSIVE REACTION.
ARSINE-BORON TRIBROMIDE: VIOLENT OXIDATION.
BASES: REACTS.
BENZENE: EXPLOSIVE REACTION.
BENZIDINE: SPONTANEOUS IGNITION.
BENZONITRILE: POSSIBLE EXPLOSION.
BENZOTHIOPHENE DERIVATIVES: FORMATION OF POSSIBLY EXPLOSIVE COMPOUNDS.
N-BENZYL-N-ETHYLANILINE: VIGOROUS DECOMPOSITION.
1,4-BIS(METHOXYMETHYL)2,3,5,6-TETRAMETHYLBENZENE: GAS EVOLUTION.
BISMUTH: INTENSE EXOTHERMIC REACTION OR EXPLOSION.
1,3-BIS(TRIFLUOROMETHYL)BENZENE: POSSIBLE EXPLOSION.
BORON: VIOLENT REACTION WITH INCANDESCENCE.
BORON DECAHYDRIDE: EXPLOSIVE REACTION.
BORON PHOSPHIDE: IGNITION REACTION.
BROMINE PENTAFLUORIDE: IGNITION REACTION.
N-BUTYL MERCAPTAN: IGNITION REACTION.

N-BUTYRALDEHYDE: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
CADMIUM PHOSPHIDE: EXPLOSIVE REACTION.
CALCIUM HYPOPHOSPHITE: IGNITION REACTION.
CARBON (PULVERIZED): VIOLENT REACTION.
CELLULOSE: FORMS EASILY COMBUSTIBLE ESTER.
CHLORATES: REACTS.
CHLORINE: INCOMPATIBLE.
CHLORINE TRIFLUORIDE: VIOLENT REACTION.
CHLOROBENZENE: POSSIBLE EXPLOSION.
4-CHLORO-2-NITROANILINE: FORMS EXPLOSIVE COMPOUND.
CHLOROSULFONIC ACID: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
COAL: EXPLOSIVE MIXTURE.
COATINGS: MAY BE ATTACKED.
CRESOL: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
CROTONALDEHYDE: VIOLENT DECOMPOSITION WITH IGNITION.
CUMENE: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
CUPRIC NITRIDE: EXPLOSIVE REACTION.
CUPROUS NITRIDE: VIOLENT REACTION.
CYANATES: POSSIBLE EXPLOSIVE REACTION.
CYCLOHEXANONE: VIOLENT REACTION.
CYCLOHEXYLAMINE: FORMS EXPLOSIVE COMPOUND.
CYCLOPENTADIENE: EXPLOSIVE REACTION.
1,2-DIAMINOETHANEBIS(TRIMETHYLGOLD): EXPLOSIVE REACTION.
DIBORANE: SPONTANEOUS IGNITION.
DI-2-BUTOXYETHYL ETHER: VIOLENT DECOMPOSITION REACTION.
2,6-DI-T-BUTYL PHENOL: FORMATION OF EXPLOSIVE COMPOUND.
DICHLOROETHANE: FORMS SHOCK AND HEAT SENSITIVE MIXTURE.
DICHLOROETHYLENE: FORMS EXPLOSIVE COMPOUND.
DICHLOROMETHANE: FORMS EXPLOSIVE SOLUTION.
DICYCLOPENTADIENE: SPONTANEOUS IGNITION.
DIENES: IGNITION REACTION.
DIETHYLAMINO ETHANOL: POSSIBLE EXPLOSION.
DIETHYL ETHER: POSSIBLE EXPLOSION.
3,6-DIHYDRO-1,2,2H-OXAZINE: EXPLOSIVE INTERACTION.
DIISOPROPYL ETHER: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
DIMETHYLAMINOMETHYLFERROCENE: VIOLENT DECOMPOSITION IF HEATED.
DIMETHYL ETHER: FORMS EXPLOSIVE COMPOUND.
DIMETHYL HYDRAZINE: IGNITES ON CONTACT.
DIMETHYL SULFOXIDE + 1,4-DIOXANE: EXPLOSION.
DIMETHYL SULFOXIDE + <14% WATER: EXPLOSIVE REACTION.
DINITROBENZENE: EXPLOSION HAZARD.
DINITROTOLUENE: EXPLOSIVE REACTION.
DIOXANE + PERCHLORIC ACID: POSSIBLE EXPLOSION.
DIPHENYL DISTIBENE: EXPLOSIVE OXIDATION.
DIPHENYL MERCURY + CARBON DISULFIDE: VIOLENT REACTION.
DIPHENYL TIN: IGNITION REACTION.
DISODIUM PHENYL ORTHOPHOSPHATE: VIOLENT EXPLOSION.
DIVINYL ETHER: POSSIBLE IGNITION REACTION.
EPICHLOROHYDRIN: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
ETHANESULFONAMIDE: EXPLOSIVE REACTION.
ETHOXY-ETHYLENE DITHIOPHOSPHATE: IGNITION ON CONTACT.
N-ETHYL ANILINE: IGNITION REACTION.
ETHYLENE DIAMINE: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
ETHYLENE GLYCOL: FORMS SHOCK AND HEAT SENSITIVE MIXTURE.
ETHYLENEIMINE: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
5-ETHYL-2-METHYL PYRIDINE: EXPLOSIVE REACTION.
ETHYL PHOSPHINE: IGNITION REACTION.
5-ETHYL-2-PICOLINE: FORMS EXPLOSIVE COMPOUNDS.

FERROUS OXIDE (POWDERED): INTENSE EXOTHERMIC REACTION.
FLUORINE: POSSIBLE EXPLOSIVE REACTION.
FORMIC ACID: EXOTHERMIC REACTION WITH RELEASE OF TOXIC GASES.
2-FORMYLAMINO-1-PHENYL-1,3-PROPANEDIOL: POSSIBLE EXPLOSION.
FUEL OIL (BURNING): EXPLOSION.
FULMINATES: REACTS.
FURFURYLIDENE KETONES: IGNITES ON CONTACT.
GERMANIUM: VIOLENT REACTION.
GLYCEROL: POSSIBLE EXPLOSION.
GLYOXAL: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
HEXALITHIUM DISILICIDE: EXPLOSIVE REACTION.
HEXAMETHYLBENZENE: POSSIBLE EXPLOSION.
2,2,4,4,6,6-HEXAMETHYLTRITHIANE: EXPLOSIVE OXIDATION.
HEXENAL: EXPLODES ON HEATING.
HYDRAZINE: VIOLENT REACTION.
HYDRAZOIC ACID: ENERGETIC REACTION.
HYDROGEN IODIDE: IGNITION REACTION.
HYDROGEN PEROXIDE: FORMS UNSTABLE MIXTURE.
HYDROGEN PEROXIDE AND KETONES: FORMS EXPLOSIVE PRODUCTS.
HYDROGEN PEROXIDE AND MERCURIC OXIDE: FORMS EXPLOSIVE COMPOUNDS.
HYDROGEN PEROXIDE AND THIOUREA: FORMS EXPLOSIVE COMPOUNDS.
HYDROGEN SELENIDE: IGNITION REACTION.
HYDROGEN SULFIDE: INCANDESCENT REACTION.
HYDROGEN TELLURIDE: IGNITION AND POSSIBLE EXPLOSIVE REACTION.
INDANE AND SULFURIC ACID: EXPLOSIVE REACTION.
ISOPRENE: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
KETONES (CYCLIC): VIOLENT REACTION.
LACTIC ACID + HYDROFLUORIC ACID: EXPLOSIVE REACTION.
LITHIUM: IGNITION REACTION.
LITHIUM SILICIDE: INCANDESCENT REACTION.
MAGNESIUM: EXPLOSIVE REACTION.
MAGNESIUM + 2-NITROANILINE: MAY IGNITE ON CONTACT.
MAGNESIUM PHOSPHIDE: INCANDESCENT REACTION.
MAGNESIUM SILICIDE: VIOLENT REACTION.
MAGNESIUM-TITANIUM ALLOY: FORMS SHOCK AND HEAT SENSITIVE MIXTURE.
MANGANESE (POWDERED): INCANDESCENCE AND POSSIBLE EXPLOSION.
MESITYL OXIDE: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
MESITYLENE: POSSIBLE EXPLOSIVE REACTION.
METALS: VIOLENT REACTION WITH EXPLOSION OR IGNITION.
METAL ACETYLIDES: VIOLENT OR EXPLOSIVE REACTION.
METAL CARBIDES: VIOLENT OR EXPLOSIVE REACTION.
METAL CYANIDES: EXPLOSIVE REACTIONS.
METAL FERRICYANIDE OR FERROCYANIDE: VIOLENT REACTION.
METAL SALICYLATES: FORMS EXPLOSIVE COMPOUNDS.
METAL THIOCYANATES: POSSIBLE EXPLOSION.
2-METHYLBENZIMIDAZOLE + SULFURIC ACID: POSSIBLE EXPLOSIVE REACTION.
4-METHYLCYCLOHEXANONE: EXPLOSIVE REACTION.
2-METHYL-5-ETHYLPYRIDINE: TEMPERATURE AND PRESSURE INCREASE IN CLOSED
CONTAINER.
METHYL THIOPHENE: IGNITION REACTION.
NEODYMIUM PHOSPHIDE: VIOLENT REACTION.
NICKEL TETRAPHOSPHIDE: IGNITION REACTION.
NITRO AROMATIC HYDROCARBONS: FORMS HIGHLY EXPLOSIVE PRODUCTS.
NITROBENZENE: EXPLOSIVE REACTION, ESPECIALLY IN THE PRESENCE OF WATER.
NITROMETHANE: EXPLOSIVE REACTION.
NITRONAPHTHALENE: EXPLOSION HAZARD.
NON-METAL OXIDES : EXPLOSIVE REACTION.
OLEUM: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.

