Contract No. DAAA15-91-D-0011
Task Order No. 5

US Army Corps of Engineers

Toxic and Hazardous Materials Agency

FINAL

FORT WINGATE DEPOT ACTIVITY

FIELD INVESTIGATION, PREPARATION OF THE RI/FS REPORT, AND ACCELERATED TRANSFER OF THE SOUTHWEST PROPERTY, IGLOO BLOCKS A, B, AND C, AND THE BALLISTIC MISSILE SITE AREAS

SUPPLEMENTAL HEALTH AND SAFETY PLAN, ELIN A008

Prepared for

U.S. ARMY TOXIC AND HAZARDOUS MATERIALS AGENCY
ABERDEEN PROVING GROUND, MARYLAND 21010

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ACRONYMS AND ABBREVIATIONS

ACGIH	American Conference of Governmental Industrial Hygienists
AEHA	Army Environmental Hygiene Agency
AMCCOM	Armament Munitions and Chemical Command
ANL	Argonne National Laboratory
AOCs	Areas of Concern
APR	Air Purifying Respirator
ASTM	American Society for Testing and Materials
°C	Degrees Celsius
CFR	Code of Federal Regulations
CGI	Combustible Gas Indicator
COR	Contracting Officer's Representative
CRZ	Contamination Reduction Zone
CSEP	Confined Space Entry Permit
dB(A)	Decibel
DOA	Department of Army
DQO	Data Quality Objectives
DOT	Department of Transportation
DRMO	Defense Reutilization and Marketing Office
EI	Environmental Investigation
EM	Electromagnetic
EOD	Explosive Ordnance Disposal
ERM	Environmental Resources Management, Inc.
°F	Degrees Fahrenheit
ft	Feet
FWDA	Fort Wingate Depot Activity
GC	Gas Chromatograph
GC/MS	Gas Chromatograph/Mass Spectrometer
HNU-PID	HNu Photoionization Detector

IDLH	Immediately Dangerous to Life or Health
IRP	Installation Restoration Program
MSDS	Material Safety Data Sheet
NIOSH	National Institute for Occupational Safety and Health
OB/OD	Open Burning/Open Detonation
OSHA	Occupational Safety and Health Administration
OVA	Organic Vapor Analyzer
PCB	Polychlorinated Biphenyl
PCP	Pentachlorophenol
PEL	Permissible Exposure Limit (OSHA Reg., Enforceable by Law)
PID	Photoionization Detector
PPE	Personal Protective Equipment
ppm	Parts Per Million
PVC	Polyvinyl Chloride
QA	Quality Assurance
QC	Quality Control
RCRA	Resource Conservation and Recovery Act
RDX	Royal Demolition Explosive (Cyclonate)
SCBA	Self-Contained Breathing Apparatus
SOP	Standard Operating Procedure
SHSP	Supplemental Health and Safety Plan
SSO	Site Safety Officer
SWMUs	Solid Waste Management Units
TEAD	Tooele Army Depot
TAL	Target Analyte List
TCL	Target Compound List
TLV	Threshold Limit Value (ACGIH Recommendation)
TPH	Total Petroleum Hydrocarbons
TWA	Time Weighted Average
USATHAMA	United States Army Toxic and Hazardous Materials Agency

U.S. EPA	United States Environmental Protection Agency
UXO	Unexploded Ordnance
VOA	Volatile Organic Analyte/Analysis

1.0 INTRODUCTION

The purpose of this Supplemental Health and Safety Plan (SHSP) is to establish procedures and protocols that will be followed in conducting an Environmental Investigation (EI) at Fort Wingate Depot Activity (FWDA). This plan has been prepared for the United States Army Toxic and Hazardous Material Agency (USATHAMA) by Environmental Resources Management (ERM) in partial fulfillment of Contract No. DAAA15-D-0011, Delivery Order No. 5 (ELIN A008).

This SHSP has been prepared to assign responsibilities, to establish personnel protection standards, mandatory safety practices and procedures, and to provide for contingencies that may arise while the field operations are conducted as part of the planned EI field activities. The procedures outlined in this plan are in conformance with the ERM Corporate Health and Safety Program and have been developed to comply with applicable local, state, and federal safety requirements.

1.1 BACKGROUND

The objective of conducting the EI Program is to prepare the FWDA facility for future property transfer. Accelerated release to the Bureau of Land Management of the southwestern area (approximately 7,000 acres) and Igloo Blocks A, B, and C is desired. During the implementation of this EI, the nature and extent of contaminant releases to soils, ground water, sediment and surface water from identified Areas of Concern (AOCs) will be investigated.

This work will conform with the directives contained in the Defense Authorization Amendments and Base Closure and Realignment Act of 1988. This Act mandated the closure or realignment of military bases to economically maximize Army activities without affecting military operations. A total of 111 installations were recommended for either closure or realignment in 1988 by the Base Realignment and Closure Commission. The FWDA was one of the installations targeted for closure and disposal by the U.S. Army.

As mandated, the base realignments and closures must comply with applicable environmental laws. Disposal of the FWDA cannot occur until the potential or identified environmental issues have been evaluated and a Statement of Condition issued through USATHAMA.

1.2 *APPROACH*

The procedures set forth in this plan are designed to reduce the risk of exposure to chemical substances that may be present in the soil, water, and air and to other hazards associated with any of the field activities. The procedures set forth herein are developed in accordance with the provisions of 29 CFR 1910.120 (Hazardous Waste Operations and Emergency Response) and in accordance with corporate experience in similar field operations.

This plan has been developed for use during those activities involving ERM personnel. A Final Health and Safety Plan for the Environmental Investigation (EI) at Fort Wingate Depot Activity (FWDA), Gallup, New Mexico, dated 6 November 1992, was prepared by Metcalf & Eddy, Inc. and has been referenced and excerpted in the preparation of this SHSP.

ERM shall be responsible solely for compliance with the provisions of the SHSP by ERM employees, subcontractors of ERM (on-site activities only) where applicable, and designated personnel other than ERM employees and subcontractors. Any other personnel are required to prepare and are responsible for administration of their own health and safety program. If these personnel are present on-site, ERM will inform them that it is the responsibility of their employer to provide them with health and safety information (including training, medical monitoring, equipment, etc.) in compliance with relevant regulations. If any personnel other than those explicitly authorized by contract or subcontract agreement or specifically mentioned in this plan should use this plan without the expressed authority of ERM, they do so at their sole risk.

The recommended health and safety guidelines set forth within this document may be modified as further information is made available during sample analysis and/or on-site characterization. Site-specific information is presented in Sections 2 through 14 of this plan, with general health and safety information presented in Appendixes A through G.

Specific goals of this plan include:

1. Detail the safety, accident, and fire protection standards and procedures to be used during the course of the project;
2. Outline standard operating procedures to ensure the safety of all ERM personnel and subcontractor personnel performing activities associated with the FWDA investigations;
3. Outline the emergency and contingency plans for protection of ERM and subcontractor personnel and for any contingencies which might also affect FWDA personnel; and

4. Designate the responsibilities and authorities for implementing this plan, as well as reporting procedures.

The evaluation of hazards, the levels of protection, and the procedures presented in this plan are based on the best and most current available information regarding the conditions at FWDA. The specifications described herein represent the minimum health and safety requirements to be observed by all site personnel. Unforeseen conditions or personnel preferences may require the use of higher levels of protection. Because site conditions may change, it is required that selected personal protective measures be continually assessed by the designated Site Safety Officer and approved by the Project Safety Supervisor prior to and during the field investigations. All project personnel must read this document carefully and complete a sign-off sheet prior to initiation of field work.

Each field team will have a copy of the SHSP in their possession for easy reference. Safety briefings will be conducted on site whenever new field teams and/or visitors arrive on site. At this time, any modifications to the plan as necessitated by changing field conditions will be explained and documented by an addendum to the plan. The plan will also be available at the ERM field office to facilitate inspection and review by ERM and subcontractor personnel, FWDA or Tooele Army Depot (TEAD) representatives, U.S. Army Toxic and Hazardous Materials Agency (USATHAMA) representatives, and Occupational Safety and Health Administration (OSHA) staff.

1.3 *REFERENCES*

This SHSP and all field activities at FWDA will be in compliance with the most current versions of the following reference documents:

- Final Health and Safety Plan for the Environmental Investigation at Fort Wingate Depot Activity, Gallup, New Mexico, November 6, 1992, prepared by Metcalf & Eddy, Inc.;
- Contract No. DAAA15-91-D-0011, Army Total Environmental Program Support;
- U.S. Army Materiel Development and Readiness Command Regulation (DARCOM-R) 385-100, Army Regulation (AR) 385-10;
- Department of the Army Pamphlet (DA PAM) 385-1;
- U.S. Department of Labor, OSHA Standards, 29 CFR Part 1910.120 and 1926;

- U.S. Environmental Protection Agency (EPA), Office of Emergency and Remedial Response, Standard Operating Safety Guides, July 1988;
- NIOSH/OSHA/USGS/EPA Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, October 1985; and
- EA Laboratories Analytical Laboratory Safety Plan.

2.0 *SITE INFORMATION*

Fort Wingate Depot Activity (FWDA) occupies approximately 34 square miles (mi^2) (22,120 acres) of land in northwestern New Mexico, in McKinley County. The installation is located (Figure 2-1) 8 miles east of Gallup, and about 130 miles west of Albuquerque on Interstate 40. It is bordered on the west by the Zuni Indian Reservation, on the south and east by the Cibola National Forest, and on the north by the Red Rock State Park. Although its history dates back to 1850 (Old Fort Wingate), almost all of the present depot facilities were constructed since 1941.

The installation presently is under the command of Tooele Army Depot (TEAD), located near Salt Lake City, Utah. As previously stated, the FWDA is currently undergoing installation closure and property transfer. The FWDA assigned mission included three primary functions: (1) to provide facilities for the storage of material, namely, ammunition components (explosive and inert), and other commodities (such as equipment and spare parts); (2) to handle the shipping and receiving of material, primarily by rail or vehicular transport; and (3) to demilitarize and dispose of obsolete or deteriorated explosives and munitions, rendering them harmless. At the time of initiation of the EI Program site activities, all remaining ammunition and munitions will have been removed from the FWDA and demilitarization (open burning/open demolition) activities will have ceased. Currently, the Base Commander, Captain David Lee, is the only military person assigned to the depot.

The FWDA is almost entirely surrounded by federally owned or administered land, including both national forest and Indian lands. The communities or areas of residential development within the immediate vicinity of FWDA are on Indian lands. McKinley County has not adopted any zoning ordinances and currently has no local zoning authority.

Transportation facilities for the FWDA are as follows. The nearest town and trade center to FWDA is the city of Gallup. The main entrance road of the depot connects with Interstate 40 approximately 8 miles east of Gallup. The depot itself contains about 150 miles of internal roads (70 miles surfaced and the rest dirt). There is no bus service between Gallup and the FWDA. The Atchison, Topeka and Santa Fe Railroad serves the major rail needs of the installation, and within the depot are approximately 22 miles of trackage (primarily to the ammunition magazine areas). There is no Army airfield on FWDA. The closest air field to the depot is the Gallup Municipal Airport, about 15 miles away.

The mailing address for FWDA is:

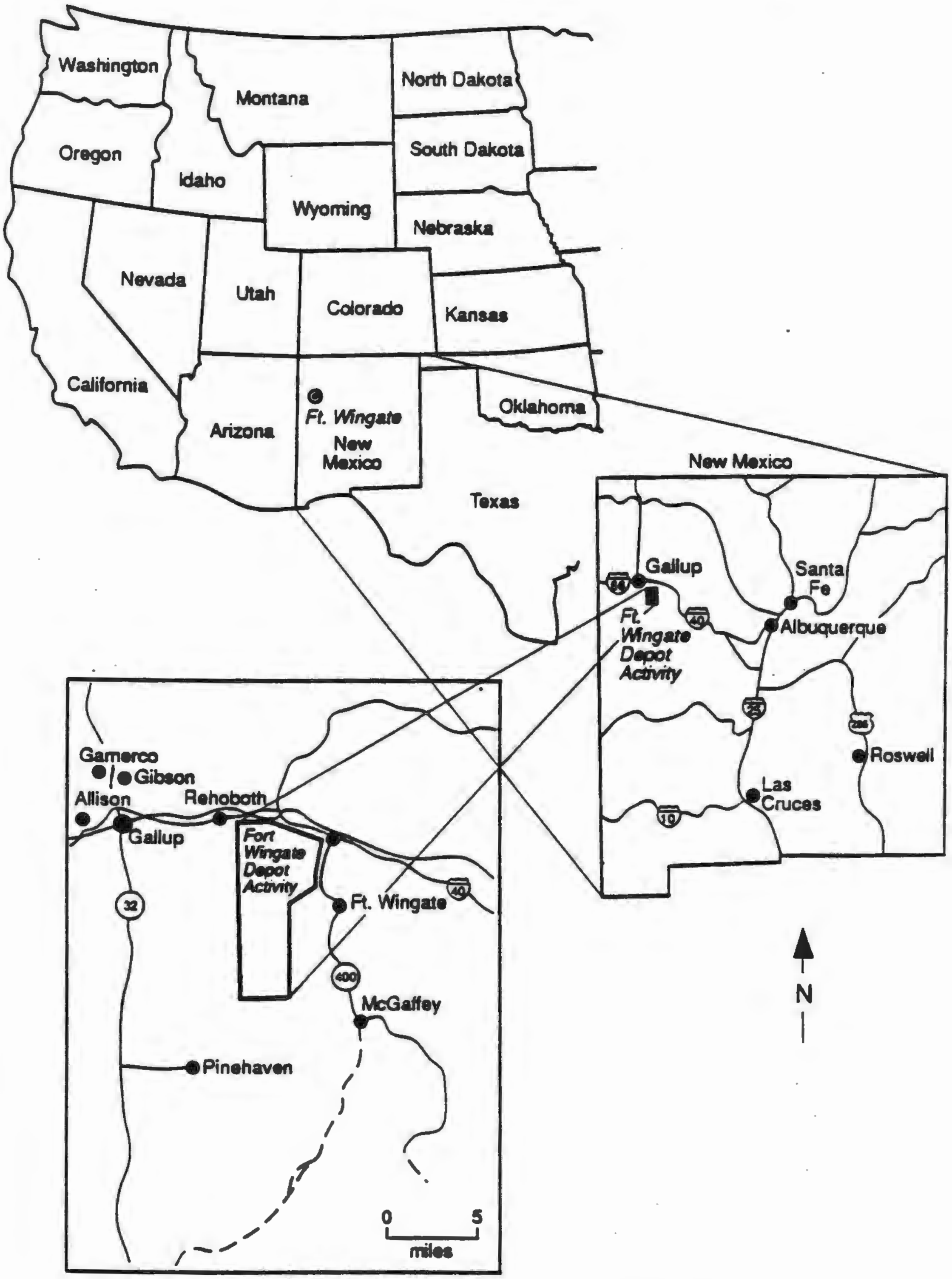
Commander
Fort Wingate Depot Activity
Gallup, New Mexico 87301

In general, the following potential hazards are expected to be associated with the FWDA EI and will be addressed in this SHSP.

- Unexploded ordnance (UXO) and debris resulting from demilitarization/disposal operations.
- Biologic hazards (poisonous plants, insects, animals, reptiles, etc.)
- Weather hazards (lightning, flash flooding, mudslides, etc.)
- Difficult terrain (slippery surfaces, steep grades, etc.)
- Electrical hazards (overhead power lines, buried utilities and cables, etc.)
- Heat stress/cold exposure
- Possible chemical exposures through dust generation, release of volatile compounds from disturbed soils or ground water, skin contact, and ingestion

In addition, the EI Program will include performing an evaluation of the FWDA facilities for impacts associated with former PCB transformers, lead-based paint and asbestos. The evaluation will be based primarily on visual surveys and reviews of previously prepared reports . In addition, field sampling will be performed in suspected areas related to the PCB transformers and suspected lead-based paint.

Figure 2-1
Location of Fort Wingate Depot Activity



Source: "Master Environmental Plan: Ft. Wingate Depot Activity, Gallup New Mexico," December 1990

3.0 PROPOSED ON-SITE INVESTIGATIONS

The primary objective of conducting the FWDA EI is to determine the nature and extent of contaminant releases to soils, ground water, sediments, and surface water from the identified Solid Waste Management Units (SWMUs) and Areas of Concern (AOCs).

Although the FWDA is not a Superfund site, as a federal facility the FWDA EI will be performed in general agreement with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended, the U.S. Environmental Protection Agency (U.S. EPA) Remedial Investigation/Feasibility Study (RI/FS) process, and the associated U.S. EPA guidance. In addition, the EI will be performed in accordance with the National Environmental Policy Act (NEPA) and the President's Council on Environmental Quality (CEQ) regulations, with USATHAMA guidance on the integration of NEPA with the EI process (memorandum from the Installation Restoration Division, 24 January 1990), and with Army Regulation 200-2 (Environmental Effects of Army Actions, 23 December 1988). A NEPA document has been prepared for FWDA.

In the performance of the field activities of this EI, only those AOCs which are identified as providing potential pathways for risk to human health and the environment will be investigated. Thus, field activities will be limited to the characterization of chemicals of concern in those AOCs which are identified as leading to potential risks, and then, only to the extent required to investigate possible releases of those chemicals. In addition to restricting investigation to only those AOCs which lead to pathways for risk, priority for investigation will be given to areas on FWDA for which early transfer is desired and those for which few AOCs are identified. A rapid transfer of the major portions of the property is anticipated by the Army because of the relatively clean status of this facility due to the type of activities conducted at FWDA.

Candidate AOCs for investigation at FWDA include those SWMUs and AOCs identified by the Argonne National Laboratory in the Enhanced Preliminary Assessment Report and the Master Environmental Plan for FWDA (ANL, 1990 a,b). In addition, candidate AOCs were considered from those identified in the RCRA Facility Assessment Report (PRC, 1990) and the Final Environmental Impact Statement (U.S. Army Corps of Engineers, 1991). Candidate AOCs also included those identified as a result of information obtained during site visits and through visual observations. Since the precise location and extent of some of the AOCs are not well known at this time, the investigation is designed to include reconnaissance techniques such as soil gas surveys and geophysical surveys to aid in determining the location, nature, and general extent of these areas.