ORGANIC MATERIALS: FIRE AND EXPLOSION HAZARD.
ORGANIC SUBSTANCES AND PERCHLORATES: POSSIBLE EXPLOSION.
ORGANIC SUBSTANCES AND SULFURIC ACID: POSSIBLE EXPLOSION.
PHENYL ACETYLENE + 1,1-DIMETHYLHYDRAZINE: VIOLENT REACTION.
PHENYL ORTHOPHOSPHORIC ACID DISODIUM SALT: FORMS EXPLOSIVE PRODUCTS.
PHOSPHINE + OXYGEN: SPONTANEOUS IGNITION.
PHOSPHONIUM IODIDE: IGNITION REACTION.
PHOSPHORUS (VAPOR): IGNITES WHEN HEATED.
PHOSPHOROUS HALIDES: IGNITION REACTION.
PHOSPHORUS TETRAIODIDE: VIGOROUS REACTION.
PHOSPHORUS TRICHLORIDE: EXPLOSIVE REACTION.
PHTHALIC ACID AND SULFURIC ACID: POSSIBLE EXPLOSIVE REACTION.
PHTHALIC ANHYDRIDE: EXOTHERMIC REACTION AND FORMS EXPLOSIVE PRODUCTS.
PICRATES: REACTS.
PLASTICS: MAY BE ATTACKED.
POLYALKENES: INTENSE REACTION..
POLYDIBROMOSILANES: EXPLOSIVE REACTION.
POLY(ETHYLENE OXIDE) DERIVATIVES: POSSIBLE EXPLOSION.
POLYPROPYLENE: TEMPERATURE AND PRESSURE INCREASE IN A CLOSED CONTAINER.
POLY(SILYLENE): IGNITION.
POLYURETHANE (FOAM): VIGOROUS REACTION.
POTASSIUM HYPOPHOSPHITE: EXPLOSIVE REACTION.
POTASSIUM PHOSPHINATE: EXPLODES ON EVAPORATION.
B-PROPIOLACTONE: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
PROPIOPHENONE + SULFURIC ACID: EXOTHERMIC REACTION ABOVE -5 C.
PROPYLENE GLYCOL + HYDROFLUORIC ACID + SILVER NITRATE: EXPLOSIVE MIXTURE.
PROPYLENE OXIDE: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
PYRIDINE: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
PYROCATECHOL: IGNITES ON CONTACT.
REDUCING AGENTS: POSSIBLE EXPLOSIVE OR IGNITION REACTION.
RESORCINOL: POSSIBLE EXPLOSION.
RUBBER: VIGOROUS REACTION, POSSIBLE EXPLOSION.
SELENIUM: VIGOROUS REACTION.
SELENIUM HYDRIDE: IGNITION OR INCANDESCENT REACTION.
SELENIUM IODOPHOSPHIDE: EXPLOSIVE REACTION.
SILICON: VIOLENT REACTION.
SILICONE OIL: POSSIBLE EXPLOSION.
SILVER BUTEN-3-YNIDE: EXPLOSION.
SODIUM: SPONTANEOUS IGNITION.
SODIUM AZIDE: EXOTHERMIC REACTION.
SODIUM HYDROXIDE: TEMPERATURE AND PRESSURE INCREASE IN A CLOSED CONTAINER.
STIBINE: EXPLOSIVE REACTION.
SUCROSE (SOLID): VIGOROUS REACTION.
SULFAMIC ACID: VIOLENT REACTION WITH EVOLUTION OF TOXIC NITROUS OXIDE.
SULFIDES: REACTS.
SULFUR DIOXIDE: EXPLOSIVE REACTION.
SULFUR HALIDES: VIOLENT REACTION.
SULFURIC ACID + GLYCERIDES: EXPLOSIVE REACTION.
SULFURIC ACID + TEREPHTHALIC ACID: VIOLENT REACTION.
SURFACTANTS + PHOSPHORIC ACID: EXPLOSION HAZARD.
TERPENES: SPONTANEOUS IGNITION.
TETRABORANE: EXPLOSIVE REACTION.
TETRABORANE DECAHYDRIDE: EXPLOSIVE REACTION.
TETRAPHOSPHOROUS DIIODOTRISELENIDE: EXPLOSIVE REACTION.
TETRAPHOSPHOROUS IODIDE: IGNITES ON CONTACT.
TETRAPHOSPHOROUS TETRAOXIDE TRISULFIDE: VIOLENT REACTION.
THIOALDEHYDES: VIOLENT REACTION.
THIOKETONES: VIOLENT REACTION.

THIOPHENES: EXPLOSIVE REACTION.
TITANIUM: FORMS SHOCK-SENSITIVE COMPOUND.
TITANIUM ALLOYS: POSSIBLE EXPLOSIVE REACTION.
TITANIUM-MAGNESIUM ALLOY: POSSIBLE EXPLOSION ON IMPACT.
TOLUENE: VIOLENT REACTION.
TOLUIDENE: IGNITION REACTION.
1,3,5-TRIACETYLHEXAHYDRO-1,3,5-TRIAZINE + TRIFLUOROACETIC ANHYDRIDE: EXPLOSIVE REACTION.
TRIAZINE: VIOLENTLY EXPLOSIVE REACTION.
TRICADMIUM DIPHOSPHIDE: EXPLOSIVE REACTION.
TRIETHYLGALLIUM MONOETHYL ETHER COMPLEX: IGNITION REACTION.
TRIMETHYLTRIOXANE: INTENSE REACTION.
TRIS(IODOMERCURI)PHOSPHINE: VIOLENT DECOMPOSITION.
TRITHIOACETONE: EXPLOSIVE REACTION.
TURPENTINE: EXPLOSIVE MIXTURE.
UNSYMMETRICAL DIMETHYL HYDRAZINE: SPONTANEOUS IGNITION.
URANIUM: EXPLOSIVE REACTION.
URANIUM ALLOY: VIOLENT REACTION.
URANIUM DISULFIDE: VIOLENT REACTION.
URANIUM-NEODYMIUM ALLOYS: EXPLOSIVE REACTION.
VINYL ACETATE: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
VINYLIDENE CHLORIDE: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
WOOD: POSSIBLE IGNITION.
P-XYLENE: INTENSE REACTION IN PRESENCE OF SULFURIC ACID.
ZINC: INCANDESCENT REACTION.
ZINC ETHOXIDE: POSSIBLE EXPLOSION.
ZIRCONIUM-URANIUM ALLOYS: EXPLOSIVE REACTION.

DECOMPOSITION:
THERMAL DECOMPOSITION PRODUCTS MAY INCLUDE TOXIC OXIDES OF NITROGEN.

POLYMERIZATION:
HAZARDOUS POLYMERIZATION HAS NOT BEEN REPORTED TO OCCUR UNDER NORMAL TEMPERATURES AND PRESSURES.

STORAGE AND DISPOSAL

OBSERVE ALL FEDERAL, STATE AND LOCAL REGULATIONS WHEN STORING OR DISPOSING OF THIS SUBSTANCE. FOR ASSISTANCE, CONTACT THE DISTRICT DIRECTOR OF THE ENVIRONMENTAL PROTECTION AGENCY.

STORAGE

PROTECT AGAINST PHYSICAL DAMAGE. SEPARATE FROM METALLIC POWDERS, CARBIDES, HYDROGEN SULFIDE, TURPENTINE, ORGANIC ACIDS, AND ALL COMBUSTIBLE, ORGANIC OR OTHER READILY OXIDIZABLE MATERIALS. PROVIDE GOOD VENTILATION AND AVOID DIRECT SUNLIGHT (NFPA 49, HAZARDOUS CHEMICALS DATA, 1975).

STORE AWAY FROM INCOMPATIBLE SUBSTANCES.

THRESHOLD PLANNING QUANTITY (TPQ):
THE SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT (SARA) SECTION 302 REQUIRES THAT EACH FACILITY WHERE ANY EXTREMELY HAZARDOUS SUBSTANCE IS PRESENT IN A QUANTITY EQUAL TO OR GREATER THAN THE TPQ ESTABLISHED FOR THAT SUBSTANCE NOTIFY THE STATE EMERGENCY RESPONSE COMMISSION FOR THE STATE IN WHICH IT IS LOCATED. SECTION 303 OF SARA REQUIRES THESE FACILITIES TO PARTICIPATE IN LOCAL

EMERGENCY RESPONSE PLANNING (40 CFR 355.30).

DISPOSAL

DISPOSAL MUST BE IN ACCORDANCE WITH STANDARDS APPLICABLE TO GENERATORS OF HAZARDOUS WASTE, 40 CFR 262. EPA HAZARDOUS WASTE NUMBER D002.

100 POUND CERCLA SECTION 103 REPORTABLE QUANTITY.

****

CONDITIONS TO AVOID

MAY IGNITE OTHER COMBUSTIBLE MATERIALS (WOOD, PAPER, OIL, ETC.). REACTS VIOLENTLY WITH WATER AND FUELS. FLAMMABLE, POISONOUS GASES MAY ACCUMULATE IN TANKS AND HOPPER CARS. RUNOFF TO SEWER MAY CREATE FIRE OR EXPLOSION HAZARD.