Field activities in the EI program are designed to characterize wastes that may be present in the units themselves only to the extent required to investigate such releases. The goal of these release investigations is to provide the information needed to determine whether or not interim corrective measures or a Feasibility/Corrective Measures Study are required. The proposed field investigations associated with the FWDA EI are summarized in "Table 3.1 Summary of EI at Fort Wingate Depot Activity", from the Final Health and Safety Plan for the Environmental Investigation (EI) at Fort Wingate Depot Activity (FWDA), dated 6 November 1992, prepared by Metcalf & Eddy. A copy of Table 3.1 is provided as Appendix 3.1 of this document.

Appendix 3-1

- *"Table 3.1 Summary of EI at Fort Wingate Depot Activity," from the Final Health and Safety Plan for the Environmental Investigation (EI) at Fort Wingate Depot Activity (FWDA), dated 6 November 1992, prepared by Metcalf & Eddy, Inc.*

TABLE 3.1 SUMMARY OF EI AT FORT WINGATE DEPOT ACTIVITY

AREA OF CONCERN	DESCRIPTION	SPATIAL DIMENS.	ACTIVE/ INACT.	REGULATORY STATUS	RELEASE HISTORY	RELEASE POTENTIAL	CHEMICALS OF CONCERN	RELEASE PATHWAY	REMEDIAL ACTION TAKEN	PROPOSED ACTIVITIES
7,000 Acres										
Missile Launch Sites BMTS site Pershing site Unused site	Used to test launch missiles from FWDA to White Sands Missile Range.	Concrete Pads 10 ft x 10 ft	Inactive	None	Two rocket engines were reported to be buried at the BMTS site.	Low	Explosives.	Surface soils.	None	Magnetometer survey and surface soil sampling.
Magazine/Igloo Area										
Group A	Munitions storage.	61 ft x 27 ft x 13	Active	None	No record releases.	Low	Explosive residue/dust.	Surface soils, surface water drainage pathways, and accumulation dust.	None	Wipe samples, surface soils, and sediment.
Group B	Munitions storage.	61 ft x 27 ft x 13	Active	None	No record releases.	Low	Explosive residue/dust.	Surface soils, surface water drainage pathways, and accumulation dust.	None	Wipe samples, surface soils, and sediment.
Group C	Munitions storage.	61 ft x 27 ft x 13	Active	None	No record releases.	Low	Explosive residue/dust.	Surface soils, surface water drainage pathways, and accumulation dust.	None	Wipe samples, surface soils, and sediment.
Group C Disposal	Located in and adjacent to an arroyo. It contains scrap metal, tires, ammunition canister, etc.	Unknown	Inactive	None	No record of releases.	Medium	Explosives, TAL inorganics, TCL organics, PCBs, and UXO.	Surface soils, subsurface soils and surface water pathways.	None	Geophysical survey, UXO survey, borings, to 20 feet, surface soil and sediment sampling.
Administration Area										
Former Maintenance Operations Building 5 Building 15	Building 15 was used for automotive maintenance. Building was used for general maintenance operations.	18,375 sq ft 17,440 sq ft	Inactive	None	Neutralized battery acid was disposed of down storm sewer.	Medium	Waste oils, solvents, sulfuric acid, greases, insecticide and pesticides.	Surface soils, subsurface soils, and sewer lines.	None	Soil sampling, soil borings, sump sediment.

TABLE 3.1 SUMMARY OF EI AT FORT WINGATE DEPOT ACTIVITY

AREA OF CONCERN	DESCRIPTION	SPATIAL DIMENS.	ACTIVE/ INACT.	REGULATORY STATUS	RELEASE HISTORY	RELEASE POTENTIAL	CHEMICALS OF CONCERN	RELEASE PATHWAY	REMEDIAL ACTION TAKEN	PROPOSED ACTIVITIES
Former Storage Yard	Open ground was used for storage of drums, radiators, spent batteries, etc. and a concrete slab was used for coal storage.	200'x 400' (open) 600'x 400' (fenced)	Inactive Inactive	Not listed on Part A or Part B permit applications.	No record of significant releases.	Low	Waste oils, solvents, pesticides, and PCBs.	Surface soils, subsurface soils, and ground water (if present).	Soil removal conducted under direction of Tooele. Proposed activities for verification.	Soil gas survey, borings to 10 feet, and surface soil sampling.
Former POL Waste Discharge	POLs were disposed of on open ground. The site was covered with clean soil in 1976. The location of this area is not precisely known.	20'x 20'	Inactive	Not listed on Part A or Part B permit applications.	Soil was reported to be saturated with POLs.	Medium	Waste POLs, solvents, pesticides, and PCBs.	Surface soils, subsurface soils, and ground water (if present).	None	Soil gas survey, borings to 10 feet and sampling existing monitoring wells. Two locations investigated.
Sewage Treatment Plant	The sewage plant consists of a bar screen, lift station, Imhoff tank, sludge drying beds, stabilization ponds, evaporation ponds, and infiltration ponds.	504 sq ft	Active	Not RCRA regulated.	None	Low	Domestic sewage.	Surface soils and subsurface soils. Sediment from overflow drainage.	None	Borings to 5 and 10 feet. Surface water (if present), and sludg from Imhoff tank.
Old Landfill - Water Tower	The landfill accepted a variety of solid wastes until 1966 and then covered it with soil.	Unknown	Inactive	Not RCRA regulated. Not permitted by New Mexico.	No record of releases.	Medium	Unknown	Gas migration, leachate and soils.	Site was closed and covered with soil in 1966.	Soil gas survey and borings to 20 feet.
Fire Training Grounds	Use in fire training exercises. Gasoline and used oil were used for fires. The site is an unlined pit. A railroad car is located near one of the pits.	20' (diameter)	Active	No record of regulatory status.	Oil stains and fuel odor reported during visits.	High	Diesel fuel, oils and spent solvents.	Soils and ground water.	None	Surface soil sampling and borings to 20 feet.
Former Locomotive Shop	Building 11, was reported to contain a transformer that leaked onto the basement floor for several months before it was detected.	6,228 sq ft	Inactive	PCBs regulated by TSCA.	Leaking transformer.	Medium	PCBs	Surface soil drain.	None	Wipe and chip samples sump sediment.
Former Inert Storage Warehouse	Building 29 was used for the storage of herbicides and pesticides. The building has a concrete floor and is well ventilated.		Inactive	No record of regulatory status.	No record of releases.	Low	Herbicides and pesticides.	Surface soil and accumulated oil surfaces.	None	Surface soil and wipe samples.
Above-ground Storage Tanks Gate 209(Building 530)-diesel Gate 209(Building 530)-diesel Gate 209 - diesel Building 11 - diesel	Above ground storage tanks-diesel fuel.	1,000 gal 1,000 gal 166 gal 420 gal	Inactive Inactive Active Active		No record of releases.	Low	Diesel fuel	Surface and subsurface soils.	None	None

TABLE 3.1 SUMMARY OF EI AT FORT WINGATE DEPOT ACTIVITY

AREA OF CONCERN	DESCRIPTION	SPATIAL DIMENS.	ACTIVE/ INACT.	REGULATORY STATUS	RELEASE HISTORY	RELEASE POTENTIAL	CHEMICALS OF CONCERN	RELEASE PATHWAY	REMEDIAL ACTION TAKEN	PROPOSED ACTIVITIES
Workshop Area										
Former TNT Washout Plant Leaching Bed – pre-1982 Leaching Beds – post 1982	Buildings 503 housed the TNT washout equipment. Washout was disposed of in three leaching beds located north of Building 503.	100'x 150'x 150' 250'x 150'x 3'	Inactive Inactive Inactive	RCRA Part A (1980)	Previous investigations show contamination of soils by explosives.	Medium	Explosives and explosive residues.	Surface soils, subsurface soils, and ground water (if present).	During operation, soil was periodically removed from the leaching beds.	Borings to 10 and 20 feet. Surface and sediment sampling. Groundwater sampling of existing wells.
Former Boiler Plant	Building 501 was used to provide steam for Building 503 and area buildings. The boiler plant is connected to Building 503 via piping.	Unknown	Inactive	No record of regulatory status.	No record of release.	Low	Explosives and explosive residues.	Surface soil.	None	Surface soil and wipe samples.
Former TNT Flaker Building	Building 503 was used to house washout equipment including the settling tanks for the TNT washout process.	13,120 sq ft	Inactive	No record of regulatory status.	No record of release.	Medium	Explosives and explosive residues.	Piping.	None	Inventory of equipment inside building. Wipe and sediment samples.
Former TNT Washout Tank	Settling tanks used to hold "pink water" prior to its discharge to the leaching beds.	6'x 12'x 6'	Inactive	None	None	Low	Explosives and explosive residues.	Surface water tank bottoms.	None	Sample water and sediment currently in tank.
Former Acid Waste Holding Pond	The pond is earthen and unlined. It was used for evaporation and infiltration of washout water and pickling solution.	20'x 20'x 3'	Inactive	RCRA Part A (1980)	Previous investigations found hazardous organic compounds.	High	Acid, PCBs, pesticides, explosives, and explosive residues.	Surface soil subsurface soil, and ground water (if present).	None	Surface soil samples and borings to 20 feet.
Former Deactivation Furnace	Furnace was located in Building 530 before being dismantled and parts disposed of in adjacent acid pits.	4000 sq ft	Inactive	RCRA Part A (1980)	No reported releases, but degradation of concrete was observed.	Medium	Explosives, phosphorous, metals, and acids.	Surface soils, concrete structure, subsurface soil, runoff sediment surface.	Furnace has been dismantled.	Borings, surface soil, sediment and concrete chip sampling.
Former PCB Transformer Storage	Transformers were stored in Building 501 while awaiting pick-up by DRMO.	4500 sq ft	Inactive	No record of regulatory status.	No record of release.	Low	PCBs.	Residue on concrete.	None have been removed.	Chip and wipe samples.
Pesticide Storage Building	Building 537, was used to store pesticides prior to use.	4,200 sq ft	Inactive	Not RCRA regulated.	No record of release.	Low	Pesticides.	Surface soil accumulated on flat surfaces.	None	Wipe, surface water, and sediment sampling. (Water and sediment from pit in basement).

TABLE 3.1 SUMMARY OF EI AT FORT WINGATE DEPOT ACTIVITY

AREA OF CONCERN	DESCRIPTION	SPATIAL DIMENS.	ACTIVE/ INACT.	REGULATORY STATUS	RELEASE HISTORY	RELEASE POTENTIAL	CHEMICALS OF CONCERN	RELEASE PATHWAY	REMEDIAL ACTION TAKEN	PROPOSED ACTIVITIES
Current Landfill	Contains mostly construction debris, land debris, cardboard, paper, etc.	6 acres 20 feet thick	Active	None	No record of releases.	Low	Unknowns	Surface soils, leachate, and landfill gas.	None	Soil gas survey, borings to 20 feet, sediment and ground water sampling. (Water)
Former Painting/Acid Washout Building	Building 515	4200 sq ft	Inactive	None	Previous investigations found hazardous organic compounds.	Medium	Acid, PCBs, pesticides, explosives, and explosive residues.	Subsurface soil and dust/residue.	None	Borings to 10 feet and wipe samples. feet.
Magazine/Igloo Area										
Group D	Munitions storage.	61 ft x 27 ft x 13 ft	Active	None	No record releases.	Low	Explosive residue/dust.	Surface soils, surface water drainage pathways, and accumulation dust.	None	Wipe samples, surface soils, and sediment.
Group E	Munitions storage.	61 ft x 27 ft x 13 ft	Active	None	No record releases.	Low	Explosive residue/dust.	Surface soils, surface water drainage pathways, and accumulation dust.	None	Wipe samples, surface soils, and sediment.
Group F	Munitions storage.	61 ft x 27 ft x 13 ft	Active	None	No record releases.	Low	Explosive residue/dust.	Surface soils, surface water drainage pathways, and accumulation dust.	None	Wipe samples, surface soils, and sediment.
Group G	Munitions storage.	61 ft x 27 ft x 13 ft	Active	None	No record releases.	Low	Explosive residue/dust.	Surface soils, surface water drainage pathways, and accumulation dust.	None	Wipe samples, surface soils, and sediment.
Group H	Munitions storage.	61 ft x 27 ft x 13 ft	Active	None	No record releases.	Low	Explosive residue/dust.	Surface soils, surface water drainage pathways, and accumulation dust.	None	Wipe samples, surface soils, and sediment.
Group J	Munitions storage.	61 ft x 27 ft x 13 ft	Active	None	No record releases.	Low	Explosive residue/dust.	Surface soils, surface water drainage pathways, and accumulation dust.	None	Wipe samples, surface soils, and sediment.

TABLE 3.1 SUMMARY OF EI AT FORT WINGATE DEPOT ACTIVITY

AREA OF CONCERN	DESCRIPTION	SPATIAL DIMENS.	ACTIVE/ INACT.	REGULATORY STATUS	RELEASE HISTORY	RELEASE POTENTIAL	CHEMICALS OF CONCERN	RELEASE PATHWAY	REMEDIAL ACTION TAKEN	PROPOSED ACTIVITIES
Group K	Munitions storage.	61 ft x 27 ft x 13 ft	Active	None	No record of releases.	Low	Explosive residue/dust.	Surface soils, surface water drainage pathways, and dust	None	Wipe samples, surface soils, and sediment.
Demolition/Burning Areas										
Burning Ground	Used for burning propellants.		Active	RCRA Interim Part B	None	Low	Explosives.	Surface soils, subsurface soils surface water runoff pathway and groundwater (if present).	None	Sediment samples in the arroyo. Surface soils and borings to 20 feet.
Demolition Craters	Used for exploding ordnance.		Active	RCRA Interim Part B	None	Medium	Explosives and UXO.	Surface soils, subsurface soils surface water runoff pathway and groundwater (if present).	None	Sediment samples in the arroyo. Surface soils and borings to 20 feet.
Old Burning Ground Piles/ Demolition Landfill	Used for burning propellants and disposal of residue and material for a demolition of explosives.		Inactive	None	None	Medium	Explosives.	Surface soils, subsurface soils surface water runoff pathway and groundwater (if present).	None	UXO, geophysical survey, surface soils, sediments, and borings to feet.
Old Demolition Area	Used for exploding ordnance.		Inactive	None	None	Low	Explosives and UXO.	Surface soils, subsurface soils surface water runoff pathway and groundwater (if present).	None	UXO, geophysical survey, surface soils, sediments, and borings to feet.
Other Areas of Concern										
Functional Testing Ranges Test Range 1 Test Range 2 & 3	FTR 1 was used to test flares and signal grenades. FTR 2 & 3 were used to test 3.5 inch rockets.		Inactive	None	None	Low	Explosives and UXO.			
Pistol Range	Target practice with small arms.		Active	None	None	Low	Lead.	Surface soils.		Surface soils.
Old Trash Burning Ground			Inactive	None	None	Medium	Unknowns			
Base-wide surface water drainage paths East drainage Central drainage West drainage Puerco River										

4.0 SAFETY ORGANIZATION, ADMINISTRATION, AND RESPONSIBILITIES

4.1 PROJECT SAFETY ORGANIZATION

The following section presents details regarding the individual responsibilities of each of the designated members of the ERM project safety organization. Figure 4-1 presents the project safety organization and lines of authority and communication associated with the field investigation efforts at FWDA. The Project Safety Supervisor is authorized by the Project Manager to require compliance with safety operating procedures, required personnel protection levels, and sample/reagent transport and has full authority to halt any procedures and/or activities being conducted in an unsafe manner.

SAFE PERFORMANCE OF THE FWDA FIELD ACTIVITIES IS THE RESPONSIBILITY OF ALL INVOLVED PERSONNEL

4.2 PROJECT HEALTH AND SAFETY PLAN CERTIFICATION

All project personnel must read this document carefully and complete a sign-off sheet prior to initiation of field work. Figure 4-2 provides a copy of the project Health and Safety Plan Certification.

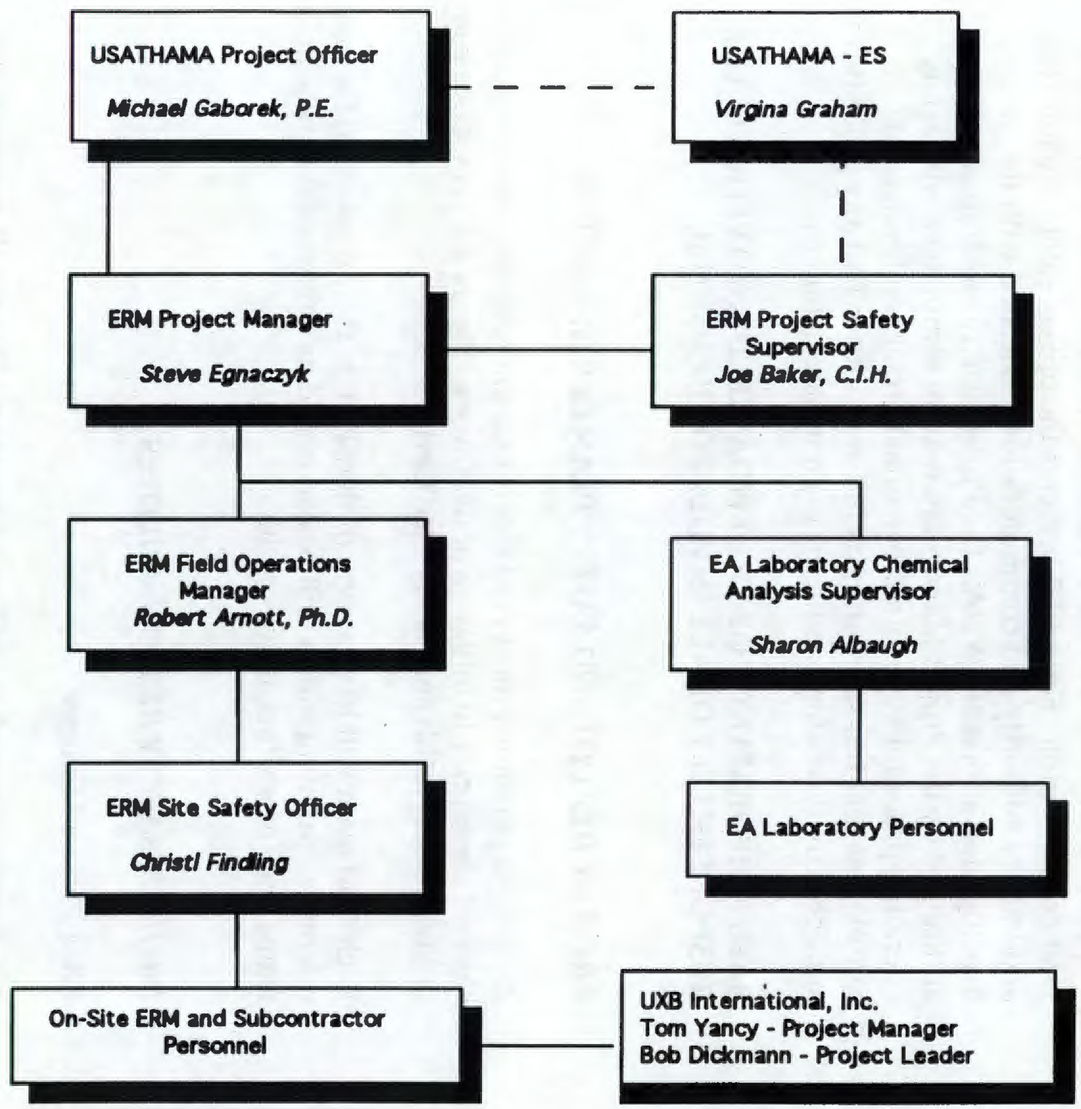
Each field team will have a copy of the SHSP in their possession for easy reference. Safety briefings will be conducted on site whenever new field teams and/or visitors arrive on site.