CONSULT NFPA PUBLICATION 43A, STORAGE OF LIQUID AND SOLID OXIDIZING MATERIALS, FOR STORAGE REQUIREMENTS.

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SPILL AND LEAK PROCEDURES

SOIL SPILL:
DIG A HOLDING AREA SUCH AS A PIT, POND OR LAGOON TO CONTAIN SPILL AND DIKE SURFACE FLOW USING BARRIER OF SOIL, SANDBAGS, FOAMED POLYURETHANE OR FOAMED CONCRETE. ABSORB LIQUID MASS WITH FLY ASH OR CEMENT POWDER.

NEUTRALIZE SPILL WITH SLAKED LIME, SODIUM BICARBONATE OR CRUSHED LIMESTONE.

AIR SPILL:
APPLY WATER SPRAY TO KNOCK DOWN AND REDUCE VAPORS. KNOCK-DOWN WATER IS CORROSIVE AND TOXIC AND SHOULD BE DIKED FOR CONTAINMENT AND LATER DISPOSAL.

WATER SPILL:
ADD SUITABLE AGENT TO NEUTRALIZE SPILLED MATERIAL TO PH-7.

OCCUPATIONAL SPILL:
KEEP COMBUSTIBLES (WOOD, PAPER, OIL, ETC.) AWAY FROM SPILLED MATERIAL. DO NOT TOUCH SPILLED MATERIAL. STOP LEAK IF YOU CAN DO IT WITHOUT RISK. USE WATER SPRAY TO REDUCE VAPORS. DO NOT GET WATER INSIDE CONTAINER. FOR SMALL SPILLS, FLUSH AREA WITH FLOODING AMOUNTS OF WATER. FOR LARGER SPILLS, DIKE FAR AHEAD OF SPILL FOR LATER DISPOSAL. KEEP UNNECESSARY PEOPLE AWAY. ISOLATE HAZARD AREA AND DENY ENTRY. VENTILATE CLOSED SPACES BEFORE ENTERING.

REPORTABLE QUANTITY (RQ): 1000 POUNDS
THE SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT (SARA) SECTION 304 REQUIRES THAT A RELEASE EQUAL TO OR GREATER THAN THE REPORTABLE QUANTITY FOR THIS SUBSTANCE BE IMMEDIATELY REPORTED TO THE LOCAL EMERGENCY PLANNING COMMITTEE AND THE STATE EMERGENCY RESPONSE COMMISSION (40 CFR 355.40). IF THE RELEASE OF THIS SUBSTANCE IS REPORTABLE UNDER CERCLA SECTION 103, THE NATIONAL RESPONSE CENTER MUST BE NOTIFIED IMMEDIATELY AT (800) 424-8802 OR (202) 426-2675 IN THE METROPOLITAN WASHINGTON, D.C. AREA (40 CFR 302.6).

PROTECTIVE EQUIPMENT

VENTILATION:
PROVIDE LOCAL EXHAUST OR PROCESS ENCLOSURE VENTILATION TO MEET PUBLISHED EXPOSURE LIMITS.

RESPIRATOR:
THE FOLLOWING RESPIRATORS AND MAXIMUM USE CONCENTRATIONS ARE RECOMMENDATIONS BY THE U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES, NIOSH POCKET GUIDE TO CHEMICAL HAZARDS; NIOSH CRITERIA DOCUMENTS OR BY THE U.S. DEPARTMENT OF LABOR, 29CFR1910 SUBPART Z.
THE SPECIFIC RESPIRATOR SELECTED MUST BE BASED ON CONTAMINATION LEVELS FOUND IN THE WORK PLACE, MUST NOT EXCEED THE WORKING LIMITS OF THE RESPIRATOR AND BE JOINTLY APPROVED BY THE NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH AND THE MINE SAFETY AND HEALTH ADMINISTRATION (NIOSH-MSHA).

NITRIC ACID:

125 MG/M3- ANY SUPPLIED-AIR RESPIRATOR OPERATED IN A CONTINUOUS-FLOW MODE.

250 MG/M3- ANY SELF-CONTAINED BREATHING APPARATUS WITH A FULL FACEPIECE.
ANY SUPPLIED-AIR RESPIRATOR WITH A FULL FACEPIECE.
ANY AIR-PURIFYING FULL FACEPIECE RESPIRATOR (GAS MASK) WITH A CHIN-STYLE OR FRONT-OR BACK-MOUNTED CANISTER PROVIDING PROTECTION AGAINST NITRIC ACID.
ANY CHEMICAL CARTRIDGE RESPIRATOR WITH A FULL FACEPIECE AND CARTRIDGE(S) PROVIDING PROTECTION AGAINST NITRIC ACID.

ESCAPE- ANY AIR-PURIFYING FULL FACEPIECE RESPIRATOR (GAS MASK) WITH A CHIN-STYLE OR FRONT-OR BACK-MOUNTED CANISTER PROVIDING PROTECTION AGAINST NITRIC ACID.
ANY APPROPRIATE ESCAPE-TYPE SELF-CONTAINED BREATHING APPARATUS.

NOTE: ONLY NON-OXIDIZABLE SORBENTS ARE ALLOWED (NOT CHARCOAL).

FOR FIREFIGHTING AND OTHER IMMEDIATELY DANGEROUS TO LIFE OR HEALTH CONDITIONS:

SELF-CONTAINED BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN PRESSURE DEMAND OR OTHER POSITIVE PRESSURE MODE.

SUPPLIED-AIR RESPIRATOR WITH FULL FACEPIECE AND OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE IN COMBINATION WITH AN AUXILIARY SELF-CONTAINED BREATHING APPARATUS OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE.

CLOTHING:
EMPLOYEE MUST WEAR APPROPRIATE PROTECTIVE (IMPERVIOUS) CLOTHING AND EQUIPMENT TO PREVENT ANY POSSIBILITY OF SKIN CONTACT WITH THIS SUBSTANCE.

GLOVES:
EMPLOYEE MUST WEAR APPROPRIATE PROTECTIVE GLOVES TO PREVENT CONTACT WITH THIS SUBSTANCE.

EYE PROTECTION:
EMPLOYEE MUST WEAR SPLASH-PROOF OR DUST-RESISTANT SAFETY GOGGLES AND A FACESHIELD TO PREVENT CONTACT WITH THIS SUBSTANCE.

EMERGENCY WASH FACILITIES:
WHERE THERE IS ANY POSSIBILITY THAT AN EMPLOYEE'S EYES AND/OR SKIN MAY BE EXPOSED TO THIS SUBSTANCE, THE EMPLOYER SHOULD PROVIDE AN EYE WASH FOUNTAIN AND QUICK DRENCH SHOWER WITHIN THE IMMEDIATE WORK AREA FOR EMERGENCY USE.

AUTHORIZED - FISHER SCIENTIFIC, INC.
CREATION DATE: 12/04/84 REVISION DATE: 09/06/89

-ADDITIONAL INFORMATION-

ACETONE
ACETONE
ACETONE

MATERIAL SAFETY DATA SHEET

FISHER SCIENTIFIC
CHEMICAL DIVISION
1 REAGENT LANE
FAIR LAWN NJ 07410
(201) 796-7100

EMERGENCY NUMBER: (201) 796-7100
CHEMTREC ASSISTANCE: (800) 424-9300

SUBSTANCE IDENTIFICATION

CAS-NUMBER 67-64-1

SUBSTANCE: **ACETONE**

TRADE NAMES/SYNONYMS:
DIMETHYLFORMALDEHYDE; DIMETHYLKETAL; DIMETHYL KETONE; BETA-KETOPROPANE; PROPANONE; 2-PROPANONE; PYROACETIC ETHER; B-KETOPROPANE; RCRA U002; STCC 4908105; UN 1090; A-949; A-40; A-20; A-19; A-946; A-18; A-18-S; A-18-SK; A-11; A-11-S; A-16-P; A-16-S; C3H6O;

CHEMICAL FAMILY:
KETONE, ALIPHATIC

MOLECULAR FORMULA: C-H3-C-O-C-H3

MOLECULAR WEIGHT: 58.08

CERCLA RATINGS (SCALE 0-3): HEALTH=1 FIRE=3 REACTIVITY=0 PERSISTENCE=0
NFPA RATINGS (SCALE 0-4): HEALTH=1 FIRE=3 REACTIVITY=0

COMPONENTS AND CONTAMINANTS

COMPONENT: ACETONE PERCENT: 100

OTHER CONTAMINANTS: NONE

EXPOSURE LIMITS:
ACETONE:
750 PPM (1780 MG/M3) OSHA TWA; 1000 PPM (2375 MG/M3) OSHA STEL
750 PPM (1780 MG/M3) ACGIH TWA; 1000 PPM (2375 MG/M3) ACGIH STEL
250 PPM (590 MG/M3) NIOSH RECOMMENDED 10 HOUR TWA

5000 POUNDS CERCLA SECTION 103 REPORTABLE QUANTITY
SUBJECT TO SARA SECTION 313 ANNUAL TOXIC CHEMICAL RELEASE REPORTING

PHYSICAL DATA

DESCRIPTION: CLEAR, COLORLESS, VOLATILE LIQUID WITH A CHARACTERISTIC,

SWEETISH, FRAGRANT, MINT-LIKE ODOR AND PUNGENT, SWEETISH TASTE.

BOILING POINT: 133 F (56 C) MELTING POINT: -139 F (-95 C)

SPECIFIC GRAVITY: 0.7899 VOLATILITY: 100%

VAPOR PRESSURE: 180 MMHG @ 20 C EVAPORATION RATE: (BUTYL ACETATE=1) 14.4

PH: NEUTRAL IN SOLUTION SOLUBILITY IN WATER: VERY SOLUBLE

ODOR THRESHOLD: 20 PPM VAPOR DENSITY: 2.0

SOLVENT SOLUBILITY: SOLUBLE IN ETHANOL, ETHER, CHLOROFORM, BENZENE, MOST OILS, DIMETHYLFORMAMIDE

FIRE AND EXPLOSION DATA

FIRE AND EXPLOSION HAZARD:
DANGEROUS FIRE HAZARD WHEN EXPOSED TO HEAT OR FLAME.

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

VAPOR-AIR MIXTURES ARE EXPLOSIVE.

FLASH POINT: -4 F (-20 C) (CC) UPPER EXPLOSIVE LIMIT: 13%

LOWER EXPLOSIVE LIMIT: 2.5% AUTOIGNITION TEMP.: 869 F (465 C)

FLAMMABILITY CLASS(OSHA): IB

FIREFIGHTING MEDIA:
DRY CHEMICAL, CARBON DIOXIDE, HALON, WATER SPRAY OR ALCOHOL FOAM (1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4).

FOR LARGER FIRES, USE WATER SPRAY, FOG OR ALCOHOL FOAM (1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4).

FIREFIGHTING:
MOVE CONTAINER FROM FIRE AREA IF POSSIBLE. COOL FIRE-EXPOSED CONTAINERS WITH WATER FROM SIDE UNTIL WELL AFTER FIRE IS OUT. STAY AWAY FROM STORAGE TANK ENDS. FOR MASSIVE FIRE IN STORAGE AREA, USE UNMANNED HOSE HOLDER OR MONITOR NOZZLES, ELSE WITHDRAW FROM AREA AND LET FIRE BURN. WITHDRAW IMMEDIATELY IN CASE OF RISING SOUND FROM VENTING SAFETY DEVICE OR ANY DISCOLORATION OF STORAGE TANK DUE TO FIRE (1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4, GUIDE PAGE 26).

EXTINGUISH ONLY IF FLOW CAN BE STOPPED. USE FLOODING AMOUNTS OF WATER AS A FOG; SOLID STREAMS MAY BE INEFFECTIVE. COOL CONTAINERS WITH FLOODING AMOUNTS OF WATER FROM AS FAR A DISTANCE AS POSSIBLE. AVOID BREATHING VAPORS; KEEP UPWIND. IF FIRE IS UNCONTROLLABLE OR CONTAINERS ARE EXPOSED TO DIRECT FLAME, EVACUATE TO A RADIUS OF 1500 FEET. CONSIDER EVACUATION OF DOWNWIND AREA IF MATERIAL IS LEAKING.

WATER MAY BE INEFFECTIVE (NFPA FIRE PROTECTION GUIDE ON HAZARDOUS MATERIALS, EIGHTH EDITION).

ALCOHOL FOAM (NFPA FIRE PROTECTION GUIDE ON HAZARDOUS MATERIAL, EIGHTH EDITION).

TRANSPORTATION DATA

DEPARTMENT OF TRANSPORTATION HAZARD CLASSIFICATION 49CFR172.101:
FLAMMABLE LIQUID

DEPARTMENT OF TRANSPORTATION LABELING REQUIREMENTS 49CFR172.101 AND SUBPART E:
FLAMMABLE LIQUID

DEPARTMENT OF TRANSPORTATION PACKAGING REQUIREMENTS: 49CFR173.119
EXCEPTIONS: 49CFR173.118

TOXICITY

ACETONE:
500 PPM EYE-HUMAN IRRITATION; 395 MG OPEN SKIN-RABBIT MILD IRRITATION; 3950 UG EYE-RABBIT SEVERE IRRITATION; 20 MG/24 HOURS EYE-RABBIT MODERATE IRRITATION; 500 MG/24 HOURS SKIN-RABBIT MILD IRRITATION; 500 PPM INHALATION-HUMAN TCLO; 12000 PPM/4 HOURS INHALATION-MAN TCLO; 10 MG/M3/6 HOURS INHALATION-MAN TCLO; 440 UG/M3/6 MINUTES INHALATION-MAN TCLO; 2857 MG/KG ORAL-MAN TDLO; 1159 MG/KG UNREPORTED-MAN LDLO; 5800 MG/KG ORAL-RAT LD50; 8 GM/KG ORAL-DOG LDLO; 3000 MG/KG ORAL-MOUSE LD50; 5340 MG/KG ORAL-RABBIT LD50; 20 GM/KG SKIN-RABBIT LD50; 110 GM/M3/1 HOUR INHALATION-MOUSE LCLO; 1297 MG/KG INTRAPERITONEAL-MOUSE LD50; 8 GM/KG INTRAPERITONEAL-DOG LDLO; 500 MG/KG INTRAPERITONEAL-RAT LDLO; 1576 MG/KG INTRAVENOUS-RABBIT LDLO; 5500 MG/KG INTRAVENOUS-RAT LD50; 4 GM/KG INTRAVENOUS-MOUSE LDLO; 5000 MG/KG SUBCUTANEOUS-GUINEA PIG LDLO; 5 GM/KG SUBCUTANEOUS-DOG LDLO; MUTAGENIC DATA (RTECS); REPRODUCTIVE EFFECTS DATA (RTECS);
CARCINOGEN STATUS: NONE.

ACETONE IS A SKIN, EYE AND MUCOUS MEMBRANE IRRITANT AND CENTRAL NERVOUS SYSTEM DEPRESSANT. THE USE OF ALCOHOLIC BEVERAGES MAY ENHANCE THE TOXIC EFFECTS. PERSONS WITH CHRONIC RESPIRATORY OR SKIN DISEASES MAY BE AT AN INCREASED RISK FROM EXPOSURE.

HEALTH EFFECTS AND FIRST AID

INHALATION:
ACETONE:
IRRITANT/NARCOTIC. 20,000 PPM IMMEDIATELY DANGEROUS TO LIFE OR HEALTH.

ACUTE EXPOSURE- VAPOR CONCENTRATIONS AROUND 1000 PPM MAY CAUSE SLIGHT TRANSIENT IRRITATION OF THE UPPER RESPIRATORY TRACT. EXPOSURE TO 12,000 PPM HAS CAUSED THROAT IRRITATION AND CENTRAL NERVOUS SYSTEM DEPRESSION WITH WEAKNESS OF THE LEGS, HEADACHE, DIZZINESS, DROWSINESS, NAUSEA AND A GENERAL FEELING OF MALAISE. OTHER POSSIBLE EFFECTS FROM EXPOSURE TO HIGH CONCENTRATIONS INCLUDE DRYNESS OF THE MOUTH AND THROAT, INCOORDINATION OF MOTION AND SPEECH, RESTLESSNESS, ANOREXIA, VOMITING, SOMETIMES FOLLOWED BY HEMATEMESIS, HYPOTHERMIA, DYSPNEA, SLOW, IRREGULAR RESPIRATION, SLOW, WEAK PULSE, PROGRESSIVE COLLAPSE WITH STUPOR, AND IN SEVERE CASES, COMA. LIVER DAMAGE MAY BE INDICATED BY HIGH UROBILIN LEVELS AND JAUNDICE. KIDNEY DAMAGE MAY BE INDICATED BY ALBUMIN AND RED AND WHITE BLOOD CELLS IN THE URINE. BLOOD GLUCOSE LEVELS MAY BE AFFECTED AND FATAL KETOSIS IS POSSIBLE.

CHRONIC EXPOSURE- WORKERS EXPOSED TO 500 PPM/6 HOURS/6 DAYS EXPERIENCED MUCOUS MEMBRANE IRRITATION, AN UNPLEASANT SMELL, HEAVY EYES, OVERNIGHT

HEADACHE, AND GENERAL WEAKNESS ACCOMPANIED BY HEMATOLOGIC CHANGES. RECOVERY OCCURRED IN SEVERAL DAYS. WORKERS EXPOSED TO 1000 PPM FOR 3 HOURS/DAY FOR 7-15 YEARS REPORTED CHRONIC INFLAMMATION OF THE RESPIRATORY TRACT, STOMACH AND DUODENUM, DIZZINESS, LOSS OF STRENGTH, AND ASTHENIA. DROWSINESS, VERTIGO, SENSATION OF HEAT, AND COUGHING HAVE ALSO BEEN REPORTED FROM CHRONIC EXPOSURE TO LOW CONCENTRATIONS. ANIMAL STUDIES SHOW ADVERSE EFFECTS ON FERTILITY WHEN FEMALES WERE EXPOSED CHRONICALLY DURING PREGNANCY.

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

SKIN CONTACT:
ACETONE:
IRRITANT.