4.3 PROJECT SAFETY RESPONSIBILITIES

ERM Project Manager

Mr. Steven Egnaczyk is the Project Manager (PM) for all aspects of the FWDA EI. The PM has direct line responsibility for the completion of the technical aspects of the task order, as well as control over the financial, and schedule components. Overall responsibility for the safe conduct of the on-site activities rests with the PM. His responsibilities include:

1. Coordinating preparation of an effective, approved site and laboratory safety plan for the project;



Source: ERM, 1992

Figure 4-1
SAFETY ORGANIZATION
FORT WINGATE DEPOT ACTIVITY

Prepared for:
U.S. Army Toxic and Hazardous
Materials Agency

Aberdeen Proving Ground, Maryland

PROJECT HEALTH AND SAFETY PLAN CERTIFICATION

By my signature, I certify that I have read, understand, and will abide by, the Health and Safety Plan (and Attachments) for the Environmental Investigation to be conducted at the Fort Wingate Depot Activity site.

Printed Name	*Signature*	*Company*	*Date*

Figure 4-2
Health and Safety Plan Certification

2. Characterizing the potential specific chemical and physical hazards which may be encountered in the conduct of the FWDA EI in conjunction with the Project Safety Supervisor;
3. Informing the project staff as to the levels of potential exposure to any dangerous levels of hazardous materials;
4. Assuring that adequate and appropriate safety training and equipment are available for project personnel;
5. Arranging for medical examinations for specified project personnel, if necessary; and
6. Designating a Site Safety Officer.

ERM Field Operations Manager

Mr. Robert Arnott, Ph.D. is the Field Operations Manager and is charged with the conduct of the field and related activities specific to this task order. The field activities, which include completion of soil gas surveys, geophysical surveys, soil borings, installation of monitor wells, and environmental/multi-media sampling, represent the work elements within which potential health risk exposures exist. On an as-needed basis, the PM may delegate portions of his project-specific safety responsibilities to the Field Operations Manager.

ERM Project Safety Supervisor

Mr. Joseph Baker, CIH has corporate level responsibility for the implementation and maintenance of the ERM Corporate Health and Safety Program. For the FWDA-EI Field Program, Mr. Baker has been designated by the PM to ensure that the required monitoring will be accomplished. He has primary responsibility for:

1. Ensuring communication to field and laboratory personnel of the project safety requirements and protocols;
2. Supporting the Field Operations Manager in conducting on-site safety supervision and in coordination with FWDA personnel;
3. Monitoring of laboratory safety procedures; and
4. Defining and monitoring required reagent and sample handling and shipping requirements.

Project-specific responsibilities of the Project Safety Supervisor include:

1. Approving all safety procedures and operations on site;
2. Ensuring that the contents of the Supplemental Health and Safety Plan are explained to employees assigned to the FWDA site and for

securing their signature on the Supplemental Health and Safety Plan indicating their understanding of and agreement;

3. Updating equipment or procedures based upon new information gathered during the site inspection, and
4. Upgrading or downgrading the levels of personnel protection based upon site observations. Downgrading requires the approval of the PM.

ERM Site Safety Officer

Christl Findling is the Site Safety Officer for this task order and will be responsible for the in-field conduct of the investigation efforts reporting through the Project Safety Supervisor. In addition to the delegated responsibilities from the Project Safety Supervisor described above, the Site Safety Officer, has the following responsibilities:

1. Assuring and enforcing compliance with the SHSP including performing site specific training and safety inspections, conducting safety briefings and maintaining the Health & Safety Log Book;
2. Coordinating site activities such that they may be performed in an efficient and safe manner consistent with the SHSP;
3. Enforcing the "buddy system" on site;
4. Assuring the ready access and availability of all safety equipment;
5. Determining and posting locations and routes to medical facilities and arranging emergency transportation to medical facilities (as required);
6. Notifying (as required) local public emergency officials (i.e., police and fire department) of the nature of the team's operations, and making emergency telephone numbers available to all team members;
7. Assuring that:
    a. At least one member of the field team is available to stay behind and notify Emergency Services if the Project Safety Supervisor or Field Operations Manager must enter an area of maximum hazard, or
    b. An area of maximum hazard is not entered until he/she (the Project Safety Supervisor or Field Operations Manager) has notified the appropriate Emergency Services (i.e., fire department);
8. Observing work party members for symptoms of exposure or stress, and

9. Arranging for the availability of on-site emergency medical care and first aid, as necessary.

The Site Safety Officer will coordinate project safety procedures with USATHAMA Emergency Services (USATHAMA-ES):

USATHAMA-ES	Mrs. V. Graham	(410) 671-1588

All project personnel performing work on site have a shared responsibility to conduct the project in a safe manner. These specific responsibilities include:

1. Complying with all aspects of the Supplemental Health and Safety Plan, including strict adherence to the "buddy system", which requires that all on-site activities be conducted using a minimum of 2-person teams;
2. Obeying the orders of the Field Operations Manager/Site Safety Officer; and
3. Notifying the Field Operations Manager/Site Safety Officer of hazardous or potentially hazardous incidents or working situations.

4.4 *HEALTH & SAFETY LOG BOOK*

The on-site Project Safety Officer will keep a log book to record site Health and Safety information and to document subcontract personnel working on site and other site visitors. At a minimum, the following information will be included in the log book on a daily basis:

- Date and time of observations and site weather conditions
- Listing of personnel on site (w/company title)
- Description of Safety Briefings/training performed and personnel in attendance
- Work activities planned/being conducted
- Level(s) of protection being employed
- Safety and air monitoring equipment in use and equipment readings obtained during work activity(ies)
- Any health & safety-related issues or situations
- Any communications with regulatory agencies
- Signature of on-site Project Safety Officer

4.5 *SAFETY INSPECTIONS*

The Site Safety Officer will conduct and document regular and ongoing inspections to determine and assure the effectiveness of the SHSP. Any deficiencies in the SHSP will be reported to the Project Manager and will be corrected by means of a modification to the SHSP or a change in the operations that resulted in the deficiency.

4.6 *PLAN AMENDMENT*

Should changes be required to the SHSP, for example when new information is received or site conditions change, that affect the established levels of protection, field monitoring action levels, etc., the SHSP will be amended. All amendments to this Plan will be documented using the form provided in Figure 4-3.

Job No.: 00306

SITE SAFETY PLAN AMENDMENT

Amendment No.: ______________________ *Date of Amendment* ______________________

Site Name: Fort Wingate Depot Activity - Environmental Investigation Program

Site Location: Gallup, New Mexico

Type of Amendment: ______________________

Reason for Amendment: ______________________

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Additional Required Changes in Other H&S Procedures: ______________________

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Required Changes in PPE: ______________________

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______________________ ______________________

Program Health and Safety Officer Date

______________________ ______________________

Project Manager Date

Figure 4-3
Site Safety Plan Amendment Form

5.0 SITE ACCESS AND SITE CONTROL

5.1 SITE ACCESS

Each Area of Concern (AOC) will be divided into work zones appropriate to the size and location of the AOC as a means to control site access while field investigations are on-going and to facilitate decontamination efforts. Work zones generally will include the following:

- **Exclusion Zone or "Hot Zone":** This zone is a contaminated or potentially contaminated area where work is to be performed. The boundary of an Exclusion Zone is called the "Hot Line". The area making up an Exclusion Zone is determined by known contamination, air monitoring results, and a potential blast radius, if applicable.
- **Contamination Reduction Zone or "Decontamination Zone":** This zone is the transition area between an Exclusion Zone and the Clean or Support Zone. The Contamination Reduction Zone (CRZ) is positioned outside and generally upwind of an Exclusion Zone. The CRZ is used as an area to decontaminate personnel and equipment, and to reduce the potential spread of contaminants into the Support Zone or other clean areas. Emergency response equipment will typically be maintained at the entrance to the contamination reduction zone.
- **Support Zone or "Clean Zone":** This zone is a known clean area used to support on-site operations. The support activities are positioned outside and upwind of the CRZ.

Access into and egress out of an Exclusion Zone shall be carefully controlled through a contamination reduction corridor. Separate contamination reduction corridors shall be established for both personnel and vehicles in order to control and monitor access.

The appropriate work zones will be established by the Site Safety Officer and will be maintained throughout the field effort at the specific AOC. Access to the AOC will occur through the appropriate access points.

Access to the work site at the AOCs under investigation during the FWDA EI will be limited to authorized personnel. Site access for the performance of field investigation activities will be provided to authorized personnel who have received the proper OSHA health and safety training and medical surveillance, have reviewed and signed the FWDA SHSP, and have been briefed by the ERM Site Safety Officer.

Access into the established exclusion zone or work area will be further limited to those authorized personnel wearing appropriate PPE. The exclusion zones will be cordoned off with colored flagging or other appropriate means, designating the exclusion zone boundary. The zones will be monitored by the Site Safety Officer or his designee to ensure unauthorized personnel do not enter.

5.2 *SITE CONTROL*

Appropriate site control procedures will be implemented to control employee exposure to hazardous substances before site work begins. Elements of the site control program include conducting safety inspections, investigating and reporting injuries and accidents, obtaining necessary safety permits, and establishing site work zones.

Certain procedures will be followed to ensure suitable site control and limitation of access so that those persons who may be unaware of site conditions are not exposed to inherent hazards. Plywood sheeting or other protective measures will be placed over boreholes when left unattended during non-working hours. Potentially contaminated media, such as drill cuttings and soils, will be containerized and/or staged to prevent unauthorized tampering. Any field equipment which may cause potential injury when left unattended will be removed from the site or otherwise rendered non-dangerous. The Field Operations Manager will be responsible to see that the specific work areas at the AOCs are secure during non-working hours.

6.0 PERSONNEL TRAINING

Site workers engaged in the performance of field activities which may expose or potentially expose workers to hazardous substances and health hazards shall receive a minimum of 40 hours of instruction off the site, and a minimum of three days actual field experience under the direct supervision of a trained, experienced supervisor. Exceptions to this requirement, e.g., decreasing the required number of training hours to 24 (for example, in instances when workers are on-site only occasionally for a specific limited task), are found in Appendix A of this SHSP. Exceptions from training are subject to review by the Project Safety Supervisor and the Site Safety Officer. Normal work procedures of the EI field team are not expected to preclude the necessary 40 hours of off-site instruction.

Additionally, in certain instances, and when only Level D Safety Protection (i.e., no air respirator) is required, non-trained personnel who would not be involved in the performance of intrusive field activities may be allowed access under escort into an AOC (i.e., for observational purposes only, such as to perform the required archeological oversight), following the performance of field monitoring, site-specific training, and the approval of the Site Safety Officer.

This SHSP will be distributed to all subcontractors prior to the start of field activities. A kick-off meeting will be held to discuss the contents of the Plan. Specialty training will be provided as determined based on task and responsibility. All training of personnel will be conducted under the direct supervision of the Site Safety Officer.

ERM project personnel will document their compliance with the training and medical requirements by completing the form shown in Figure 6-1 and contractors and subcontractors will document their compliance to the training and medical requirements by completing the form shown in Figure 6-2.

A more detailed discussion of personnel training requirements is included in Appendix A.

FIGURE 6-1
ERM SITE PERSONNEL AND CERTIFICATION STATUS

Name	Title	Task(s)	Medical Current a.	Fit Test Current Qual. b.1	Fit Test Current Quant. b.2	Training Current c.	Certification Level or Description
1.			☐	☐	☐	☐	
2.			☐	☐	☐	☐	
3.			☐	☐	☐	☐	
4.			☐	☐	☐	☐	
5.			☐	☐	☐	☐	
6.			☐	☐	☐	☐	
7.			☐	☐	☐	☐	
8.			☐	☐	☐	☐	
9.			☐	☐	☐	☐	
10.			☐	☐	☐	☐	
11.			☐	☐	☐	☐	
12.			☐	☐	☐	☐	
13.			☐	☐	☐	☐	
Site Safety Officer (SSO) 14.			☐	☐	☐	☐	

a. Training: All personnel, including visitors, entering the exclusion or contamination reduction zones must have certification of completion of training in accordance with OSHA 29 CFR 1910, 29 CFR 1926/1910, or 29 CFR 1910.120.

b. Respirator fit testing: All persons, including visitors, entering any area requiring the use or potential use of any negative pressure respirator must have had as a minimum a Qualitative fit test (b.1), administered in accordance with OSHA 29 CFR 1910.134 or ANSI within the last 12 months. If site conditions require the use of a full-face, negative pressure, air-purifying respirator for protection from asbestos or lead, employees must have had a Quantitative fit test (b.2), administered according to OSHA 29 CFR 1910.1002 or 1025 within the last six months.

c. Medical monitoring requirements: All personnel, including visitors, entering the exclusion or contamination reduction zones must be certified as medically fit to work, and to wear a respirator, as appropriate, in accordance with 29 CFR 1910, 29 CFR 1926/1910, or 29 CFR 1910.120.

The Site Safety Officer is responsible for verifying all certifications and fit tests.

FIGURE 6-2
SUBCONTRACTOR OCCUPATIONAL SAFETY AND HEALTH CERTIFICATION

PROJECT: ____________________

SUBCONTRACTOR: ____________________

1. Contractor certifies that the following personnel to be employed during the FWDA EI have met the following requirements of the OSHA Hazardous Waste Operations Standard (29 CFR 1910.120) and other applicable OSHA standards, as required by ERM.

Subcontractor Personnel	Training	Respirator Certification	Medical Exam
example: John Smith	3/6/90 ERM	3/6/90 ERM (small MSA)	2/27/90 Paoli

2. Subcontractor certifies that it has received a copy of the Health and Safety Plan and will ensure that its employees are informed and will comply with its requirements.

3. Subcontractor further certifies that it has read and understands and will comply with all provisions of its contractual agreement.

7.0 *MEDICAL MONITORING*

ERM personnel involved in field activities associated with this project will be active participants in the medical monitoring program. ERM has implemented a medical monitoring program that complies with the requirements of 29 CFR 1910.120.

Contractors and subcontractors to ERM will be required to adhere to the medical monitoring requirements of 29 CFR 1910.120 and provide documentation of compliance by completing the form shown in Figure 6-1 or through other appropriate means, or demonstrate exemptions from these requirements based on scheduled activities and work area characterization. An example of such an exemption would be a delivery driver who makes a delivery to the site in an area which has been characterized as having no contamination. Personnel required to participate in the medical monitoring program shall provide participation documents prior to site entry. It is unlikely that any field personnel will be exempt from the medical surveillance requirements.

Appendix B provides general information on medical monitoring.

8.0 SITE HAZARD CHARACTERIZATION/ANALYSIS

8.1 SITE-SPECIFIC HAZARD EVALUATION

A site-specific hazard evaluation was presented in Section 3 in the "Final Health and Safety Plan for the Environmental Investigation at Fort Wingate Depot Activity (FWDA) Gallup, New Mexico," dated 6 November 1992 and prepared by Metcalf & Eddy, Inc. ("Final Health and Safety Plan"). A copy of the site-specific hazard evaluation is provided as Appendix 8.1.

8.2 CHEMICAL EXPOSURE

Hazard information for the identified and site contaminants was presented as Table 4-1 in the "Final Health and Safety Plan". A copy of Table 4-1 is provided as Appendix 8.2.

8.3 BURIED UTILITIES

Consultation must occur with FWDA site personnel and available site drawings prior to drilling to confirm the absence of underground cables, utility lines, and pipes, etc. Drilling operations will not proceed until the drill site has been cleared by the Site Safety Officer.

8.4 UNEXPLODED ORDNANCE

Due to the nature of previous activities at the FWDA, the potential has been identified for unexploded ordnance (UXO) to exist. Specific areas of potential UXO concern have been identified during past site investigations and project scoping activities.

These areas include:

- Functional Test Ranges 1, 2 and 3;
- Group C Disposal Area, and
- Burning Ground and Demolition Areas.

In addition, other site areas of potential UXO concern could be identified during the performance of site activities. UXO subcontractor support will be provided by UXB International, Inc. (UXB) during the installation of borings and monitoring wells (if required) and in the performance of sampling within these identified areas.

Appendix 11.1 contains the "Work Plan for UXO Support Services at Fort Wingate, New Mexico," dated November 1992, prepared by UXB as well as Ordnance Safety Precautions (Section I) and Standard Operating Procedures for UXO (Section II).