ACUTE EXPOSURE- CONTACT WITH THE LIQUID CAUSED MILD IRRITATION IN RABBITS. CELLULAR DAMAGE TO THE OUTER LAYERS OF THE EPITHELIUM WITH MILD EDEMA AND HYPEREMIA HAS BEEN DEMONSTRATED IN HUMANS, BUT WAS READILY REVERSIBLE. SMALL AMOUNTS MAY BE ABSORBED THROUGH INTACT SKIN.

CHRONIC EXPOSURE- REPEATED OR PROLONGED EXPOSURE MAY CAUSE DERMATITIS WITH DRYING, CRACKING, AND ERYTHEMA DUE TO THE DEFATTING ACTION. THE AMOUNT ABSORBED THROUGH THE SKIN INCREASES DIRECTLY WITH THE FREQUENCY AND EXTENT OF THE EXPOSURE. 2 OF 3 GUINEA PIGS EXPOSED BY SKIN CONTACT FOR 3 WEEKS DEVELOPED CATARACTS BY THE END OF THREE MONTHS.

FIRST AID- REMOVE CONTAMINATED CLOTHING AND SHOES IMMEDIATELY. WASH AFFECTED AREA WITH SOAP OR MILD DETERGENT AND LARGE AMOUNTS OF WATER UNTIL NO EVIDENCE OF CHEMICAL REMAINS (APPROXIMATELY 15-20 MINUTES). GET MEDICAL ATTENTION IMMEDIATELY.

EYE CONTACT:
ACETONE:
IRRITANT.

ACUTE EXPOSURE- IN HUMANS, VAPORS PRODUCE ONLY SLIGHT IRRITATION WHEN THE CONCENTRATION IS AT OR BELOW 1000 PPM. HOWEVER, HIGH VAPOR CONCENTRATIONS HAVE CAUSED CORNEAL EPITHELIAL AND CONJUNCTIVAL INJURY IN ANIMALS. LIQUID SPLASHED IN HUMAN EYES CAUSES AN IMMEDIATE STINGING SENSATION AND, IF WASHED PROMPTLY, DAMAGE ONLY TO THE CORNEAL EPITHELIUM CHARACTERIZED BY MICROSCOPIC GRAY DOTS AND A FOREIGN BODY SENSATION, WHICH HEALS COMPLETELY IN 1-2 DAYS.

CHRONIC EXPOSURE- PROLONGED OR REPEATED EXPOSURE TO THE VAPORS MAY CAUSE IRRITATION OR CONJUNCTIVITIS.

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

INGESTION:
ACETONE:
NARCOTIC.

ACUTE EXPOSURE- MAY CAUSE A FRUITY ODOR OF THE BREATH AND MUCOUS MEMBRANE AND GASTROENTERIC IRRITATION. IN ACUTE CASES, A LATENT PERIOD MAY BE FOLLOWED BY RESTLESSNESS AND VOMITING PROCEEDING TO HEMATEMESIS AND PROGRESSIVE COLLAPSE WITH STUPOR. HEPATORENAL LESIONS HAVE BEEN REPORTED. THE BLOOD GLUCOSE LEVEL MAY BE AFFECTED AND KETOSIS MAY BE FATAL. 10-20 MILLILITERS HAVE BEEN TOLERATED WITHOUT ILL EFFECTS. 200 MILLILITERS HAVE

CAUSED STUPOR WITHIN A HALF HOUR, FLUSHED CHEEKS, SHALLOW RESPIRATION, AND COMA WHICH LASTED FOR 12 HOURS. RENAL GLUCOSURIA PERSISTED FOR 5 MONTHS.

CHRONIC EXPOSURE- NO DATA AVAILABLE.

FIRST AID- IF THE PERSON IS CONSCIOUS AND NOT CONVULSING, INDUCE EMESIS BY GIVING SYRUP OF IPECAC FOLLOWED BY WATER. (IF VOMITING OCCURS KEEP THE HEAD BELOW THE HIPS TO PREVENT ASPIRATION). REPEAT IN 20 MINUTES IF NOT EFFECTIVE INITIALLY. GIVE ACTIVATED CHARCOAL. IN PATIENTS WITH DEPRESSED RESPIRATION OR IF EMESIS IS NOT PRODUCED, PERFORM GASTRIC LAVAGE CAUTIOUSLY (DREISBACH, HANDBOOK OF POISONING, 12TH ED.). TREAT SYMPTOMATICALLY AND SUPPORTIVELY. GASTRIC LAVAGE SHOULD BE PERFORMED BY QUALIFIED MEDICAL PERSONNEL. GET MEDICAL ATTENTION IMMEDIATELY.

ANTIDOTE:
NO SPECIFIC ANTIDOTE. TREAT SYMPTOMATICALLY AND SUPPORTIVELY.

REACTIVITY

REACTIVITY:
STABLE UNDER NORMAL TEMPERATURES AND PRESSURES.

INCOMPATIBILITIES:
ACETONE:
  ACIDS: INCOMPATIBLE.
  AMINES (ALIPHATIC): INCOMPATIBLE.
  BROMINE: VIOLENT REACTION WITH EXCESS AMOUNTS OF BROMINE.
  BROMINE TRIFLUORIDE: EXPLOSION ON CONTACT.
  BROMOFORM: VIOLENT REACTION IN PRESENCE OF BASES (E.G. POTASSIUM HYDROXIDE).
  CHLOROFORM: VIOLENT REACTION IN PRESENCE OF A BASE.
  CHROMIUM TRIOXIDE: IGNITION ON CONTACT AT AMBIENT TEMPERATURE.
  CHROMYL CHLORIDE: INCANDESCENT REACTION.
  DIOXYGEN DIFLUORIDE + SOLID CARBON DIOXIDE: EXPLOSION AT -78 C.
  HEXACHLOROMELAMINE: POSSIBLE EXPLOSION.
  HYDROGEN PEROXIDE: EXPLOSION.
  NITRIC ACID: IGNITION.
  NITRIC + ACETIC ACID MIXTURE: POSSIBLE EXPLOSION.
  NITRIC + SULFURIC ACID MIXTURE: VIOLENT OXIDATION.
  NITROSYL CHLORIDE: EXPLOSIVE REACTION.
  NITROSYL PERCHLORATE: IGNITION AND EXPLOSION.
  NITRYL PERCHLORATE: IGNITION AND EXPLOSION.
  OXIDIZERS (STRONG): FIRE AND EXPLOSION HAZARD.
  PERMONOSULFURIC ACID: EXPLOSION.
  PLASTICS: INCOMPATIBLE.
  PLATINUM + NITROSYL CHLORIDE: POSSIBLE EXPLOSION.
  POTASSIUM-TERT-BUTOXIDE: IGNITION.
  RAYON: INCOMPATIBLE.
  SODIUM HYPOBROMITE: EXPLOSION.
  SODIUM HYPOIODITE: POSSIBLE EXPLOSION.
  SULFUR DICHLORIDE: VIOLENT REACTION.
  SULFURIC ACID AND POTASSIUM BICHROMATE: IGNITION.
  THIODIGLYCOL + HYDROGEN PEROXIDE: POSSIBLE EXPLOSION.
  THIOTRIAZYL PERCHLORATE: POSSIBLE EXPLOSION.
  1,1,1-TRICHLOROETHANE: EXOTHERMIC CONDENSATION BY A BASIC CATALYST.
  TRICHLOROMELAMINE: POSSIBLE EXPLOSION.
SEE ALSO KETONES.

KETONES:

ACETALDEHYDE: VIOLENT CONDENSATION REACTION.
NITRIC ACID + HYDROGEN PEROXIDE: FORMATION OF EXPLOSIVE PRODUCT.
PERCHLORIC ACID: VIOLENT DECOMPOSITION.

DECOMPOSITION:
THERMAL DECOMPOSITION PRODUCTS MAY INCLUDE TOXIC OXIDES OF CARBON.

POLYMERIZATION:
HAZARDOUS POLYMERIZATION HAS NOT BEEN REPORTED TO OCCUR UNDER NORMAL TEMPERATURES AND PRESSURES.

STORAGE AND DISPOSAL

OBSERVE ALL FEDERAL, STATE AND LOCAL REGULATIONS WHEN STORING OR DISPOSING OF THIS SUBSTANCE. FOR ASSISTANCE, CONTACT THE DISTRICT DIRECTOR OF THE ENVIRONMENTAL PROTECTION AGENCY.

STORAGE

STORE IN ACCORDANCE WITH 29 CFR 1910.106.

BONDING AND GROUNDING: SUBSTANCES WITH LOW ELECTROCONDUCTIVITY, WHICH MAY BE IGNITED BY ELECTROSTATIC SPARKS, SHOULD BE STORED IN CONTAINERS WHICH MEET THE BONDING AND GROUNDING GUIDELINES SPECIFIED IN NFPA 77-1983, RECOMMENDED PRACTICE ON STATIC ELECTRICITY.

STORE AWAY FROM INCOMPATIBLE SUBSTANCES.

DISPOSAL

DISPOSAL MUST BE IN ACCORDANCE WITH STANDARDS APPLICABLE TO GENERATORS OF HAZARDOUS WASTE, 40CFR 262. EPA HAZARDOUS WASTE NUMBER U002.

****

CONDITIONS TO AVOID

AVOID CONTACT WITH HEAT, SPARKS, FLAMES, OR OTHER SOURCES OF IGNITION. VAPORS MAY BE EXPLOSIVE AND POISONOUS; DO NOT ALLOW UNNCECESSARY PERSONNEL. DO NOT OVERHEAT CONTAINERS; CONTAINERS MAY VIOLENTLY RUPTURE AND TRAVEL A CONSIDERABLE DISTANCE IN HEAT OF FIRE.