Appendix 8.1

- *"Section 3 - Site Specific Hazard Evaluation," from the Final Health and Safety Plan For The Environmental Investigation (EI) At Fort Wingate Depot Activity (FWDA), Gallup, New Mexico, dated 6 November 1992, prepared by Metcalf & Eddy, Inc.*

3.0 SITE-SPECIFIC HAZARD EVALUATION

An installation as large as Fort Wingate, which has hosted a variety of activities over an extensive period of time, is likely to have a great many sites requiring investigation. Some of these sites were first identified in the Pollution Abatement Study prepared in May 1981 by the U.S. Army Environmental Hygiene Agency (AEHA). The study was performed in order to request a waiver for the groundwater requirements of the Resource Conservation and Recovery Act (RCRA). The number of sites was expanded in September of that year by an Environmental Survey completed for USATHAMA. In 1988, the AEHA conducted a groundwater contamination survey of the AOCs described in this document. By 1990, in response to the Defense Authorization Amendments and Base Closure and Realignment Act, an enhanced Preliminary Assessment (PA) was completed. In order to address environmental issues that could affect the closure of FWDA, the PA included additional unnumbered SWMUs and other areas and facilities requiring environmental evaluation. (Table 3-1 summarizes the AOCs and salient facts characterizing them.) All figures in this section are found in map pockets at the rear of this document.

The following potential hazards are associated with the FWDA site investigation in general:

- biologic hazards (poisonous plants, insects, animals, reptiles, etc.)
- weather hazards (lightning, flash-flooding, mudslides, etc.)
- slippery surfaces, steep grades, uneven terrain, etc.
- electrical hazards (overhead power lines, buried cables, etc.)
- heat stress/cold exposure (see Appendix B)
- presence of heavy machinery and fast-moving drill rig components
- excessive noise levels
- presence of sharp objects
- possible chemical exposures through dust generation, release of volatile compounds from disturbed soils or groundwater, skin contact and ingestion.

3.1 ADMINISTRATION AREA

The Administration Area, contains administrative office buildings, housing and recreation facilities, general maintenance and warehouse buildings, a clinic, and several utility support facilities. A sewage treatment facility is in an adjacent limited-access area but is grouped with the Administration Area facilities for the purpose of this report. Two warehouses are leased to the Department of Agriculture for food storage and distribution. The activities associated with specific buildings have changed over time. Within the Administration Area, nine AOCs are identified: Maintenance Shop.

Storage Yard, POL Waste Discharge Area, Septic Tanks and Cesspools, Sewage Treatment Plant, Old Landfill-Water Tower, and Fire Training Ground, the PCB transformer in Building 11 and the Herbicide storage room in Building 29. All AOCs in the Administration Area are located in Figure 3-1.

3.1.1 Maintenance Shops (Buildings 5 and 15)

3.1.1.1 Site History

The two maintenance shops in Buildings 5 and 15 are both located in the Administration Area. In the past, Building 15 was used for heavy equipment and automotive maintenance, spray painting, battery charging, plumbing and electrical works, and the mixing of pesticides. Since 1980, Building 15 has reportedly been used for general storage and waste oil storage. Currently, maintenance operations are performed in Building 5. They include battery charging, automotive repair, arc and acetylene welding, and vehicle wash.

3.1.1.2 Nature and Extent of Contamination

Soda ash was used to neutralize battery acid in the battery service area inside Building 15. The neutralized solution was disposed of into a sump which led to a storm drain. It was estimated that five to ten truck batteries and one forklift truck battery were serviced each year. The waste mixture of water, oils, and greases from vehicle wash was also directed to the storm drains. There was no water/oil separator in the building. Detergents were not used.

Waste materials - including waste oils, solvents, sulfuric acid, greases, and minor amounts of pesticides - were generated in the two buildings. Chemicals possibly used in the past are listed in Table 3-2. In a visit by personnel of New Mexico Health and Environment Department on August 22, 1989, 1,1,1-trichloroethane was identified as having been used in the past until about April 1989, when it was then replaced by naphtha.

3.1.1.3 Proposed Action

Surface soil samples and surface wipe samples will be collected. Analyses for the following will be conducted: explosives, nitrate, nitrite, total phosphorus, and sulfate.

TABLE 3.1 SUMMARY OF EI AT FORT WINGATE DEPOT ACTIVITY

AREA OF CONCERN	DESCRIPTION	SPATIAL DIMENS.	ACTIVE/ INACT.	REGULATORY STATUS	RELEASE HISTORY	RELEASE POTENTIAL	CHEMICALS OF CONCERN	RELEASE PATHWAY	REMEDIAL ACTION TAKEN	PROPOSED ACTIVITIES
7,000 Acres										
Missile Launch Sites BMTS site Pershing site Unused site	Used to test launch missiles from FWDA to White Sands Missile Range.	Concrete Pads 10 ft x 10 ft	Inactive	None	Two rocket engines were reported to be buried at the BMTS site.	Low	Explosives.	Surface soils.	None	Magnetometer survey and surface soil sampling.
Magazine/Igloo Area										
Group A	Munitions storage.	61 ft x 27 ft x 13	Active	None	No record releases.	Low	Explosive residue/dust.	Surface soils, surface water drainage pathways, and accumulation dust.	None	Wipe samples, surface soils, and sediment.
Group B	Munitions storage.	61 ft x 27 ft x 13	Active	None	No record releases.	Low	Explosive residue/dust.	Surface soils, surface water drainage pathways, and accumulation dust.	None	Wipe samples, surface soils, and sediment.
Group C	Munitions storage.	61 ft x 27 ft x 13	Active	None	No record releases.	Low	Explosive residue/dust.	Surface soils, surface water drainage pathways, and accumulation dust.	None	Wipe samples, surface soils, and sediment.
Group C Disposal	Located in and adjacent to an arroyo. It contains scrap metal, tires, ammunition canister, etc.	Unknown	Inactive	None	No record of releases.	Medium	Explosives, TAL inorganics, TCL organics, PCBs, and UXO.	Surface soils, subsurface soils and surface water pathways.	None	Geophysical survey, UXO survey, borings, to 20 feet, surface soil and sediment sampling.
Administration Area										
Former Maintenance Operations Building 6 Building 15	Building 15 was used for automotive maintenance. Building was used for general maintenance operations.	18,376 sq ft 17,440 sq ft	Inactive	None	Neutralized battery acid was disposed of down storm sewer.	Medium	Waste oils, solvents, sulfuric acid, greases, insecticide and pesticides.	Surface soils, subsurface soils, and sewer lines.	None	Soil sampling, soil borings, sump sediment.

TABLE 3.1 SUMMARY OF EI AT FORT WINGATE DEPOT ACTIVITY

AREA OF CONCERN	DESCRIPTION	SPATIAL DIMENS.	ACTIVE/ INACT.	REGULATORY STATUS	RELEASE HISTORY	RELEASE POTENTIAL	CHEMICALS OF CONCERN	RELEASE PATHWAY	REMEDIAL ACTION TAKEN	PROPOSED ACTIVITIES
Former Storage Yard	Open ground was used for storage of drums, radiators, spent batteries, etc. and a concrete slab was used for coal storage.	200'x 400' (open) 600'x 400' (fenced)	Inactive Inactive	Not listed on Part A or Part B permit applications.	No record of significant releases.	Low	Waste oils, solvents, pesticides, and PCBs.	Surface soils, subsurface soils, and ground water (if present).	Soil removal conducted under direction of Tooele. Proposed acti-vities for verification.	Soil gas survey, borings to 10 feet, and surface soil sampling.
Former POL Waste Discharge	POLs were disposed of on open ground. The site was covered with clean soil in 1976. The location of this area is not precisely known.	20'x 20'	Inactive	Not listed on Part A or Part B permit applications.	Soil was reported to be saturated with POLs.	Medium	Waste POLs, solvents, pesticides, and PCBs.	Surface soils, subsurface soils, and ground water (if present).	None	Soil gas survey, borings to 10 feet and sampling existing monitoring wells. Two locations investigated.
Sewage Treatment Plant	The sewage plant consists of a bar screen, lift station, Imhoff tank, sludge drying beds, stabilization ponds, evaporation ponds, and infiltration ponds.	684 sq ft	Active	Not RCRA regulated.	None	Low	Domestic sewage.	Surface soils and subsurface soils. Sediment from overflow drainage.	None	Borings to 5 and 10 feet. Surface water (if present), and sludg from Imhoff tank.
Old Landfill - Water Tower	The landfill accepted a variety of solid wastes until 1966 and then covered it with soil.	Unknown	Inactive	Not RCRA regulated. Not permitted by New Mexico.	No record of releases.	Medium	Unknown	Gas migration, leachate and soils.	Site was closed and covered with soil in 1966.	Soil gas survey and borings to 20 feet.
Fire Training Grounds	Use in fire training exercises. Gasoline and used oil were used for fires. The site is an unlined pit. A railroad car is located near one of the pits.	20' (diameter)	Active	No record of regulatory status.	Oil stains and fuel odor reported during visits.	High	Diesel fuel, oils and spent solvents.	Soils and ground water.	None	Surface soil sampling and borings to 20 feet.
Former Locomotive Shop	Building 11, was reported to contain a transformer that leaked onto the basement floor for several months before it was detected.	6,229 sq ft	Inactive	PCBs regulated by TSCA.	Leaking transformer.	Medium	PCBs	Surface soil drain.	None	Wipe and chip samples sump sediment.
Former Inert Storage Warehouse	Building 29 was used for the storage of herbicides and pesticides. The building has a concrete floor and is well ventilated.		Inactive	No record of regulatory status.	No record of releases.	Low	Herbicides and pesticides.	Surface soil and accumulated oil surfaces.	None	Surface soil and wipe samples.
Above-ground Storage Tanks Gate 209(Building 530)-diesel Gate 209(Building 530)-diesel Gate 209 - diesel Building 11 - diesel	Above ground storage tanks-diesel fuel.	1,000 gal 1,000 gal 168 gal 420 gal	Inactive Inactive Active Active		No record of releases.	Low	Diesel fuel	Surface and subsurface soils.	None	None

TABLE 3.1 SUMMARY OF EI AT FORT WINGATE DEPOT ACTIVITY

AREA OF CONCERN	DESCRIPTION	SPATIAL DIMENS.	ACTIVE/ INACT.	REGULATORY STATUS	RELEASE HISTORY	RELEASE POTENTIAL	CHEMICALS OF CONCERN	RELEASE PATHWAY	REMEDIAL ACTION TAKEN	PROPOSED ACTIVITIES
Workshop Area										
Former TNT Washout Plant Leaching Bed – pre-1982 Leaching Beds – post 1982	Buildings 503 housed the TNT washout equipment. Washout was disposed of in three leaching beds located north of Building 503.	 100'x 150'x 150' 250'x 150'x 3'	 Inactive Inactive Inactive	RCRA Part A (1980)	Previous investigations show contamination of soils by explosives.	Medium	Explosives and explosive residues.	Surface soils, subsurface soils, and ground water (if present).	During operation, soil was periodically removed from the leaching beds.	Borings to 10 and 20 feet. Surface and sediment sampling. Groundwater sampling of existing wells.
Former Boiler Plant	Building 501 was used to provide steam for Building 503 and area buildings. The boiler plant is connected to Building 503 via piping.	Unknown	Inactive	No record of regulatory status.	No record of releases.	Low	Explosives and explosive residues.	Surface soil.	None	Surface soil and wipe samples.
Former TNT Flaker Building	Building 503 was used to house washout equipment including the settling tanks for the TNT washout process.	13,120 sq ft	Inactive	No record of regulatory status.	No record of releases.	Medium	Explosives and explosive residues.	Piping.	None	Inventory of equipment inside building. Wipe and sediment samples.
Former TNT Washout Tank	Settling tanks used to hold "pink water" prior to its discharge to the leaching beds.	6'x 12'x 6'	Inactive	None	None	Low	Explosives and explosive residues.	Surface water tank bottoms.	None	Sample water and sediment currently in tank.
Former Acid Waste Holding Pond	The pond is earthen and unlined. It was used for evaporation and infiltration of washout water and pickling solution.	20'x 20'x 3'	Inactive	RCRA Part A (1980)	Previous investigations found hazardous organic compounds.	High	Acid, PCBs, pesticides, explosives, and explosive residues.	Surface soil subsurface soil, and ground water (if present).	None	Surface soil samples and borings to 20 feet.
Former Deactivation Furnace	Furnace was located in Building 530 before being dismantled and parts disposed of in adjacent acid pits.	4000 sq ft	Inactive	RCRA Part A (1980)	No reported releases, but degradation of concrete was observed.	Medium	Explosives, phosphorous, metals, and acids.	Surface soils, concrete structure, subsurface soil, runoff sediment surface.	Furnace has been dismantled.	Borings, surface soil, sediment and concrete chip sampling.
Former PCB Transformer Storage	Transformers were stored in Building 501 while awaiting pick-up by DRMO.	4500 sq ft	Inactive	No record of regulatory status.	No record of releases.	Low	PCBs.	Residue on concrete.	None have been removed.	Chip and wipe samples.
Pesticide Storage Building	Building 537, was used to store pesticides prior to use.	4,200 sq ft	Inactive	Not RCRA regulated.	No record of releases.	Low	Pesticides.	Surface soil accumulated on flat surfaces.	None	Wipe, surface water, and sediment sampling. (Water and sediment from pit in basement).

TABLE 3.1 SUMMARY OF EI AT FORT WINGATE DEPOT ACTIVITY

AREA OF CONCERN	DESCRIPTION	SPATIAL DIMENS.	ACTIVE/ INACT.	REGULATORY STATUS	RELEASE HISTORY	RELEASE POTENTIAL	CHEMICALS OF CONCERN	RELEASE PATHWAY	REMEDIAL ACTION TAKEN	PROPOSED ACTIVITIES
Current Landfill	Contains mostly construction debris, land debris, cardboard, paper, etc.	6 acres 20 feet thick	Active	None	No record of releases.	Low	Unknowns	Surface soils, leachate, and landfill gas.	None	Soil gas survey, borings to 20 feet, sediment and ground water sampling. (Water)
Former Painting/Acid Washout Building	Building 515	4200 sq ft	Inactive	None	Previous investigations found hazardous organic compounds.	Medium	Acid, PCBs, pesticides, explosives, and explosive residues.	Subsurface soil and dust/residue.	None	Borings to 10 feet and wipe samples. feet.
Magazine/Igloo Area										
Group D	Munitions storage.	61 ft x 27 ft x 13 ft	Active	None	No record releases.	Low	Explosive residue/dust.	Surface soils, surface water drainage pathways, and accumulation dust.	None	Wipe samples, surface soils, and sediment.
Group E	Munitions storage.	61 ft x 27 ft x 13 ft	Active	None	No record releases.	Low	Explosive residue/dust.	Surface soils, surface water drainage pathways, and accumulation dust.	None	Wipe samples, surface soils, and sediment.
Group F	Munitions storage.	61 ft x 27 ft x 13 ft	Active	None	No record releases.	Low	Explosive residue/dust.	Surface soils, surface water drainage pathways, and accumulation dust.	None	Wipe samples, surface soils, and sediment.
Group G	Munitions storage.	61 ft x 27 ft x 13 ft	Active	None	No record releases.	Low	Explosive residue/dust.	Surface soils, surface water drainage pathways, and accumulation dust.	None	Wipe samples, surface soils, and sediment.
Group H	Munitions storage.	61 ft x 27 ft x 13 ft	Active	None	No record releases.	Low	Explosive residue/dust.	Surface soils, surface water drainage pathways, and accumulation dust.	None	Wipe samples, surface soils, and sediment.
Group J	Munitions storage.	61 ft x 27 ft x 13 ft	Active	None	No record releases.	Low	Explosive residue/dust.	Surface soils, surface water drainage pathways, and accumulation dust.	None	Wipe samples, surface soils, and sediment.

TABLE 3.1 SUMMARY OF EI AT FORT WINGATE DEPOT ACTIVITY

AREA OF CONCERN	DESCRIPTION	SPATIAL DIMENS.	ACTIVE/ INACT.	REGULATORY STATUS	RELEASE HISTORY	RELEASE POTENTIAL	CHEMICALS OF CONCERN	RELEASE PATHWAY	REMEDIAL ACTION TAKEN	PROPOSED ACTIVITIES
Group K	Munitions storage.	61 ft x 27 ft x 13 ft	Active	None	No record of releases.	Low	Explosive residue/dust.	Surface soils, surface water drainage pathways, and dust	None	Wipe samples, surface soils, and sediment.
Demolition/Burning Areas										
Burning Ground	Used for burning propellants.		Active	RCRA Interim Part B	None	Low	Explosives.	Surface soils, subsurface soils surface water runoff pathway and groundwater (if present).	None	Sediment samples in the arroyo. Surface soils and borings to 20 feet.
Demolition Craters	Used for exploding ordnance.		Active	RCRA Interim Part B	None	Medium	Explosives and UXO.	Surface soils, subsurface soils surface water runoff pathway and groundwater (if present).	None	Sediment samples in the arroyo. Surface soils and borings to 20 feet.
Old Burning Ground Piles/ Demolition Landfill	Used for burning propellants and disposal of residue and material for a demolition of explosives.		Inactive	None	None	Medium	Explosives.	Surface soils, subsurface soils surface water runoff pathway and groundwater (if present).	None	UXO, geophysical survey, surface soils, sediments, and borings to feet.
Old Demolition Area	Used for exploding ordnance.		Inactive	None	None	Low	Explosives and UXO.	Surface soils, subsurface soils surface water runoff pathway and groundwater (if present).	None	UXO, geophysical survey, surface soils, sediments, and borings to feet.
Other Areas of Concern										
Functional Testing Ranges Test Range 1 Test Range 2 & 3	FTR 1 was used to test flares and signal grenades. FTR 2 & 3 were used to test 3.5 inch rockets.		Inactive	None	None	Low	Explosives and UXO.			
Pistol Range	Target practice with small arms.		Active	None	None	Low	Lead.	Surface soils.		Surface soils.
Old Trash Burning Ground			Inactive	None	None	Medium	Unknowns			
Base-wide surface water drainage paths East drainage Central drainage West drainage Puerco River										

TABLE 3-2

Industrial Activities and Possible Contaminants in the Maintenance Shop Area, SWMU 8

Building No.	Activity	Possible Contaminants
5	Arc and acetylene welding, automotive repair, battery charging, cleaning metal parts	Greases, oils, metal dust, Stoddard solvent, sulfuric acid, 1,1,1-trichloroethane
15	Automotive maintenance, spray painting, battery charging, forging, plumbing and electric work	Oils, greases, sulfuric acid,Stoddard solvent, paint, thinner, carbon tetrachloride, metal and pesticides mixing for roads and grounds, abrasive dusts, metal and flux, Sanfax cleaner (methylene chloride, methyl chloroform, liquid detergent and emulsifier); malathion, Dieldrin, chlordane, DDT, diazinon, warfarin, dalapon, and sodium salt

Source: ANL, 1990b.

3.1.1.4 Hazard Identification

Following are potential hazards identified for the area of the Maintenance Shops:

- biologic hazards (poisonous plants, insects, animals, reptiles, etc.)
- slippery surfaces, steep grades, uneven terrain, other tripping hazards
- electrical hazards (overhead power lines, buried cables, arcing from contact with battery circuits)
- presence of heavy machinery and fast-moving drill rig components
- excessive noise levels
- presence of sharp objects
- fuel gas fire hazard (severe if cylinders damaged or heated)
- possible chemical exposures through dust generation, release of volatile compounds from disturbed soils or groundwater, skin contact and ingestion
- electric arc radiation from welding - eye hazard.

3.1.2 Storage Yard

3.1.2.1 Site History

The Storage Yard and outdoor coal storage area were located in the northwest part of the Administration Area (Figure 3-1) and west of Building 15. The Storage Yard was an area approximately 600 ft x 400 ft, with approximately 200 ft x 250 ft of the space used for storage.

The Storage Yard was used primarily to store items being turned in to the Defense Revitalization and Marketing Office (DRMO) or awaiting pickup by a recycling contractor. Items include scrap metals, pipes, radiators, hot water tanks, 55-gallon drums of waste oils, solvents, and antifreeze, empty battery electrolyte containers, and full batteries. When enough waste solvents are accumulated, a recycling contractor is engaged for pickup.

The coal storage area was used to store coal for the power plant on FWDA.

3.1.2.2 Nature and Extent of Contamination

The Storage Yard was used to store hazardous (waste oils, solvents, and batteries) and nonhazardous wastes (scrap metals). In August 1989, the State of New Mexico noted that the Storage Yard contained several dozen 55-gallon drums of waste oils, solvents, and antifreeze on bare ground or on wooden pallets. Oil-stained soils were found around several drums, indicating spills or leaks.

3.1.2.3 Proposed Action

Surface soil will be collected. Soil borings will be drilled.

3.1.2.4 Hazard Identification

The following potential hazards are identified as associated with the Storage Yard:

- biologic hazards (poisonous plants, insects, animals, reptiles, etc.)
- slippery surfaces, steep grades, uneven terrain, tripping hazards
- electrical hazards (overhead power lines may be present)
- heat stress/cold exposure (see Appendix B)
- presence of heavy machinery and fast-moving drill rig components

- presence of sharp objects possible
- possible chemical exposures through dust generation, release of volatile compounds from disturbed soils or groundwater, skin contact and ingestion.

3.1.3 POL Waste Discharge Area

3.1.3.1 Site History

In interviews with FWDA personnel, an area formerly used as a Petroleum, Oils and Lubricants (POL) dump was identified. The site is located north of the fluorspar storage area in the Administration Area and was used until 1975. Waste oils and possibly some solvents were disposed at this location. When the site was covered with soil in 1975, it was reported that the surface soil on the dump area was saturated with waste oils.

3.1.3.2 Nature and Extent of Contamination

Wastes from vehicle maintenance activities were disposed at this location over a period of about four years. It is estimated that 200 gallons/year of POL wastes and possibly some solvents were disposed of at the dump. POL products, possibly containing lead, could have been transported via surface water to the Puerco River. Organic solvents probably would have volatilized in the discharge area due to the high evaporation rate.

Although the site has not been used for many years, a number of factors contribute to the potential for contaminant migration off site. The site is located in the northern part of the installation, and the direction of surface flow is toward the Puerco River, which lies off site to the north. The unknown identity and quantity of waste and the location of the site in the more permeable alluvial deposits are also considerations. Factors limiting migration are the low precipitation and the high evaporation rate of the area.

3.1.3.3 Proposed Action

Surface and subsurface soil will be collected.

3.1.3.4 Hazard Identification

The following potential hazards are identified as associated with the POL Waste Discharge Area:

- biologic hazards (poisonous plants, insects, animals, reptiles, etc.)
- slippery surfaces, steep grades, uneven terrain, etc.
- electrical hazards (overhead power lines, buried cables may be present)
- presence of sharp objects possible
- possible chemical exposures through dust generation, release of volatile compounds from disturbed soils or groundwater, skin contact and ingestion.

3.1.4 Sewage Treatment Plant

3.1.4.1 Site History

The plant is a secondary sewage treatment facility established in 1941. It is located in a limited-access area northwest of the Administration Area near the installation northern boundary. During an Argonne National Laboratory (ANL) staff visit, plant effluent was clear but a pink solution was found in a small, isolated pool in one of the two evaporation/infiltration ponds.

3.1.4.2 Nature and Extent of Contamination

The specific waste treated and disposed of through this plant is domestic sewage. No discharge appears to take place from this facility to surface waters, and the wastes are disposed of through evaporation/infiltration. In the past, however, occasional storms sent overflows to a tributary of the Puerco River. There is rarely a surface water discharge from this facility and, therefore, no hazardous constituents are expected from this operation. Low precipitation/high evaporation restrict contaminant movement at this site, and the deep aquifer is virtually inaccessible because of depth and confining formations.

3.1.4.3 Proposed Action

Soil borings will be drilled and surface water will be collected.

3.1.4.4 Hazard Identification

The following potential hazards may be associated with the Sewage Treatment Plant:

- biologic hazards (poisonous plants, insects, animals, reptiles, etc.)
- slippery surfaces, steep grades, uneven terrain
- electrical hazards (overhead power lines, buried cables, etc.)
- potential for falls into wastewater
- presence of heavy machinery and fast-moving drill rig components
- potential for toxic release (e.g., hydrogen sulfide) under abnormal or upset conditions
- excessive noise levels
- possible chemical exposures through dust generation, release of volatile compounds from disturbed soils or sewage, skin contact and ingestion.

In addition, the possible presence of explosives may present a hazard in this area.

3.1.5 Old Landfill-Water Tower

3.1.5.1 Site History

The Old Landfill-Water Tower (also called Abandoned Landfill-North Patrol Road) is located on the side of a hill north of water storage tanks and off North Patrol Road. It was a landfill and a suspected burn area that was in use until 1968. In this landfill, garbage, trash, and debris generated in the installation were buried. Today, overgrown grass and small brush cover the area.

Besides garbage, trash, and debris, some pesticide containers may have been disposed of in this landfill. It was reported that explosive-contaminated wastes were never disposed of here; these were taken to the Demolition Area.

3.1.5.2 Nature and Extent of Contamination

Low precipitation and high evaporation prevalent in the area would severely limit the generation of leachate, especially since the landfill was on the side of a hill, and any precipitation would not have a chance to infiltrate. Any leachate generated would probably migrate to the northeast, following the topographic gradient.

Groundwater may exist in the alluvial deposits that underlie the area. If groundwater is not present, it is extremely doubtful that any contamination, if it exists, would migrate away from the immediate area. The major aquifer (San Andreas-Glorieta) is virtually inaccessible because of its depth and confining formation. It is unlikely that wastes containing hazardous constituents were placed in the landfill.

3.1.5.3 Proposed Action

A soil gas survey will be conducted and soil borings will be drilled.

3.1.5.4 Hazard Identification

The following potential hazards may be associated with the Old Landfill-Water Tower:

- biologic hazards (poisonous plants, insects, animals, reptiles, etc.)
- slippery surfaces, steep grades, uneven terrain, etc.
- presence of heavy machinery and fast-moving drill rig components
- excessive noise levels
- presence of sharp objects
- possible chemical exposures through dust generation, release of volatile compounds from disturbed soils or groundwater, skin contact and ingestion.

The presence of flammable landfill gas (methane) is not ruled out.

3.1.6 Fire Training Ground

3.1.6.1 Site History

The Fire Training Ground is located southwest of the Administration Area. The U.S. Bureau of Indian Affairs has had a program to train fire fighters since the early 1970s, reportedly using the pit three times a year. Diesel fuel, gasoline, organic solvents, or oil was dumped and burned in an unlined pit with a diameter of 20 feet. As much as one 55-gallon drum of fuel might be used each time, according to FWDA personnel. Currently, the training ground is not used.

3.1.6.2 Nature and Extent of Contamination

Specific wastes in the Fire Training Ground pit could be waste oil, solvents, and other fuels. The pit may fill with water after heavy rains.

Lead may be a contaminant of the waste oil, and fuel breakdown products may include several of the purgeable organic priority pollutants. Lead may have settled in the base of the pit and contaminated surrounding soil. Petroleum hydrocarbons and acid and base/neutral extractable organics may also be present in the pit and surrounding soil. Visible evidence of release included an oil sheen on the water in the pit and oil stains on the grass around the site, particularly where the drums were stored. There was also fuel odor in the area.

3.1.6.3 Proposed Action

Surface soil will be collected and soil borings will be drilled.

3.1.6.4 Hazard Identification

The following potential hazards may be associated with the Fire Training Ground:

- biologic hazards (poisonous plants, insects, animals, reptiles, etc.)
- slippery surfaces, steep grades, uneven terrain, etc.
- electrical hazards (overhead power lines, buried cables, etc.)
- heat stress/cold exposure (see Appendix B)
- presence of heavy machinery and fast-moving drill rig components
- excessive noise levels
- presence of sharp objects
- possible chemical exposures through dust generation, release of volatile compounds from disturbed soils or groundwater, skin contact and ingestion
- falls into water in the event of heavy rain.

3.1.7 Former PCB Transformer (Building 11)

3.1.7.1 Site History

In the Administration Area, before 1986, a leaking transformer containing PCBs was located in the basement of Building 11. Transformer fluid had been leaking to the concrete floor for several months without being cleaned up. The building has a floor drain, posing a potential for leaks to migrate to surface water and sediments of the drainage system.

3.1.7.2 Nature and Extent of Contamination

The leakage of PCB fluids could possibly have led to contamination of the floor in the building and the adjacent floor drain.

3.1.7.3 Proposed Action

Surface wipes and possibly chip samples will be collected.

3.1.7.4 Hazard Identification

The following potential hazards may be associated with the former PCB Transformer:

- biologic hazards (poisonous plants, insects, animals, reptiles, etc.)
- slippery surfaces, uneven terrain, etc.
- electrical hazards (overhead power lines, buried cables, etc.)
- presence of sharp objects
- possible chemical exposures through dust generation, release of volatile compounds from disturbed soils or groundwater, skin contact and ingestion
- eye hazard from flying particles (chip sampling).

3.1.8 Herbicide Storage (Building 29)

3.1.8.1 Site History

For many years pesticides and herbicides have been stored and used on the grounds of FWDA. Herbicides were used for weed control primarily on railroad tracks and along sewage and industrial lines. Today, only minor amounts of herbicides are stored and used at the FWDA. Herbicides were reported to have been stored in leak-proof containers in Building 29 (Inert Storage Warehouse), which has a concrete floor and is well ventilated. Currently, however, FWDA herbicides are not stored in Building 29.

3.1.8.2 Nature and Extent of Contamination

Herbicides were formerly used for weed control primarily on railroad tracks and along sewage and industrial lines. Today only minor amounts of these materials are stored and used at FWDA.

Empty containers and waste material may have been disposed of in the landfills of the installation.

3.1.8.3 Proposed Action

Surface soil and surface wipe samples will be collected.

3.1.8.4 Hazard Identification

The following potential hazards may be associated with the Herbicide Storage:

- biologic hazards (poisonous plants, insects, animals, reptiles, etc.)
- slippery surfaces, uneven terrain, etc.
- electrical hazards (overhead power lines, buried cables, etc.)
- presence of sharp objects
- possible chemical exposures through dust generation, release of volatile compounds from disturbed soils, skin contact and ingestion
- note that some common herbicides in the area could contain highly toxic contaminants.

3.2 WORKSHOP AREA, AMMUNITION

The Workshop Area was used for ammunition maintenance and renovation. It includes seven AOCs: the Former TNT Leaching Beds, the Acid Waste Holding Pond, the Former PCB Transformer Storage Area, the Pesticide Storage Building, the Deactivation Furnace, and the Current Landfill. All AOCs in the Workshop Area are located in Figure 3-2.

3.2.1 Former TNT Leaching Beds

3.2.1.1 Site History

Beginning in 1949, explosive washout operations were conducted in the "500 series" area. Munitions were received in Building 500, where they were unpacked and broken down. They were then transported to Building 503 for a hot water washout. The contents (2,4,6-TNT, RDX, and Tritonal) were pumped into a storage and drying tank located in the flaker room on the second floor of the building, then flaked, dropped into a hopper in the room below, and boxed and shipped to various Army ammunition plants for reuse.

Pink water from the TNT washout was sent to three outside settling tanks (on the north side of Building 503), which overflowed into a leaching bed immediately adjacent to the building. Residue from the settling tanks was periodically removed. The bed is on flat ground and is triangular. The approximate dimensions are 100 ft. x 150 ft. x 150 ft. Between 1962 and 1967 (when the operation ceased) two beds north of Arterial Road No. 4 were used. These are referred to as the east pit and the west pit. Each bed is about 3 ft deep and about 250 ft x 150 ft.

3.2.1.2 Nature and Extent of Contamination

In late 1949, approximately 2,400 gallon/day of pink water from the TNT washout were disposed of in the leaching bed adjacent to Building 503. Beginning in 1962, wastewater was sent to the newly constructed leaching beds. When the operation was shut down in 1967, the bottom soil from all beds was removed and burned at the old burning ground in the Demolition Area. This may have caused contamination of the burning ground. Soil from the leaching beds was analyzed in 1981. It was found to contain 2,4,6-TNT, 2,4-DNT, and 1,3,5-TNB. These results are presented in Table 3-3. These data indicate that even though the contents and some of the soil were removed, contaminants are still present.

TABLE 3-3
Contaminants Present in the Soil of the TNT Leaching Beds

Sample No.	Approximate Location	Compound	Concentration (mg/kg)
FWO9	Triangular pit	TNT	0.917
FWO9		2,4-DNT	0.300
FW14	East pit	TNT	8.290
FW15	West pit	TNT	0.872
FW15		2,4-DNT	0.265
FW15		TNB	7.830
FW17	Downgradient	TNT	0.548

Source: Environmental Science and Engineering, 1981.

3.2.1.3 Proposed Action

Surface soil will be collected. Soil borings will be drilled and sediment samples will be collected.

3.2.1.4 Hazard Identification

The following potential hazards may be associated with the former TNT Leaching Beds:

- biologic hazards (poisonous plants, insects, animals, reptiles, etc.)
- slippery surfaces, steep grades, uneven terrain, etc.
- electrical hazards (overhead power lines, buried cables, etc.)
- presence of heavy machinery and fast-moving drill rig components
- excessive noise levels
- presence of sharp objects
- possible chemical exposures through dust generation, release of volatile compounds from disturbed soils, skin contact and ingestion.

In addition, the potential presence of explosives may present a hazard in this area.

3.2.2 Former Acid Waste Holding Pond

3.2.2.1 Site History

The Acid Waste Holding Pond is adjacent to the Ammunition Painting facility (Building 515), in the Workshop Area. From the late 1940s until the late 1960s, Building 515 housed a paint shop where acid was used to pickle surfaces of metal parts prior to painting. The acid waste from the pickling tanks was discharged to the acid waste holding pond just west of the building, where it evaporated and percolated into the ground. The spent acid and dissolved metals from pickling and metal cleaning were not treated prior to discharge to the holding pond.

3.2.2.2 Nature and Extent of Contamination

The waste acid in the holding pond may have been partially neutralized by the alkaline soil. However, acid and heavy metal contaminants probably infiltrated the subsurface, and some potential exists for contamination of groundwater and soils. If the pond overflowed during heavy rains, heavy metals could have been transported via surface flow and deposited in the river bed.

3.2.2.3 Proposed Action

Surface soil will be collected and soil borings will be drilled.

3.2.2.4 Hazard Identification

The following potential hazards may be associated with the former Acid Waste Holding Pond:

- biologic hazards (poisonous plants, insects, animals, reptiles, etc.)
- slippery surfaces, steep grades, uneven terrain, etc.
- electrical hazards (overhead power lines, buried cables, etc.)
- presence of heavy machinery and fast-moving drill rig components
- excessive noise levels
- presence of sharp objects
- possible chemical exposures through dust generation, skin contact and ingestion.

3.2.3 Former PCB-Contaminated Transformer Storage Areas

3.2.3.1 Site History

The PCB-Contaminated Transformer Storage Area is located in Building 501, where two transformers, each containing between 50 ppm and 500 ppm PCBs, were stored. The Storage Area has concrete floors without drains. Although there are no berms, the transformers were reportedly stored in overpacks with absorbent material. They have been removed and disposed of by the DRMO.

3.2.3.2 Nature and Extent of Contamination

The possibility that spills and leaks occurred is considered low because there are no records of such events and no apparent evidence to indicate leakage.

3.2.3.3 Proposed Action

Surface wipe and possibly chip samples will be collected.

3.2.3.4 Hazard Identification

The following potential hazards may be associated with the former PCB Transformer Storage Areas:

- biologic hazards (poisonous plants, insects, animals, reptiles, etc.)
- slippery surfaces possible
- presence of sharp objects possible
- possible limited chemical exposures through dust generation, skin contact and ingestion.

3.2.5 Pesticide Storage Building

3.2.5.1 Site History

Pesticides are stored in Building 537, located south of the Workshop Area. This building has been used for storage for many years and has a 4,200-ft^2 concrete floor. All pesticides (mostly insecticides) are stored in leak-proof containers.

3.2.5.2 Nature and Extent of Contamination

Pesticides are used mainly for controlling insects and rodents in the buildings and adjacent areas. Herbicides are used mainly for weed control on railroad tracks and along sewage and industrial pipelines. The primary concerns for this SWMU are the storage and mixing areas. Since a variety of chlorinated products were used over a number of years, releases of concentrated chemicals could have occurred.

3.2.5.3 Proposed Action

Surface wipes, sediment, surface soil, and surface water samples will be collected.

3.2.5.4 Hazard Identification

The following potential hazards may be associated with the Pesticide Storage Building:

- biologic hazards (poisonous plants, insects, animals, reptiles, etc.)
- slippery surfaces, steep grades, uneven terrain, etc.
- presence of sharp objects
- possible chemical exposures through dust generation, release of volatile compounds from disturbed soils, skin contact and ingestion.