****

SPILL AND LEAK PROCEDURES

OCCUPATIONAL SPILL:
SHUT OFF IGNITION SOURCES. STOP LEAK IF YOU CAN DO IT WITHOUT RISK. USE WATER SPRAY TO REDUCE VAPORS. FOR SMALL SPILLS, TAKE UP WITH SAND OR OTHER ABSORBENT MATERIAL AND PLACE INTO CONTAINERS FOR LATER DISPOSAL. FOR LARGER SPILLS, DIKE FAR AHEAD OF SPILL FOR LATER DISPOSAL. NO SMOKING, FLAMES OR FLARES IN HAZARD AREA! KEEP UNNECESSARY PEOPLE AWAY; ISOLATE HAZARD AREA AND DENY ENTRY.

REPORTABLE QUANTITY (RQ): 5000 POUNDS
THE SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT (SARA) SECTION 304 REQUIRES THAT A RELEASE EQUAL TO OR GREATER THAN THE REPORTABLE QUANTITY FOR THIS

SUBSTANCE BE IMMEDIATELY REPORTED TO THE LOCAL EMERGENCY PLANNING COMMITTEE AND THE STATE EMERGENCY RESPONSE COMMISSION (40 CFR 355.40). IF THE RELEASE OF THIS SUBSTANCE IS REPORTABLE UNDER CERCLA SECTION 103, THE NATIONAL RESPONSE CENTER MUST BE NOTIFIED IMMEDIATELY AT (800) 424-8802 OR (202) 426-2675 IN THE METROPOLITAN WASHINGTON, D.C. AREA (40 CFR 302.6).

PROTECTIVE EQUIPMENT

VENTILATION:
PROVIDE GENERAL DILUTION VENTILATION TO MEET PUBLISHED EXPOSURE LIMITS.

RESPIRATOR:
THE FOLLOWING RESPIRATORS AND MAXIMUM USE CONCENTRATIONS ARE RECOMMENDATIONS BY THE U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES, NIOSH POCKET GUIDE TO CHEMICAL HAZARDS; NIOSH CRITERIA DOCUMENTS OR BY THE U.S. DEPARTMENT OF LABOR, 29CFR1910 SUBPART Z.
THE SPECIFIC RESPIRATOR SELECTED MUST BE BASED ON CONTAMINATION LEVELS FOUND IN THE WORK PLACE, MUST NOT EXCEED THE WORKING LIMITS OF THE RESPIRATOR AND BE JOINTLY APPROVED BY THE NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH AND THE MINE SAFETY AND HEALTH ADMINISTRATION (NIOSH-MSHA).

1000 PPM- ANY CHEMICAL CARTRIDGE RESPIRATOR WITH ORGANIC VAPOR CARTRIDGE(S).
ANY POWERED AIR-PURIFYING RESPIRATOR WITH ORGANIC VAPOR CARTRIDGE(S).
ANY SUPPLIED-AIR RESPIRATOR.
ANY SELF-CONTAINED BREATHING APPARATUS.

6250 PPM- ANY SUPPLIED-AIR RESPIRATOR OPERATED IN A CONTINUOUS FLOW MODE.

12,500 PPM- ANY AIR-PURIFYING FULL FACEPIECE RESPIRATOR (GAS MASK) WITH A CHIN-STYLE OR FRONT- OR BACK-MOUNTED ORGANIC VAPOR CANISTER.
ANY SUPPLIED-AIR RESPIRATOR WITH A FULL FACEPIECE.
ANY SELF-CONTAINED BREATHING APPARATUS WITH A FULL FACEPIECE.

20,000 PPM- ANY SUPPLIED-AIR RESPIRATOR WITH A FULL FACEPIECE AND OPERATED IN A PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE.

ESCAPE- ANY AIR-PURIFYING FULL FACEPIECE RESPIRATOR (GAS MASK) WITH A CHIN-STYLE OR FRONT- OR BACK-MOUNTED ORGANIC VAPOR CANISTER.
ANY APPROPRIATE ESCAPE-TYPE SELF-CONTAINED BREATHING APPARATUS.

FOR FIREFIGHTING AND OTHER IMMEDIATELY DANGEROUS TO LIFE OR HEALTH CONDITIONS:

SELF-CONTAINED BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN PRESSURE DEMAND OR OTHER POSITIVE PRESSURE MODE.

SUPPLIED-AIR RESPIRATOR WITH FULL FACEPIECE AND OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE IN COMBINATION WITH AN AUXILIARY SELF-CONTAINED BREATHING APPARATUS OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE.

CLOTHING:
EMPLOYEE MUST WEAR APPROPRIATE PROTECTIVE (IMPERVIOUS) CLOTHING AND EQUIPMENT TO PREVENT REPEATED OR PROLONGED SKIN CONTACT WITH THIS SUBSTANCE.

GLOVES:
EMPLOYEE MUST WEAR APPROPRIATE PROTECTIVE GLOVES TO PREVENT CONTACT WITH THIS

SUBSTANCE.

EYE PROTECTION:
EMPLOYEE MUST WEAR SPLASH-PROOF OR DUST-RESISTANT SAFETY GOGGLES TO PREVENT EYE CONTACT WITH THIS SUBSTANCE.

EMERGENCY EYE WASH: WHERE THERE IS ANY POSSIBILITY THAT AN EMPLOYEE'S EYES MAY BE EXPOSED TO THIS SUBSTANCE, THE EMPLOYER SHOULD PROVIDE AN EYE WASH FOUNTAIN WITHIN THE IMMEDIATE WORK AREA FOR EMERGENCY USE.

AUTHORIZED - FISHER SCIENTIFIC, INC.
CREATION DATE: 09/06/84 REVISION DATE: 10/13/89

-ADDITIONAL INFORMATION-

Appendix C

Heat Stress

ADOPTED
THRESHOLD LIMIT VALUES

Work - Rest Regime

These Threshold Limit Values (TLVs) refer to heat stress conditions under which it is believed that nearly all workers may be repeatedly exposed without advrse health effects. The TLVs shown in Table 1 are based on the assumption that nearly all acclimatized, fully clothed workers with adequate water and salt intake should be able to function effectively under the given working conditions without exceeding a deep body temperature of 38°C.

1. Work Load Categories

Heat produced by the body and the environmental heat together determine the total heat load. Therefore, if work is to be performed under hot environmental conditions, the workload category of each job shall be established and the heat exposure limit pertinent to the workload evaluated against the applicable standard in order to protect the worker exposure beyond the permissible limit.

The work load category may be established by ranking each job into light, medium, and heavy categories onthe basis of type of operation. Where the work load is ranked into one of said three categories, i.e.,

(1) light work (up to 200 kcal/hr or 800 Btu/hr): e.g., sitting or standing to control machines, performing light hand or arm work,

(2) moderate work (200-350 kcal/hr or 800-1400 Btu/hr): e.g., walking about with moderate lifting and pushing, or

(3) heavy work (350-500 kcal/hr or 1400-2000 Btu/hr): e.g., pick and shovel work,

The permissible heat exposure limit for that workload shall be determined from Table 1.

2. Work-Rest Regimen

The permissible exposure limits specified in Table 1 and Figure 1 are based on he assumption that the WBGT value of the resting place is the same or very close to that of the workplace.

The permissible exposure limits for continuous work are applicable where there is a work-rest regimen of a 5-day work week and an 8-hour work day with a short morning and afternoon break (approximately 15 minutes) and a longer lunch break (approximately 30 minutes). Higher exposure limits are permitted if additional resting time is allowed. All breaks, including unscheduled pauses and administrative or operational waiting periods during work, may be counted as rest time when additional rest allowance must be given because of high environmental temperatures.

3. Clothing:

The permissible heat exposure TLVs are valid for light summer clothing as customarily worn by workers when working under hot environmental conditins. If special clothing is required for performing a particular job and this clothing is heavier or it impedes sweat evaporation or has higher insulation value, the worker's heat tolerance is reduced, and the permissible heat exposure limits indicated in Table 1 and Figure 1 are not applicable. For each job category where special clothing is required, the permissible hat exposure limit shall be established by an expert.

4. Acclimatization and Fitness:

Acclimatization to heat involves a series of physiological and psychological adjustments that occur in an individual during this first week of exposure to hot environmental conditions. The recommended heat stress TLVs are valid for acclimated workers who are physicall fit. Extra caution must be employed when unacclimated or physically unfit workers must be exposed to heat stress conditions.