3.2.6 Deactivation Furnace

3.2.6.1 Site History

The Deactivation Furnace was located in Building 530, in the southern part of the Workshop Area. Currently, the shell of the building, the former furnace foundation, and several associated concrete areas remain. There are two acid pits remaining on the south side of the building. It is reported that parts of the furnace were placed in the pits before filling them with gravel. Between the late 1950s and the late 1960s, the furnace was used to melt cartridges and small arms ammunition to recover lead, brass, and steel. Residue and ash were collected and disposed of at the burning ground.

From 1982 until 1986, white phosphorus was removed from munitions and burned to produce phosphorus pentoxide. The phosphorus pentoxide was then sent through a water scrubbing system to produce phosphoric acid, which was sold commercially for the production of fertilizer. When the operation was discontinued, the furnace was dismantled by AMCCOM, analyzed for hazardous contaminants, and disposed of by the DRMO.

3.2.6.2 Nature and Extent of Contamination

There have been no previous investigations in the area. Based on the nature of the operations, releases to the environment could have occurred. White phosphorus ignites unless it is in an oxygen-deprived atmosphere, making its presence highly improbable at this site. The acid used was phosphoric acid; the soils of this area are alkaline and would essentially neutralize any acid, leaving only phosphate, which is commonly used as a fertilizer. Therefore, the contaminants of concern include metals, phosphates, and wastes.

3.2.6.3 Proposed Action

Surface soil and sediment samples will be collected. Soil borings will be drilled and chip samples collected.

3.2.6.4 Hazard Identification

The following potential hazards may be associated with the Deactivation Furnace area:

- biologic hazards (poisonous plants, insects, animals, reptiles, etc.)
- slippery surfaces, steep grades, uneven terrain, etc.
- electrical hazards (overhead power lines, buried cables, etc.)
- presence of heavy machinery and fast-moving drill rig components
- excessive noise levels
- presence of sharp objects
- possible chemical exposures through dust generation, skin contact and ingestion.

In addition, the potential presence of explosives and possibly white phosphorus (at depth) may pose a hazard in this area.

3.2.7 Current Landfill

3.2.7.1 Site History

The Current Landfill is located west of the Workshop Area and just east of Storage Area B. It has been operated since 1969. It covers approximately six acres and was reported to receive mostly construction and demolition rubble, land debris, paper wastes, and similar material. There is an agreement between FWDA and the City of Gallup whereby all garbage from the Depot, particularly the Administration Area, is collected by the City and hauled to a City-owned landfill for disposal.

3.2.7.2 Nature and Extent of Contamination

The Current Landfill, since its establishment, appears to have received mostly construction and demolition rubble, land debris, paper wastes, and similar material. In the past, pesticide containers were identified among other waste material disposed in the Landfill. A soil sample taken from the Landfill in 1981 contained trace amounts of pesticides and Aroclor 1016. The waste and soil cover may be as much as 20 feet deep in portions of the Landfill, and the contents of older portions are believed to include garbage from the installation. It is suspected that sludge from the drying beds at the sewage treatment plant was disposed of here, too.

3.2.7.3 Proposed Action

A soil gas survey will be conducted. Soil borings will be drilled and sediment samples will be collected.

3.2.7.4 Hazard Identification

The following potential hazards may be associated with the Current Landfill:

- biologic hazards (poisonous plants, insects, animals, reptiles, etc.)
- slippery surfaces, steep grades, uneven terrain, etc.
- electrical hazards (overhead power lines, buried cables, etc.)
- presence of heavy machinery and fast-moving drill rig components
- excessive noise levels
- presence of sharp objects
- possible chemical exposures through dust generation, release of volatile compounds
- flammable gas (methane mixtures) generated from decay of paper and wood waste.

3.3 MAGAZINE/IGLOO AREA

3.3.1 Site History

Most of the central portion of FWDA property is occupied by magazine facilities for storing ammunition - approximately 7,400 acres, or about one-third of the installation land. The magazine facilities are shown in Figure 3-3 as clusters of lined areas. There are 760 earth-covered concrete igloos in ten clusters designated A-H, J, and K. The igloos are about 60 feet deep with an exposed concrete face and earth-covered sides. They have been used since 1941 for storing high-explosive ordnance and other munitions. This area also contains revetments, above-ground storage for ammunition. The Magazine Area is served by a network of roads and railroads. Storage sites for fluorspar are scattered throughout this area.

3.3.2 Nature and Extent of Contamination

The igloos have been used for the storage of explosives and ammunition since 1941. No information has been found to suggest that other types of hazardous materials have been stored in these facilities. In 1989, two igloos reportedly used by the Atomic Energy Commission in the 1940s were surveyed for radioactivity. The results showed no elevated levels of radiation. The Department of Energy currently stores equipment in magazine J309. According to available information, there are no radioactive materials stored.

The stored explosives are containerized. No records were found to indicate that loose powder has ever been stored in the Magazine/Igloo Area or that any of the individual magazine units have had explosions or releases of explosives to the environment. During the EI site visit, the revetments and igloos were inspected and appeared to be well maintained and clean.

3.3.3 Proposed Action

Surface soil and sediment samples will be collected. Surface wipe samples will also be collected.

3.3.4 Hazard Identification

The following potential hazards are associated with the Magazine/Igloo area:

- biologic hazards (poisonous plants, insects, animals, reptiles, etc.)
- slippery surfaces, steep grades, uneven terrain, etc.
- presence of sharp objects
- possible chemical exposures through dust generation, release of volatile compounds, skin contact and ingestion.

In addition, the potential presence of explosives may pose a hazard in this area.

3.3.5 Igloo Group C Dump Area

3.3.5.1 Site History

The site is in the southern part of Igloo Group C area in an arroyo. Scrap metal, railroad ties, tires and ammunition shells are the major wastes scattered on the slopes and in the bottom of the arroyo. The history of the site is not clear.

3.3.5.2 Nature and Extent of Contamination

The majority of the waste, except for ammunition shells, on this site appears not to be hazardous.

3.3.5.3 Proposed Actions

Surface soil and sediment samples will be collected. Surface wipe samples will also be collected.

3.3.5.4 Hazard Identification

The following potential hazards are associated with the Igloo Group C Dump Area:

- biologic hazards (poisonous plants, insects, animals, reptiles, etc.)
- slippery surfaces, steep grades, uneven terrain, etc.
- presence of sharp objects
- possible chemical exposures through dust generation, release of volatile compounds, skin contact and ingestion.

In addition, the potential presence of explosives may present a problem in this area.

3.4 DEMOLITION AND BURNING AREA

In the west central portion of FWDA property, there are approximately 1,100 acres fenced and designated as the Demolition and Burning Area. This area contains several locations where demolition and open burning of munitions occur. The area also contains disposal grounds for explosive-contaminated material and old equipment from TNT drying and flaking facilities. At least two burning areas, one now closed, are located there. Demolition pits are currently used for demilitarization operations involving up to 5,000 pounds of explosives above the ground and up to 10,000 pounds of explosives with earth cover.

Within the Demolition/Burning Area the following numbered AOCs are identified: Demolition Craters, Burning Ground, Demolition Area Residue Piles, and Old Burning Ground and Demolition Landfill. All AOCs in the Demolition and Burning Area are located in Figure 3-4.

3.4.1 Demolition Craters

3.4.1.1 Site History

The demolition craters are located inside a fenced area in the southwestern part of the FWDA. The craters have been used for destruction of various types of explosives, propellants, and pyrotechnics on both sides of an arroyo since the early 1940s. The site includes many demolition craters, or pits, whose numbers may change from time to time.

3.4.1.2 Nature and Extent of Contamination

Twenty-four soil samples were collected in 3 of the 11 demolition craters in 1981 and analyzed for EP toxicity metals and explosives. Of the three sampled craters (5, 8, and 10), two are located on the western side of the arroyo, and one on the eastern side. Eight samples were taken from each crater. The results are listed in Table 3-4. Eight of 24 samples show cadmium concentrations ranging from 0.10 to 0.26 mg/l. One sample shows a selenium concentration at a level of 0.14 mg/l. These are below the RCRA EP toxicity regulatory levels. Minor amounts of explosives were also detected (Table 3-4). RDX (royal demolition explosive, hexohydro-1,3,5-trinitro-1,3,4-triazine) is found in 3 of 24 samples, ranging from 2.8 to 7.8 μg/g; in 2 of 24 samples, 2,4,6 TNT (trinitrotoluene) ranges from 1.1 to 1.9 μg/g; and one sample has HMX content of 1.4 μg/g.

One sediment sample and one surface water sample were collected from a pond about 800 feet downstream from the demolition area in 1981. The samples demonstrate insignificant contamination. The pond receives discharge from the demolition area, either through a spring in the area or from rain or snow precipitation. In the sediment sample, an insignificant amount of bis (2-ethylhexyl) phthalate was found, at a level of 3 mg/kg. The surface water sample contains a minor amount of toluene, 10 μg/l. All other explosives and semivolatiles are below detection limits in both samples.

From the above results, it is concluded that the soil in the demolition craters area has been contaminated with metal and explosives. Transport of the contaminant through surface water is limited. The soil contamination is not homogeneous within each crater. The potential contaminated area may include all the craters that have been used. In addition to metal and explosive contamination, unexploded ordnance is considered to be a potential problem at this site because of previous detonations.

3.4.1.3 Proposed Actions

An UXO survey will be conducted. Surface soil will be collected. Soil borings will be drilled and sediment samples will be collected.

3.4.1.4 Hazard Identification

The following potential hazards may be associated with the Demolition Craters area:

TABLE 3-4
CHEMICAL RESULTS OF SOIL SAMPLING IN THE DEMOLITION CRATERS

Sample No.	EP Toxicity(a) Concentration (mg/l)								Explosives (a) Concentration (mg/kg)					
	Ag	As	Ba	Cd	Cr	Hg	Pb	Se	2,4 DNT	2,6 DNT	2,4,6 TNT	HMX	RDX	TETRYL
Crater 5														
039	BDL(b)	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
040	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
041	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
042	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
043	BDL	BDL	BDL	0.11	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
044	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
045	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
046	BDL	BDL	BDL	0.13	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Crater 8														
031	BDL	BDL	BDL	0.12	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
032	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
033	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
034	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
035	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
036	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
037	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
038	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Crater 10														
047	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	1.9	BDL	BDL
048	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.14	BDL	BDL	BDL	BDL	BDL	BDL
049	BDL	BDL	BDL	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	1.4	7.8
050	BDL	BDL	BDL	0.10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
051	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
052	BDL	BDL	BDL	0.15	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
053	BDL	BDL	BDL	0.16	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
054	BDL	BDL	BDL	0.26	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Detection Limit	0.5	0.5	10	0.1	0.5	0.2	0.1	1.0	1.0	1.0	1.0	1.0	1.0	1.0

(a) See Table A-1 for identification of constituents. (b) Below detection limit.

TABLE 3-5
SELECTED CHEMICAL RESULTS
OF SEDIMENT AND SURFACE WATER
SAMPLING IN DEMOLITION AREA

Compound (a)	Sediment (mg/kg) FW18S	Surface Water (µg/l) FW18W
Semivolatile		
Bis (2-ethylhexyl)phthalate	3	<2
Chrysene	<1	<2
Fluoranthene	<2.0	<1
Naphthalene	<0.4	<2
Phenol	<0.4	<20
Toluene	NA	10
Explosive		
13 DNB	<0.317	<4.8
24 DNT	<0.223	<3.0
26 DNT	<0.419	<3.8
135 TNB	<1.08	NA
Nitrobenzene	<0.194	NA
RDX	<1.64	<17
Tetryl	<1.5	<23.9
White P	<0.07	<0.7
Total P	NA	40

(a) See Table A-1 for identification of compounds.

- biologic hazards (poisonous plants, insects, animals, reptiles, etc.)
- slippery surfaces, steep grades, uneven terrain, etc.
- electrical hazards (possibly overhead power lines, buried cables, etc.)
- presence of heavy machinery and fast-moving drill rig components
- excessive noise levels
- presence of sharp objects
- possible chemical exposures through dust generation, release of volatile compounds from disturbed soils, skin contact and ingestion.

In addition, the potential presence of explosives, including UXO, may pose a hazard in this area.

3.4.2 Burning Ground

3.4.2.1 Site History

The main burn area is located on the eastern side of a valley immediately adjacent to an arroyo, and is situated below the general area of the demolition craters. The site has been used since 1955. Before 1982, explosives and explosive-contaminated wastes were burned in the open, and all residues from the operations were bulldozed into the adjacent arroyo, forming a series of residue piles stretching several hundred feet. Residues include burned-out jet-assisted takeoff bottles, empty 55-gallon drums, and small metal parts.

Since 1982, open burning has been conducted in two burning troughs and two burning trays. The troughs and trays are located several hundred feet north of the previous burning ground and were built to Army specifications. Explosives and explosive-contaminated wastes are burned following strict safety protocols. Part of the residue is sent to the DRMO, and the rest is disposed of in residue piles. The dimensions of the current Burning Ground are approximately 750 feet x 150 feet.

It should be mentioned also that wastes from the operation of the Deactivation Furnace (Workshop Area) were sent to the burning pit area.

3.4.2.2 Nature and Extent of Contamination

Based on past operations, semivolatile, metal, and explosive contamination, and unexploded ordnance are the major concerns of this site. The last becomes a concern because the site is in the vicinity of the detonation craters. Fuel may also have been used in the burning activities, causing semivolatile contamination.

In 1981, 13 surface soil samples were taken from the pre-1982 burning area, and 3 samples from immediately north of the burning area. Many samples are found with explosive contamination. The results are (1) 13 of 16 samples have 2,4,6-TNT ranging from 1.9 to 2,810 $\mu g/g$, (2) 7 of 16 samples have RDX at a level ranging from 2.4 to 3,110 $\mu g/g$, (3) 7 of 16 have HMX at a level ranging from 2.0 to 765 $\mu g/g$, (4) one sample has 2,6-DNT at a level of 2.2 $\mu g/g$, and (5) two samples contain 2,4-DNT up to levels of 7.7 $\mu g/g$ (see Table 3-6). Residue piles were also analyzed (see Table 3-7).

Minor metal contamination was found in the 16 samples (Table 3-6). From the EP toxicity test, lead and cadmium were found in 4 of the 16 samples. They range from 0.5 to 2.6 mg/l for lead and from 0.1 to 0.33 mg/l for cadmium.

Because the Burning Ground is in the vicinity of the open demolition craters, UXO constitutes a major concern at this site. Very little information is available in the record to document the amount and location of UXO that has been discovered in the area. Incidents of unplanned UXO explosions in the general area were reported to ANL staff by FWDA personnel.

3.4.2.3 Proposed Actions

Surface soil will be collected. Soil borings will be drilled and sediment samples will be collected.

3.4.2.4 Hazard Identification

The following potential hazards may be associated with the Burning Ground area:

- biologic hazards (poisonous plants, insects, animals, reptiles, etc.)
- slippery surfaces, steep grades, uneven terrain, etc.
- electrical hazards (possible overhead power lines, buried cables)
- presence of heavy machinery and fast-moving drill rig components
- excessive noise levels
- presence of sharp objects
- possible chemical exposures through dust generation, release of volatile compounds from disturbed soils, skin contact and ingestion.

In addition, the potential presence of explosives, including UXO, may present a hazard in this area.

TABLE 3-6

CHEMICAL RESULTS OF SOIL SAMPLING IN THE BURNING GROUND AREA

Sample No.	EP Toxicity(a) Concentration (mg/l)								Explosives (a) Concentration (mg/kg)					
	Ag	As	Ba	Cd	Cr	Hg	Pb	Se	2,4 DNT	2,6, DNT	2,4,6 TNT	HMX	RDX	TETRYL
Burning Ground (SWMU 4a)														
001	BDL(b)	BDL	13	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
002	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
003	BDL	BDL	113	BDL	BDL	BDL	BDL	BDL	BDL	BDL	2.1	BDL	BDL	BDL
004	BDL	BDL	45	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
005	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	4.6	BDL	BDL	BDL
006	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	10.0	BDL	BDL	BDL
007	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	8.9	BDL	BDL	BDL
008	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	51.0	BDL	BDL	BDL
009	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	88.0	2.0	2.4	BDL
010	BDL	BDL	734	0.33	BDL	BDL	2.1	BDL	BDL	BDL	1.9	12.0	32.5	BDL
011	BDL	BDL	BDL	0.30	BDL	BDL	2.6	BDL	BDL	BDL	5.9	9.3	30.2	BDL
012	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	7.7	2.2	810	680	3060	BDL
013	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	6.2	BDL	2020	765	3110	BDL
Immediate North of Burning Ground														
023	BDL	BDL	10	0.10	BDL	BDL	1.3	BDL	BDL	BDL	19.0	12.1	13.5	BDL
024	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	403.0	3.1	12.4	BDL
025	BDL	BDL	BDL	0.12	BDL	BDL	0.5	BDL	BDL	BDL	2.5	BDL	1.4	BDL
Detection Limit	0.5	0.5	10	0.1	0.5	0.2	0.1	1.0	1.0		1.0	1.0	1.0	1.0

(a) See Table A-1 for identification of constituents. (b) Below detection limit.

FINAL

TABLE 3-7

CHEMICAL RESULTS OF SOIL SAMPLING IN THE residue pile area

Sample No.	EP Toxicity(a) Concentration (mg/l)								Explosives (a) Concentration (mg/kg)					
	Ag	As	Ba	Cd	Cr	Hg	Pb	Se	2,4 DNT	2,6, DNT	2,4,6 TNT	HMX	RDX	TETRYL
014	BDL(b)	BDL	12	BDL	BDL	BDL	BDL	BDL	6.7	BDL	3180	62.1	204	BDL
015	BDL	BDL	69	0.94	BDL	BDL	4.5	BDL	BDL	BDL	337	102	241	BDL
016	BDL	BDL	208	BDL	BDL	BDL	BDL	BDL	BDL	BDL	75.4	13.4	29.5	BDL
017	BDL	BDL	449	0.13	BDL	BDL	2.8	BDL	BDL	BDL	37.1	22.8	25.8	BDL
018	BDL	BDL	119	BDL	BDL	BDL	BDL	BDL	BDL	BDL	485	14.4	37.5	1.8
019	BDL	BDL	11	BDL	BDL	BDL	BDL	BDL	BDL	BDL	755.0	32	137	1.3
020	BDL	BDL	13	BDL	BDL	BDL	0.7	BDL	BDL	BDL	320	48.1	16.6	BDL
021	BDL	BDL	122	BDL	BDL	BDL	1.8	BDL	NA(c)	BDL	BDL	107	492	21.7
022	BDL	BDL	759	BDL	BDL	BDL	0.50	BDL	2	BDL	447	15.1	46.6	BDL
Detection Limit	0.5	0.5	10	0.1	0.5	0.2	0.1	1.0	1.0		1.0	1.0	1.0	1.0

(a) See Table A-1 for identification of constituents. (b) Below detection limit.
(c) Not available

3.4.3 Old Burning Ground and Demolition Landfill

3.4.3.1 Site History

The site is located in the Fenced-Up Horse Valley (an arroyo) at the end of Burning Area Road and on both sides of the road. The site was used from about 1948 to about 1955 to receive explosive-contaminated wastes from the Ammunition Washout Plant during and after the plant operation. Old equipment from the TNT drying and flaking operation was removed from Building 503 during the renovation of the building. The equipment was reportedly dumped in the arroyo without being decontaminated or washed. Wastes were not decontaminated prior to land disposal.

According to documents dated from late 1954 to early 1955, the site might have included burning activities even after 1955. The burning ground covered an area about 1,400 feet long and 200 feet wide along the embankment of an arroyo.

The major concerns at this site are metal and explosive contamination. Assuming that the operational practices at the site were the same as those now used at the current demolition area, components or explosives, including out-of-date and obsolete explosives, propellants, munitions, and unsafe munition items, might have been disposed of at the site.

3.4.3.2 Nature and Extent of Contamination

Two soil samples taken in the north side of the arroyo in June 1981 showed explosives contamination. The chemicals analyzed include semivolatiles and explosives. In the sample located in the western site (FW20), the concentrations of 2,4,6-TNT and total phosphate were found at 4,940 mg/kg and 496 mg/kg, respectively, while the second sample located in the eastern site (FW21) contained 2,4,6-TNT and total phosphate at 5.03 mg/kg and 72.7 mg/kg, respectively (Table 3-8). In addition, anomalous high concentrations of nitrate and nitrite were found in sample FW20. Because the detected limits of other kinds of explosives are set so high, their significance is not clear.

The extent of the contamination in the sediment cannot be justified because no sediment samples were taken in the alluvium within the arroyo. However, a sediment sample taken in an arroyo about 600 feet downstream from the site has a 2,4,6-TNT content of 1,940 mg/g. Since this arroyo receives discharge from both the demolition area and this site, the 2,4,6-TNT could be from both sources.

TABLE 3-8
SELECTED CHEMICAL RESULTS
OF SEDIMENT AND SURFACE WATER
SAMPLING IN DEMOLITION AREA

Compound (a)	Concentration (mg/kg)		
	FW19	FW20	FW21
Semivolatile			
Bis (2-ethylhexyl)phthalate	0.6	0.6	1
Chrysene	<1	<1	<1
Fluoranthene	<0.4	<0.4	<0.4
Naphthalene	<0.4	<0.4	<0.4
Phenol	<0.4	<0.4	<0.4
Explosive			
1,3 DNB	<0.317	<31.7	<0.317
2,4 DNT	<0.223	<22.3	<0.223
2,6 DNT	<0.419	<41.9	<0.419
1,3,5 TNB	<1.08	<1080	<1.08
2,4,6 TNT	0.663	4940	5.03
Nitrobenzene	<1.64	<164	<1.64
RDX	<2.88	<2.88	<2.88
Tetryl	<1.5	<1.5	<1.5
NO2 + NO3	<3	58	<3
Total PO4	307	496	72.7

(a) See Table A-1 for identification of compounds.

There are no metal data available for this site.

In summary, the sampling results indicate that soil on the site has been contaminated with explosives. The extent of the contamination is not clear. Based on the site history and field evidence, landfill, open burning, and open detonation activities on the site in the past may have caused extensive soil contamination. Major concerns at the site include UXO and metal and explosive contamination in the soil, sediment, and probably groundwater. The proposed actions, therefore, are to better define the nature and the extent of the contamination.

3.4.3.3 Proposed Actions

A geophysical survey and a UXO survey will be conducted. Sediment samples will be collected.

3.4.3.4 Hazard Identification

The following potential hazards may be associated with the Old Burning Ground and Demolition Landfill:

- biologic hazards (poisonous plants, insects, animals, reptiles, etc.)
- slippery surfaces, steep grades, uneven terrain, etc.
- presence of sharp objects
- possible chemical exposures through dust generation, release of volatile compounds, skin contact and ingestion.

In addition, the potential presence of explosives, including UXO, may pose a hazard in this area.

3.4.4 Old Demolition Area

3.4.4.1 Site History

The site is located about 2,000 feet south of the Old Burning Ground and Demolition Landfill adjacent to the western boundary of FWDA. It was identified in 1981 as an old demolition ground. The site has scattered metal parts on the surface. Three earth mounds are identified. The history of the site is not well known. According to FWDA personnel, the site was actively used before 1950. Even in the early 1950s, explosives from the holding tank of the washout plant in the Workshop Area were shipped to this site and burned in the open. The exact boundary of the site is not known.

3.4.4.2 Nature and Extent of Contamination

Only one soil sample has been taken from this site (FW19). The sample contains small amounts of 2,4,6-TNT explosive (0.663 mg/kg). Other explosives were below detection limits. However, significant concentration of total phosphate at a level of 307 mg/kg is found. No metal data are available.

3.4.4.3 Proposed Actions

A geophysical survey will be conducted and sediment and surface soil samples will be collected.

3.4.4.4 Hazard Identification

The following potential hazards may be associated with the Old Demolition Area:

- biologic hazards (poisonous plants, insects, animals, reptiles, etc.)
- slippery surfaces, steep grades, uneven terrain, etc.
- presence of sharp objects
- possible chemical exposures through dust generation, release of volatile compounds, skin contact and ingestion.

In addition, the potential presence of explosives, including UXO, may pose a hazard in this area.

3.5 FUNCTIONAL TESTING RANGES

3.5.1 Functional Test Range 1

3.5.1.1 Site History

This is one of the three functional test areas at the FWDA. The site is located in the east-central section of the depot (see Figure 3-3) and seems to have had different uses in the past. From a map dated 1949, the site was listed as a powder burning area. In an aerial photograph taken in 1948, the site was shown being actively used. It is possible that burning activities may have occurred in the early 1940s. In a 1955 map, the designation of the "powder burning area" shown in the 1949 map disappeared, implying that the site was not active. However, the area was noted as a site for flare and signal grenade testing during the late 1950s. The site currently is covered with grasses. Scrap metal and shrapnel are spread over a large area. Residues were piled by the bank of an arroyo near the eastern part of the site.

3.5.1.2 Nature and Extent of Contamination

Based on information about past activities, the major environmental concerns in the site are metal and explosives contamination. All rounds were accounted for; however, a confirmation UXO sweep will be conducted. No soil, sediment, and water samples have been taken from the area.

3.5.1.3 Proposed Actions

A UXO survey will be conducted. Surface soil and sediment samples will be collected.

3.5.1.4 Hazard Identification

The following potential hazards may be associated with the Functional Test Range 1:

- biologic hazards (poisonous plants, insects, animals, reptiles, etc.)
- slippery surfaces, steep grades, uneven terrain, etc.
- presence of sharp objects
- possible chemical exposures through dust generation, release of volatile compounds, skin contact and ingestion.

In addition, the potential presence of explosives, including UXO, may pose a hazard in this area.

3.5.2 Functional Test Ranges 2 and 3

3.5.2.1 Site History

Functional Test Ranges 2 and 3 are both in the northeastern part of FWDA and are adjacent to each other (see Figure 3-3). Range 2 was reportedly used between 1960 and 1967 to test a variety of munitions, rockets and mortars, including 3.5-inch rockets and 4.2-inch mortars. Range 2 is mostly revegetated except for a small area in the northeast portion where there is less vegetation. Range 3 was used in the 1960s to test high explosives and contained many craters. It is currently revegetated.

3.5.2.2 Nature and Extent of Contamination

The major concerns on this site are UXO and potential explosives and metal contamination. This conclusion is based on known past activities at the site. All rounds were accounted for; however, a confirmation UXO sweep will be conducted. As there are no chemical data on the soil on the site, the seriousness of metal contamination is not clear.

3.5.2.3 Proposed Actions

A UXO survey will be conducted. Surface soil and sediment samples will be collected.

3.5.2.4 Hazard Identification

The following potential hazards may be associated with Functional Test Ranges, 2 and 3:

- biologic hazards (poisonous plants, insects, animals, reptiles, etc.)
- slippery surfaces, steep grades, uneven terrain, etc.
- presence of sharp objects
- possible chemical exposures through dust generation, release of volatile compounds, skin contact and ingestion.

In addition, the potential presence of explosives, including UXO, may pose a hazard in this area.

3.6 OTHER AREAS AND FACILITIES OF CONCERN

Other areas and facilities on the FWDA property that require additional environmental evaluation are:

- **Above-ground fuel storage tanks,**
- **Missile launch sites (three sites),**
- **Pistol range areas, and**
- **Old Trash Burning Ground.**

The following potential hazards may be associated with the tests at these areas:

- biologic hazards (poisonous plants, insects, animals, reptiles, etc.)
- weather hazards (lightning, flash-flooding, mudslides, etc.)
- slippery surfaces, steep grades, uneven terrain, etc.

- electrical hazards (overhead power lines, buried cables, etc.)
- heat stress/cold exposure (see Appendix B)
- presence of heavy machinery and fast-moving drill rig components
- excessive noise levels
- presence of sharp objects
- possible chemical exposures through dust generation, release of volatile compounds, skin contact and ingestion.

In addition, the potential presence of explosives, including UXO may pose a hazard at the missile launch sites and the Old Trash Burning Ground.

3.6.1 Missile Launch Sites

Pershing and Sergeant missiles were launched from FWDA as part of a test program in the 1960s. From October 1963 to February 1964, 14 missiles were launched from this area. The three known missile launch sites are all in the southern section of FWDA (see Figure 3-4). Missiles were launched from FWDA into the White Sands Missile Range to the southeast.

The Ballistic Missile Testing Site (BMTS) contains much debris left over from the launchings, including a concrete pad, communication wire, old tires, and two "headstones" that reportedly mark the spot where two missile engines are buried. This BMTS area contains a launch pad and, when operational, contained quarters for the launching team and their equipment.

The Pershing missile site is located near Lake McFerren. A launching pad is visible, but few other visible signs remain to indicated that this was a missile launch site. This area is currently used for recreation.

A third missile launch site that was reportedly never used exists to the north of the BMTS and Pershing launch sites, near the eastern border of FWDA. This site has a launch pad but little other visible evidence of missile launch activities.

A geophysical survey will be conducted and surface soil and sediments samples will be collected. The following analyses will be conducted: explosives.

3.6.2 Pistol Range

The New Mexico Army National Guard has leased 600 acres of land for bivouac and tank maneuver training. Training has occurred sporadically in the past. Firing of weapons reportedly took place during training. The U.S. Army Reserve Engineers also periodically train personnel on the installation in the use of construction equipment and techniques. Information is not available as to the length of time the pistol range has been in use. The Pistol Range is located in Figure 3-3, south of Magazine Area G.

3.6.3 Old Trash Burning Ground

A map from 1944 identified an area in the northern portion of the installation as a trash burning area. It is located about 2,000 feet west of the sewage disposal plant and south of the road and man-proof fence.

A geophysical survey will be conducted, surface soil will be collected and soil borings will be drilled.

Appendix 8.2

- *"Table 4-1 - Contaminants Reported For Ft. Wingate Site, Site Specific Hazard Evaluation," Final Health and Safety Plan For The Environmental Investigation (EI) At Fort Wingate Depot Activity (FWDA), Gallup, New Mexico, dated 6 November 1992, prepared byMetcalf & Eddy, Inc.*

Table 4-1 - Continued

Potential Contaminants for Fort Wingate Site

Contaminant	Highest Observed Concentration (units in media)	Health Hazard Rating	Route of Entry	Symptoms/Effect of Exposure	PEL/TLV ppm or mg/m³ (specify)	IDLH ppm or mg/m³ (specify)	Photo-Ionization Potential
Selenium compounds	Unk	L	Inh ing abs con	irritation of eyes, nose, and throat; visual disturbances; headache, chill, fever; dyspnea, bronchitis; metallic taste, garlic breath, GI, dermatitis; blurring eyes, skin	0.2 mg/M³ TWA TLV 0.2 mg/M³ TWA PEL	100 mg/M³	
Iron oxide (fume hazard data)	Unk	L	Inh	benign pneumoconiosis; x-ray shadows indistinguishable from fibrotic pneumoconiosis	10 mg/M³ TWA PEL	(N. A.)	
SOLVENTS:							
Carbon tetrachloride	Unk	L	Inh ing abs con	central nervous system depression; nausea, vomiting; liver, kidney damage; skin irritation; (carc.)	5 A2 ppm TWA TLV SK 2 ppm TWA PEL	300 ppm	
Toluene	Unk	L	Inh ing abs con	fatigue, weakness; confusion, euphoria, dizziness, headache; dilated pupils, lacrimation; nervousness, muscle fatigue, insomnia; paresthesias, dermatitis, photophobia	(100) ppm TWA TLV 100 ppm TWA PEL 150 ppm STEL PEL (150) ppm STEL TLV	2000 ppm	8.82 eV
Stoddard solvent	Unk	L	Inh ing con	irritation of eyes, nose, throat; dizziness; dermatitis	100 ppm TWA TLV 100 ppm TWA PEL	5000 ppm	

Key: A = Air A1 = ACGIH Known Human Carcinogen A2 = ACGIH Suspect Carcinogen Abs = Absorption Ca or CARC = Carcinogen Ceil = Ceiling limit
Con = Contact GW = Groundwater L = Low M = Medium H = High Inh = Inhalation Ing = Ingestion NA = Not available S = Soil SP = Seeps
Skin = Skin Permeation STEL = Short Term Exposure Limit SW = Surface Water T = Tailings TWA = Time-weighted average (TLV)=TLV Change Pending

Table 4-1 - Continued

Potential Contaminants for Fort Wingate Site

Contaminant	Highest Observed Concentration (units in media)	Health Hazard Rating	Route of Entry	Symptoms/Effect of Exposure	PEL/TLV ppm or mg/m³ (specify)	IDLH ppm or mg/m³ (specify)	Photo-Ionization Potential
Fluorides (as F) (Fluorspar)	Unk	L	Inh ing con	irritation of eyes, respiratory system; acute exposure: nausea, abdominal pain, diarrhea, excess salivation, thirst, sweat; chronic exposure: stiff spine, dermatitis; calcification of	2.5 mg/M³ TWA TLV 2.5 mg/M³ TWA PEL	500 mg/M³	
Di-sec-octyl phthalate	Unk	L	Inh ing con	irritation of eyes, mucous membranes; nausea, diarrhea (carc)	5 mg/M³ TWA TLV 5 mg/M³ TWA PEL 10 mg/M³ STEL PEL 10 mg/M³ STEL TLV	(Ca)	

Key: A = Air A1 = ACGIH Known Human Carcinogen A2 = ACGIH Suspect Carcinogen Abs = Absorption Ca or CARC = Carcinogen Ceil = Ceiling limit
Con = Contact GW = Groundwater L = Low M = Medium H = High Inh = Inhalation Ing = Ingestion NA = Not available S = Soil SP = Seeps
Skin = Skin Permeation STEL = Short Term Exposure Limit SW = Surface Water T = Tailings TWA = Time-weighted average U = Unknown

9.0 *ACCIDENT PREVENTION*

General safety precautions and procedures applicable to all field investigations are outlined in Appendix E. The following sections present specific procedures which will be followed during the FWDA-EI Program.

9.1 *FIELD ACTIVITIES COVERED UNDER THIS PLAN*

Field activities to be performed as part of the FWDA-EI Program are summarized in this section. Daily records of actual field activities will be kept in the Health and Safety log book, as discussed in Section 4.

Besides the more specific hazards for each field activity discussed in Section 3 (Appendix 8.1 of this SHSP) of the "Final Health and Safety Plan for the Environmental Investigation (EI) at Fort Wingate Depot Activity (FWDA) Gallup, New Mexico", dated 6 November 1992 and prepared by Metcalf & Eddy, Inc. (Final Health and Safety Plan), the following are general hazards that on-site personnel should be aware of:

- Unexploded ordnance (UXO) and debris resulting from demilitarization/disposal operations
- Biologic hazards (poisonous plants, insects [red ants], animals [buffalo], reptiles, etc.)
- Weather hazards (lightning, flash flooding, mudslides, etc.)
- Difficult terrain (slippery surfaces, steep grades, etc.)
- Electrical hazards (overhead power lines, buried utilities and cables, etc.)
- Heat stress/cold exposure
- Possible chemical exposures through dust generation, release of volatile compounds from disturbed soils or ground water, skin contact, and ingestion

In addition, the EI Program will include performing an evaluation of the FWDA facilities for impacts associated with former PCB transformers, lead-based paint and asbestos. The evaluation will be based primarily on visual surveys and reviews of previously prepared reports. In addition, field sampling will be performed in suspected areas related to the PCB transformers and suspected lead-based paint.

9.2 *FIELD OPERATIONS*

9.2.1 *Safety Permits*

Safety permits required for the proposed operations on site will be obtained. Permits that may potentially be required include operation of motor vehicles on site, operation of heavy equipment on site, installation of monitoring wells, etc.

Confined space entry procedures require execution of a Confined Space Entry Permit (CSEP), executed by the Site Safety Officer and approved by the Project Manager/Project Safety Supervisor and incorporation of the required procedures into the SHSP in accordance with the OSHA Hazardous Waste Operations and Emergency Response Standard 29 CFR 1910.120. **No Confined Space Entries are anticipated during the FWDA EI.**

9.2.2 *UXO Clearance*

UXO clearance will be performed prior to the initiation of sampling activities in the Functional Test Ranges and the Burning Ground and Demolition Area. Appendix 11.1 provides the Work Plan and Standard Operating Procedures (SOPs) for the performance of UXO activities.

Any items recovered that are suspected to contain UXO or chemical agents will not be handled by UXO personnel. The Site Safety Officer will contact the Project Manager who will coordinate with the USATHAMA COR and the Base Contact and EI activities will be relocated or deferred.