TABLE 1
Permissible Heat Exposure Threshold Limit Values
(Values are given in °C WBGT)

	Work Load		
Work—Rest Regimen	Light	Moderate	Heavy
Continuous work	30.0	26.7	25.0
75% Work — 25% Rest, each hour	30.6	28.0	25.9
50% Work — 50% Rest, each hour	31.4	29.4	27.9
25% Work — 75% Rest, each hour	32.2	31.1	30.0

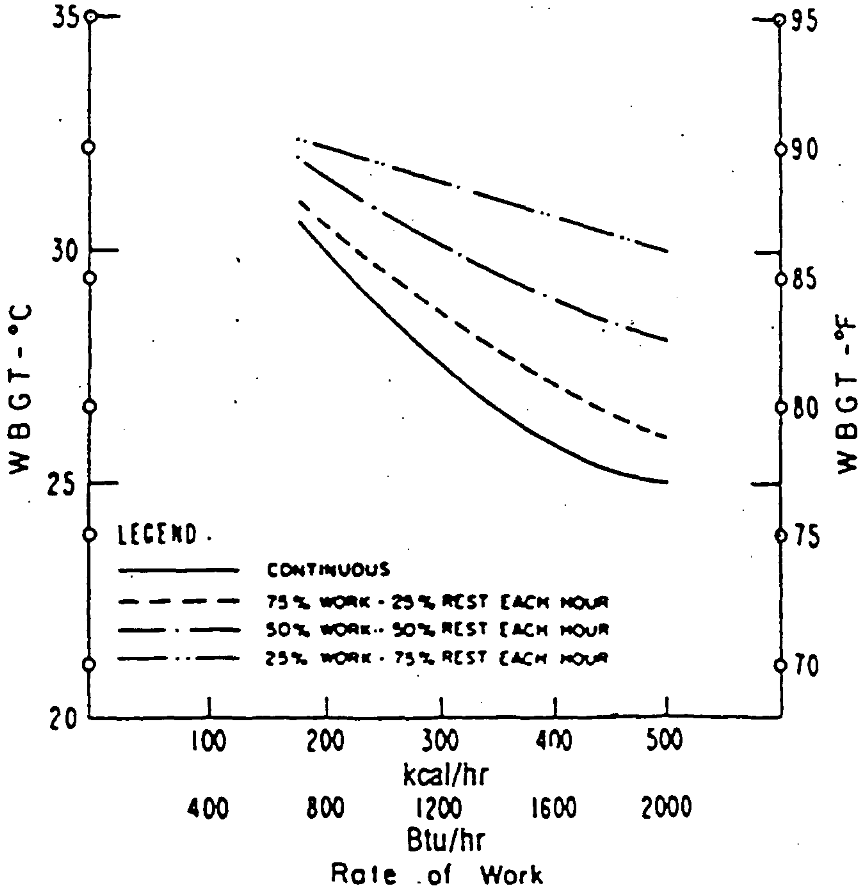

Figure 1 — Permissible Heat Exposure Threshold Limit Values.

HEAT STRESS (Preventive Management)

Adverse weather conditions are important considerations in planning and conducting site operations. Hot or cold weather can cause physical discomfort, loss of efficiency, and personal injury. Of particular importance is heat stress resulting when protective clothing decreases natural body ventilation.

Provide plenty of liquids. To replace body fluids (water and electrolytes) lost because of sweating, use a 0.1 percent saltwater solution, more heavily salted foods, or commercial mixes. The commercial mixes may be preferable for those employees on a low-sodium diet.

Body water loss (BWL) due to sweating should be measured by weighing the worker in the morning and in the evening. The clothing worn should be similar at both weighings; preferably the worker should be nude. The scale should be accurate to plus or minus 1/4 lb. BWL should not exceed 1.5 percent of the total body weight. If it does, the worker should be instructed to increase his daily intake of fluids by the weight lost. Ideally, body fluids should be maintained at a constant level during the work day. This requires replacement of salt lost in sweat as well.

Have workers drink 16 ounces of water before beginning work, such as in the morning or after lunch. Provide disposable 4-ounce cups, and water that is maintained at .50 - 60°F. Urge workers to drink 1 to 2 of these cups of water every 20 minutes for a total of 1 to 2 gallons per day. Provide a cool, preferably air conditioned area for rest breaks. Discourage the use of alcohol during non-working hours, and discourage the intake of coffee during working hours. Monitor for signs of heat stress.

Monitoring of personnel wearing impervious clothing should commence when the ambient temperature is 70°F or above. Frequency of monitoring should increase as the ambient temperature increases or as slow recovery rates are indicated. When temperatures exceed 80°F, workers should be monitored for heat stress after every work period. The following are important considerations:

1. Heart rate (HR) should be measured by the radial pulse for 30 sec. as early as possible in the resting period. The HR at the beginning of the rest period should not exceed 110 beats/min. If the HR is higher, the next work period should be shortened by 10 min. (or 33 percent), while the length of the rest period stays the same. If the pulse rate is 100 beats/min. at the beginning of the next rest period, the following work cycle should be shortened by 33 percent.

2. Body temperature should be measured orally with a clinical thermometer as early as possible in the resting period. Oral temperature (OT) at the beginning of the rest period should not exceed 99°F. If it does, the next work period should be shortened by 10 min. (or 33 percent), while the length of the rest period stays the same. However, if the OT exceeds 99.7°F at the beginning of the next period, the following work cycle should be further shortened by 33 percent. OT should be measured again at the end of the rest period to make sure that it has dropped below 99°F.

   Acclimate workers to site work conditions by slowly increasing workloads, i.e., do not begin site work activities with extremely demanding activities.

3. Provide cooling devices to aid natural body ventilation. These devices, however, add weight, and their use should be balanced against worker efficiency. Long cotton underwear acts as a wick to help absorb moisture and protect the skin from direct contact with heat-absorbing protective clothing. It should be the minimum under-garment worn.

   Install mobile showers and/or hose-down facilities to reduce body temperature and cool protective clothing.

   In extremely hot weather, conduct nonemergency response operations in the early morning or evening.

   Ensure that adequate shelter is available to protect personnel against heat, cold, rain, snow, etc., which can decrease physical efficiency and increase the probability of accidents.

   In hot weather, rotate shifts of workers wearing impervious clothing.

4. Good hygienic standards must be maintained by frequent change of clothing and daily showering. Clothing should be permitted to dry during rest periods. Persons who notice skin problems should immediately consult medical personnel.

HEAT STRESS CONDITIONS

1. Heat Cramps

Heat cramps are caused by perspiration that is not balanced by adequate fluid intake. Heat cramps are often the first sign of a condition that can lead to heat stroke.

- <u>Symptoms</u> -- Acute painful spasms of voluntary muscles, e.g., abdomen and extremities.

- <u>Treatment</u> -- Remove victim to a cool area and loosen clothing. Have patient drink 1 to 2 cups water immediately, and every 20 minutes thereafter until symptoms subside. Total water consumption should be 1 to 2 gallons per day. Consult with physician.

2. <u>Heat Rash</u>

Heat rash is caused by continuous exposure to heat and humid air and aggravated by chafing clothes. The condition decreases ability to tolerate heat.

- <u>Symptoms</u> -- Mild red rash, especially in areas of the body in contact with protective gear.

- <u>Treatment</u> -- Decrease amount of time in protective gear and provide powder to help absorb moisture and decrease chafing.

3. <u>Heat Stroke</u>

Heat stroke is an acute and dangerous reaction to heat stress caused by a failure of heat regulating mechanisms of the body -- the individual's temperature control system that causes sweating stops working correctly. Body temperature rises so high that brain damage and death will result if the person is not cooled quickly.

- <u>Symptoms</u> -- Red, hot, dry skin, although person may have been sweating earlier; nausea; dizziness; confusion; extremely <u>high</u> body temperature; rapid respiratory and pulse rate; unconsciousness or coma.

- <u>Treatment</u> -- Cool the victim quickly. If the body temperature is not brought down fast, permanent brain damage or death will result. Soak the victim in cool, but not cold, water; sponge the body with cool water or pour water on the body to reduce the temperature to a safe level (102°F). Observe the victim and obtain medical help. Do not give coffee, tea, or alcoholic beverages.

4. <u>Heat Exhaustion</u>

Heat exhaustion is a state of very definite weakness or exhaustion caused by the loss of fluids from the body. The condition is much less dangerous than heat stoke, but it nonetheless must be treated.

- <u>Symptoms</u> -- Pale, clammy, moist skin; profuse perspiration and extreme weakness. Body temperature is normal, pulse is weak and rapid, breathing is shallow. The person may have a headache, may vomit, and may be dizzy.

- <u>Treatment</u> -- Remove the person to a cool, air conditioned place, loosen clothing, place in a head-low position and provide bed rest. Consult physician, especially in severe cases. The normal thirst mechanism is not sensitive enough to ensure body fluid replacement. Have patient drink 1 to 2 cups water immediately, and every 20 minutes thereafter until symptoms subside. Total water consumption should be about 1 to 2 gallons per day.

Appendix D

Incident Report

INCIDENT REPORT

DATE OF REPORT ____________

SITE: ____________

SITE LOCATON: ____________

REPORT PREPARED BY: ____________
NAME PRINTED TITLE

INCIDENT CATEGORY
(check all that apply)

___ Injury ___ Illness ___ Property Damage

___ Near Miss ___ Fire ___ Chemical Exposure

___ Motor Vehicle ___On site equipment ___ Electrical

___ Mechanical ___ Other

DATE AND TIME OF INCIDENT ____________

Narrative Report of Incident:
(Provide sufficient detail so that the reader may fully understand the actions leading to or contributing to the incident, the incident occurrence, and actions following the incident. Append additional sheets of paper if necessary.)

WITNESSES TO INCIDENT

1. NAME ______________________________ COMPANY ______________
   ADDRESS ____
   TELEPHONE NO. ____

2. NAME ______________________________ COMPANY ______________
   ADDRESS ____
   TELEPHONE NO. ____

INJURIES

FIRST INJURED PERSON

Name and Address of Injured: ___________________________

____

SSN: ________________ Age: _______ Sex: _______

Years of Service: __________ Time on Present Job: ______

Title/Classification: ____________________________

Severity of Injury or Illness: _____ Non-disabling
_____ Disabling _____ Medical Treatment
_____ Fatality

Estimated Number of Days Away From Job: _________________

Nature of Injury or Illness: ___________________________

____

Classification of Injury:

_____ Fractures _____ Heat Burns _____ Cold Exposure
_____ Dislocations _____ Chemical Burns _____ Frostbite

____ Sprains
____ Abrasions
____ Lacerations
____ Punctures
____ Faint/Dizziness
____ Respiratory Allergy
____ Dermal Allergy

____ Radiation Burns
____ Bruises
____ Blisters
____ Toxic Respiratory Exposure

____ Heat Stroke
____ Heat Exhaustion
____ Concussion
____ Bites
____ Toxic Ingestion

Part of Body Affected: ____________________
Degree of Disability: ____________________

Date Medical Care was Received: ____________________
Where Medical Care was Received: ____________________
Address (if off-site):
____

If Hospitalized
Name, Address and Telephone No. of Hospital:
____

Name, Address and Telephone No. of Physician
____

SECOND INJURED PERSON

Name and Address of Injured: ____________________
____

SSN: ____________ Age: ______ Sex: ______

Years of Service: ________ Time on Present Job: ______

Title/Classification: ____________________

Severity of Injury or Illness: ____ Non-disabling
____ Disabling ____ Medical Treatment
____ Fatality

Estimated Number of Days Away From Job: ____________

Nature of Injury or Illness: ____________________
____

Classification of Injury:

____ Fractures
____ Dislocations
____ Sprains
____ Abrasions
____ Lacerations
____ Punctures
____ Faint/Dizziness
____ Respiratory Allergy
____ Dermal Allergy

____ Heat Burns
____ Chemical Burns
____ Radiation Burns
____ Bruises
____ Blisters
____ Toxic Respiratory Exposure

____ Cold Exposure
____ Frostbite
____ Heat Stroke
____ Heat Exhaustion
____ Concussion
____ Bites
____ Toxic Ingestion

Part of Body Affected: ____________________
Degree of Disability: ____________________
Date Medical Care was Received: ____________________
Where Medical Care was Received: ____________________
Address (if off-site):

____

If Hospitalized
Name, Address and Telephone No. of Hospital:

____

Name, Address and Telephone No. of Physician

____

(If more than two injuries, provide information on separate sheet).

PROPERTY DAMAGE

Brief Description of Property Damaged

____
____
____

Estimate of damage: $____________________

INCIDENT LOCATION

INCIDENT ANALYSIS

Causative agent most directly related to accident (Object, substance, material, machinery, equipment, conditions):

Was weather a factor?:

Unsafe mechanical/physical/environmental condition at time of incident (Be specific):

Unsafe act by injured and/or others contributing to the incident (Be specific, must be answered):

Personal factors (Improper attitude, lack of knowledge or skill, slow reaction, fatigue):

On Site Incidents

Level of personal protection equipment required in Site Safety Plan:

Modifications:

Was injured using required equipment?:

If not, how did actual equipment use differ from plan:

ACTION TAKEN TO PREVENT RECURRENCE

(Be very specific. What has or will be done? When will it be done? Who is the responsible party to insure that the correction is made?)

INCIDENT REPORT COMPLETED BY

HSO Name Printed HSO Signature

OTHERS PARTICIPATING IN INVESTIGATION

Name Printed Signature Title

Name Printed Signature Title

Name Printed Signature Title

Date ____________________

INCIDENT FOLLOW-UP

Date of Incident: ______________________________

Site: ____________________________________

Brief description of incident: ________________________________

Outcome of incident: ________________________________

Physician's recommendations: ________________________________

Date injured returned to work: ______________________________

ATTACH ANY ADDITIONAL INFORMATION TO THIS FORM

Appendix E

Health & Safety Reporting Forms

H&S WEEKLY REPORT

SITE: ______________________________

WEEK OF REPORT: ____________________

HSO: _______________________________

Activities	Levels of Protection	Comments/Unusual Occurrences
Drilling, GW sampling, etc.)	(Resp.)	
M		
T		
W		
Th		
F		

Summary of job-related injuries/illnesses:

Summary of violations or near misses:

Other notable items, incidents, conditions, etc.:

HOURLY ESTIMATE
LEVELS OF PROTECTION

SITE________________________________ COMPLETED BY______________________________

WEEK ___/___/___

PRIMARY ACTIVITY
DURING WEEK______________________________

NAME/JOB	LEVEL	S /	M /	T /	W /	T /	F /	S /	TOTAL
	D								
	C								
	B								
	D								
	C								
	B								
	D								
	C								
	B								
	D								
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	B								

EXPOSURE DATA SUMMARY

Date Summary: (From) ____________________(To) ____________________ Form ID#: Activity/Form # ____________________

Site:______________________________Location:______________________ HSO:______________________________

Job #:______________________

I. II.

Date	Subactivity/ Location	(Real-Time) Measurement Range Avg./Range	Instr.	Personal Sample Collected	Temp. Range	Upwind/ Downwind/ Crosswind	WS Range	Weat. Cond.	PPE Resp/Cloth	UG	DG

Comments:

Appendix F

OSHA Poster

JOB SAFETY & HEALTH PROTECTION

The Occupational Safety and Health Act of 1970 provides job safety and health protection for workers by promoting safe and healthful working conditions throughout the Nation. Requirements of the Act include the following:

Employers

All employers must furnish to employees employment and a place of employment free from recognized hazards that are causing or are likely to cause death or serious harm to employees. Employers must comply with occupational safety and health standards issued under the Act.

Employees

Employees must comply with all occupational safety and health standards, rules, regulations and orders issued under the Act that apply to their own actions and conduct on the job.

The Occupational Safety and Health Administration (OSHA) of the U.S. Department of Labor has the primary responsibility for administering the Act. OSHA issues occupational safety and health standards, and its Compliance Safety and Health Officers conduct jobsite inspections to help ensure compliance with the Act.

Inspection

The Act requires that a representative of the employer and a representative authorized by the employees be given an opportunity to accompany the OSHA inspector for the purpose of aiding the inspection.

Where there is no authorized employee representative, the OSHA Compliance Officer must consult with a reasonable number of employees concerning safety and health conditions in the workplace.

Complaint

Employees or their representatives have the right to file a complaint with the nearest OSHA office requesting an inspection if they believe unsafe or unhealthful conditions exist in their workplace. OSHA will withhold, on request, names of employees complaining.

The Act provides that employees may not be discharged or discriminated against in any way for filing safety and health complaints or for otherwise exercising their rights under the Act.

Employees who believe they have been discriminated against may file a complaint with their nearest OSHA office within 30 days of the alleged discrimination.

Citation

If upon inspection OSHA believes an employer has violated the Act, a citation alleging such violations will be issued to the employer. Each citation will specify a time period within which the alleged violation must be corrected.

The OSHA citation must be prominently displayed at or near the place of alleged violation for three days, or until it is corrected, whichever is later, to warn employees of dangers that may exist there.

Proposed Penalty

The Act provides for mandatory penalties against employers of up to $1,000 for each serious violation and for optional penalties of up to $1,000 for each nonserious violation. Penalties of up to $1,000 per day may be proposed for failure to correct violations within the proposed time period. Also, any employer who willfully or repeatedly violates the Act may be assessed penalties of up to $10,000 for each such violation.

Criminal penalties are also provided for in the Act. Any willful violation resulting in death of an employee, upon conviction, is punishable by a fine of not more than $10,000, or by imprisonment for not more than six months, or by both. Conviction of an employer after a first conviction doubles these maximum penalties.

Voluntary Activity

While providing penalties for violations, the Act also encourages efforts by labor and management, before an OSHA inspection, to reduce workplace hazards voluntarily and to develop and improve safety and health programs in all workplaces and industries. OSHA's Voluntary Protection Programs recognize outstanding efforts of this nature.

Such voluntary action should initially focus on the identification and elimination of hazards that could cause death, injury, or illness to employees and supervisors. There are many public and private organizations that can provide information and assistance in this effort, if requested. Also, your local OSHA office can provide considerable help and advice on solving safety and health problems or can refer you to other sources for help such as training.

Consultation

Free consultative assistance, without citation or penalty, is available to employers, on request, through OSHA supported programs in most State departments of labor or health.

More Information

Additional information and copies of the Act, specific OSHA safety and health standards, and other applicable regulations may be obtained from your employer or from the nearest OSHA Regional Office in the following locations:

Atlanta, Georgia
Boston, Massachusetts
Chicago, Illinois
Dallas, Texas
Denver, Colorado
Kansas City, Missouri
New York, New York
Philadelphia, Pennsylvania
San Francisco, California
Seattle, Washington

Telephone numbers for these offices, and additional area office locations, are listed in the telephone directory under the United States Department of Labor in the United States Government listing.

Washington, D.C.
1985
OSHA 2203

Bill Brock

William E. Brock, Secretary of Labor

U.S. Department of Labor
Occupational Safety and Health Administration

Under provisions of Title 29, Code of Federal Regulations, Part 1903.2(a)(1) employers must post this notice (or a facsimile) in a conspicuous place where notices to employees are customarily posted.