9.2.3 *Drilling/Well Installation*

Drilling or well installation activities will occur at the investigation sites provided in Table 3.1 (Appendix 8.1 of this SHSP) of the Final Health and Safety Plan. Hazards associated with this type of activity typically include the presence of heavy machinery and fast-moving drill rig components; the potential for trips, slips, and falls; excessive noise levels; the presence of sharp objects; and possible chemical exposures through dust generation, release of volatile compounds from disturbed soils or ground water, and skin contact. These hazards will be minimized by following the procedures given in other parts of Section 4.

At a minimum, the following safety precautions will be implemented during drilling/well installation activities:

- The drilling subcontractor will ensure that all site personnel are knowledgeable of the appropriate safety and emergency action procedures for the drilling equipment to be operated.
- The drilling subcontractor will inspect all drilling equipment on a daily basis during use to ensure that the equipment is well-maintained, meets safety requirements and has all required safety equipment; i.e., ABC fire extinguisher, emergency stops, etc. In addition, boring tools will be well maintained to ensure adequacy for the work to be performed.
- The drill rig(s) will be operated by qualified operator(s) able to identify potential problems/failures and supervise the driller's helper(s). Transportation of the drill rig to the work site will be performed by an appropriate commercially licensed operator.
- To the extent possible, the drill rig will be operated on a level terrain with consideration of optimum ground surface conditions such that movement of the drill rig is unlikely or minimized. If the terrain slope appears hazardous, the Project Manager will coordinate with the USATHAMA Project Officer to determine selection of a safe drill site.

The Field Operations Manager /Site Safety Officer will ensure that the following procedures are followed during drilling and sampling operations:

1. The established (Appendix 11.1) procedures for performing investigation activities in the identified potential UXO areas;
2. Goggles or safety glasses will be worn when operating power tools, sanding, grinding, filing, or entering areas of FWDA where they are required. Welders' glasses or a mask will be worn in the vicinity of welding operations;
3. Hardhats will be worn at all times in the vicinity of the drilling rig and heavy rubber boots with reinforced toes will be worn in the vicinity of the rig;
4. Outer work gloves must be worn over nitrile gloves to protect hands from cables, etc. These gloves should fit tightly to avoid getting caught in machinery;
5. Loose-fitting clothing or free long hair are not permitted near the rig;
6. Hands will be kept out of the way of moving parts of machinery when drilling is in progress;
7. Daily inspection of all ropes, cables, bolts, and moving parts of the rig is mandatory;

8. A first-aid kit and fire extinguisher will be available at all times;
9. The water supply available for drilling use will be maintained in a ready state to wash down any ERM or subcontractor personnel receiving significant accidental exposure to liquids or particulates emanating from the ground;
10. All crews will consist of at least two persons;
11. There will be no smoking;
12. No drilling will occur during impending electrical storms or when rain or icing conditions create a hazard in working with equipment, and
13. In the areas where utilities are located, water discharged during drilling/well development will be prevented from entering underground utilities manholes.

9.2.4 *Soil Sampling*

Soil sampling activities will occur at the investigation sites listed in Table 3-1 (Appendix 8.1 of this SHSP). Hazards associated with this type of activity typically include the potential for trips, slips, and falls and possible chemical exposures through dust generation, release of volatile compounds from disturbed soils, and skin contact.

9.2.5 *Surface Water/Sediment Sampling*

Surface water and sediment sampling activities will occur at the investigation sites listed in Table 3.1 (Appendix 8.1 of this SHSP). Hazards associated with this type of activity typically include the presence of open surface water; the potential for trips, slips, and falls; and possible chemical exposures through skin contact or ingestion. Samples for some types of analyses require preservation in the field using nitric acid, hydrochloric acid, or sodium hydroxide. Exposure to these chemicals may be hazardous. Material Safety Data Sheets that describe the potential hazards for these chemicals are provided in Appendix C.

9.2.6 *Ground Water Sampling*

Ground water sampling activities will occur at investigation sites where monitoring wells are installed. Hazards associated with this type of activity typically include the potential for trips, slips, and falls and possible chemical exposures through skin contact and the release of volatile compounds from ground water. Samples for some types of analyses require preservation in the field using nitric acid, hydrochloric acid, or sodium hydroxide. Exposure to these chemicals may be hazardous. Material Safety Data Sheets that describe the potential hazards for these chemicals are provided in Appendix C.

9.3 *PERSONAL PROTECTION*

As discussed in Section 4.5 of the "Final Health and Safety Plan," (a copy of which is included as Appendix 9.1 of this SHSP) all tasks are currently expected to require level D Personal Protective Equipment (PPE), which includes wearing hard hats, safety glasses, steel-toed boots, and gloves. In addition, tyvek suits will be worn near all drilling activities and during well sampling, and ear plugs will be worn near operating drill rigs or anywhere that sustained noise levels may exceed 85 dBA. Should the field monitoring described below show ambient levels exceeding the action levels listed in Subsection 4.6 of the "Final Health and Safety Plan" (Appendix 9.1 to this SHSP), site personnel will upgrade to Level C PPE.

Based upon the known/suspected site conditions, there is no expectation of either Level B or Level A upgrades. Descriptions of PPE levels, including procedures for caring for various types of PPE, are given in Appendix C of the "Final Health and Safety Plan." Pertinent hazard information for identified and suspected site contaminants is summarized in Table 4-1 of the "Final Health and Safety Plan," (Appendix 9.2 of this SHSP).

9.4 *ON-SITE MONITORING*

Field activities associated with the FWDA EI Program may create potentially hazardous conditions, such as the release of organic vapors into the breathing zone or contact with contaminated soils and water. As determined by the Site Safety Officer (SSO), most proposed site activities will involve continual monitoring of the ambient airspace in the work area by the SSO, or qualified designee. As described in the following sections, an OVA, a flame ionization detector (FID) or a photo ionization detector (PID) will be used to monitor total VOC concentrations. The FID and the PID will be calibrated daily (or as instructed by manufacturer recommendations).

At the initiation of each work activity or work period, the SSO (or qualified designee) will measure and record the background levels of total VOCs in the ambient airspace. Additionally, relevant meteorologic data will be estimated and recorded in the project field book (i.e., wind speed and direction and ambient air temperature). The potential for volatilization of VOCs will be assessed based upon the activity to be performed (intrusive versus non-intrusive), and the meteorologic conditions existing at the time the activity is to take place.

9.5 AIR MONITORING

During all drilling and well installation tasks, air monitoring will be conducted as discussed in Subsection 4.6 of the "Final Health and Safety Plan" (Appendix 9.1). A discussion of personal protective equipment is included in Appendix C and instruments used for health and safety monitoring are described in Appendix D of the "Final Health and Safety Plan" (copies of which are included as Appendix 9.3 to this SHSP).

9.6 DECONTAMINATION PROCEDURES

Decontamination is the process of removing or inactivating contaminants that have accumulated on personnel or equipment. There are two purposes for decontamination during EI activities. One purpose is to prevent cross-contamination of samples, and the other is to protect workers and the public from exposure to hazardous substances. Decontamination procedures are detailed in Subsection 4.7 of the "Final Health and Safety Plan" (Appendix 9.1 of this SHSP) and are intended to protect personnel from any foreseeable health effects.

Decontamination will be performed first by physical removal methods such as dislodging, wiping off, rinsing, and evaporation. Following gross physical removal methods, further removal is performed using a soap and water solution or by using other surfactants and solidifying agents.

One goal of decontamination is to minimize the quantity of contaminated material requiring disposal. The best form of contaminant reduction is through prevention. Prevention of contamination should be established as standard operating procedure and included as the first step in the decontamination plan. For this project, prevention of contamination will be accomplished through the following practices:

- Use of site-dedicated work clothing to be used on-site only
- Work practices that minimize contact with contaminants
- Use of remote sampling and handling equipment wherever possible
- Covering or wrapping equipment
- Use of disposable outer garments
- Encasement of contaminant sources

9.7 *WEATHER HAZARDS*

During the field drilling and sampling efforts, the following precautions will be taken:

1. Personnel will be observed closely for signs of heat stroke or heat stress (summer/fall), particularly if wearing Tyvek® coveralls;
2. Personnel will be observed for signs of hypothermia (fall/winter); and
3. Field operations will cease immediately upon signs of impending thunderstorms and lightning.

Appendix 9.1

- *"Subsections 4.5 and 4.6" from the Final Health and Safety Plan for the Environmental Investigation (EI) at Fort Wingate Depot Activity (FWDA) Gallup, New Mexico, dated 6 November 1992, prepared by Metcalf & Eddy, Inc.*

4.5 PERSONAL PROTECTION

All tasks are currently expected to require Level D Personal Protective Equipment (PPE), which includes wearing hard hats, safety glasses, steel-toed boots, and gloves. In addition, tyvek suits will be worn near all drilling activities and during well sampling, and ear plugs will be worn near operating drill rigs or anywhere that sustained noise levels may exceed 85 dB(A). Should the field monitoring described below show ambient levels exceeding the action levels listed in 4.6, site personnel will upgrade to Level C PPE. Based upon the known/suspected site conditions, there is no expectation of either Level B or Level A upgrades. Descriptions of PPE levels, including procedures for caring for various types of PPE, are given in Appendix C. Pertinent hazard information for identified and suspected site contaminants is summarized in Table 4-1.

4.6 AIR MONITORING

During all drilling and well installation tasks, air monitoring will be conducted as shown in Table 4-2. A discussion of personal protective equipment is included in Appendix C. Instruments used for health and safety monitoring are described in Appendix D. The instruments listed in Table 4-2 will be calibrated at least daily. A record of the daily calibrations will be kept using the Daily Calibration Record Form shown in Figure 4-4.

TABLE 4-2
AIR MONITORING

Instrument	Activity	Action Levels	Monitoring Frequency
HNu	All	1 ppm for 5 min Evacuate affected areas, conduct monitoring for benzene specifically. Potentially, upgrade to C. (if benzene > 1 ppm in BZ)	Continuous
OVA	All	25 ppm ceiling Evacuate affected areas, conduct monitoring for benzene specifically. Consult Program H&SO	To Supplement HNu
Visual	All	Indication of Airborne Dust, Upgrade to C	Continuous
Explosimeter	All	10% of LEL Evaluate affected areas.	Continuous, minimum of every 15 min. directly at bore holes.

Note: APRs (Level C) not permitted for benzene above 25 ppm, which is not considered credible at this site.

DAILY CALIBRATION RECORD

Instrument No.________

Date	Calibration Gas Concentration	Meter Ready	Adjustments Made	Comments	Calibration by Initials

Figure 4-4

Daily Calibration Record Form

If an upgrade to C is required, the contractor will use high-efficiency particulate arrestor (HEPA) combination respirator cartridges with impregnated charcoal. These cartridges are rated for acid gases and/or organic vapors, and color coded magenta and yellow.

In addition, a daily health and safety/air monitoring log will be maintained by the Site Safety Officer. The log will include, at a minimum, the following information:

- description of the field work being conducted and any changes in the operation
- name, company affiliation, title of all personnel working on activities under this Plan
- types of air monitoring equipment being used and calibrations
- air monitoring readings
- level of PPE being worn
- accidents and injuries
- description of any unusual occurrences or physical complaints.

Copies of the logs will be facsimiled to USATHAMA, CETHA-TS-S, weekly during field activities at (410) 671-1675.

4.7 DECONTAMINATION PROCEDURES

Decontamination is the process of removing or inactivating contaminants that have accumulated on personnel or equipment. There are two purposes for decontamination during EI activities. One purpose is to prevent cross-contamination of samples, and the other is to protect workers and the public from exposure to hazardous substances. Decontamination procedures to satisfy the first purpose are detailed in the Sampling and Analysis Plan. The decontamination procedures detailed below are intended to protect personnel from any foreseeable health effects.

Decontamination will be performed first by physical removal methods such as dislodging, wiping off, rinsing, and evaporation. Following gross physical removal methods, further removal is performed using a soap and water solution or by using other surfactants and solidifying agents. Typical decontamination equipment items are listed in Figure 4-5.

One goal of decontamination is to minimize the quantity of contaminated material requiring disposal. The best form of contaminant reduction is through prevention. Prevention of contamination should be established as standard operating procedure and included as the first step in the decontamination plan. For this project, prevention of contamination will be accomplished through the following practices:

- Use of site-dedicated work clothing to be used on site only
- Work practices that minimize contact with contaminants
- Use of remote sampling and handling equipment wherever possible
- Covering or wrapping equipment
- Use of disposable outer garments
- Encasement of contaminant sources.

Personnel Decontamination

Personnel decontamination will consist of safe work practices, the use of disposable protective clothing, personal hygiene, and personal decontamination before breaks and at the completion of each work day. Decontamination of workers is described below:

Routine Decontamination

- Scrub overboots with a water and mild soap solution before removal;
- Remove disposable coveralls and place in a plastic trash bag;
- Remove disposable gloves and place in a plastic trash bag;
- Thoroughly wash hands and face; and
- If necessary, wash respirators in a respirator sanitizing solution, rinse, and air dry.

ITEM	APPLICATION Personnel	Equipment
Plastic sheeting to isolate contaminants	X	X
Wood pallets for an elevated walkway	X	
Portable saw horses to elevate equipment		X
Vehicle support decontamination pad		X
Hand pressurized sprayer	X	X
Long-handled (plastic) scrub brushes	X	X
Wire bristle scrub brushes		X
High pressure water or steam cleaner		X
High-volume water supply		X
Low-volume water supply	X	
Galvanized metal wash basins/pails	X	X
Hand soap in dispenser	X	
Soap solutions	X	X
Decon solutions	X	X
Rinse water containment vessels	X	X
Rinse water transfer pump	X	X
Rinse water storage containers	X	X
Plastic trash cans with liners	X	X
Paper Towels (rolls or packages of singles)	X	X
Class ABC fire extinguisher (20-lb. capacity)	X	X
Portable air pressurized eye wash/shower	X	X
Sprayer (minimum 15-minute capacity)	X	X
First aid kit	X	X

Figure 4-5

Typical Decontamination Equipment

A centralized field decontamination station will be positioned outdoors in the "clean zone." The components of the decontamination station will consist of the following:

• Long-handled scrub brush	(4 each)
• Boot wash basin	(2 each)
• Plastic sheeting	(10' x 20')
• Air pressurized eye wash/decon sprayer	(1 each)
• Plastic trash bags	(200 each)
• ALCONOX soap powder	(4 pounds)
• Paper towels	(40 rolls)
• Garden hose and continuous water supply	(1 each)
• First aid kit	(2 each)
• Class ABC fire extinguisher	(1 each)

USATHAMA-approved tap water will be used for personnel decontamination.

Emergency Decontamination

Should a worker be splashed with contaminants, the worker will immediately be escorted to the field decontamination station and be decontaminated as follows:

- Remove all contaminated clothing.
- Remove all wet clothing.
- Dress in clean/dry clothing.
- Transport worker to hospital, if necessary.

Equipment Decontamination:

The decontamination procedures for equipment are described in the FSP. Decontamination will be verified each time a person or piece of equipment leaves the facility by the on-site Health and Safety Officer.

4.8 SHIPPING PROCEDURES

The Contractor shall comply with U.S. Department of Transportation (DOT) Rules for Hazardous Materials Transportation. Shipment of materials to and from hazardous waste sites is the responsibility of designated individuals, who are provided with procedures to comply with the DOT rules as applicable to each particular substance they ship.

Compliance with U.S. DOT regulations begins with proper classification of the substance, i.e., whether it meets the criteria for inclusion in any of the U.S. DOT hazard categories.

- Explosive (A, B, or C)
- Blasting Agent
- Flammable Gas
- Flammable Liquid
- Flammable Solid
- Organic Peroxide
- ORM-A (Irritant Leakage)
- ORM-C (Problem Character)
- Radioactive
- Poison Gas (Poison A)
- Poison B (Liquid or Solid)
- Combustible Liquid
- Irritating Material
- Nonflammable Compressed Gas
- Oxidizer
- ORM-B (Damaging Leakage)
- ORM-E (Hazardous Substance)
- Etiologic Agent

The U.S. DOT Hazardous Materials Table at 49 CFR 172.101 and appendix are used to determine the Proper Shipping Name and classification for chemical substances in commerce. If a listing cannot be found for the material, and the material appears to belong in one or more of the DOT classes, a determination must be made by comparing the characteristics of the material to be shipped with the definitions for the class in question. After the Proper Shipping Name is determined, the packaging, marking, labeling, placarding, and miscellaneous other requirements can be determined along with restrictions on quantities and modes of transportation. Shipping papers are always required, and the shipper is required to certify to the carrier that the material is prepared in accordance with the regulations. The Health and Safety Officer can provide assistance.

Materials for Contractor use on site (such as acids, bases, and solvents) are shipped to sites under the direction of equipment technicians following established procedures. In the vast majority of cases, environmental samples of soil or water or air contaminants will not meet any of the criteria for a DOT class and will be classified "Not Hazardous" for shipping purposes. Where a particular sampling effort is expected to yield samples with unusual properties that may conceivably lead to their classification as "hazardous" under these rules, assistance should be sought from the Health and Safety Officer in making a determination. If samples are classified "hazardous" under the U.S. DOT rules, the Sampling Plan must provide in detail for packaging, labeling, marking, and documentation that will comply with the regulations.

Appendix 9.2

- *"Table 4.1" from the Final Health and Safety Plan for the Environmental Investigation (EI) at Fort Wingate Depot Activity (FWDA) Gallup, New Mexico, dated 6 November 1992, prepared by Metcalf & Eddy, Inc.*

Table 4-1.

Contaminants Reported for Ft. Wingate Site

Contaminant	Highest Observed Concentration (units in media)	Health Hazard Rating	Route of Entry	Symptoms/Effect of Exposure	PEL/TLV ppm or mg/M^3 (specify)	IDLH ppm or mg/M^3 (specify)	Photo-Ionization Potential
METALS:							
Lead and inorganic lead compounds	Unk	L	Inh ing con	lassitude, insomnia; pallor, eye grounds; anorexia, weight loss, malnutrition, constipation, abdominal pain, colic; hypotense,anemia; gingival lead line; tremors, paralysis wrist	0.15 mg/M^3 TWA TLV 0.05 mg/M^3 TWA	(variable)	
Tetraethyl lead (Biological monitoring necessary if exposure is substantial)	Unk	L	Inh ing abs con	insomnia, weight loss, anxiety, tremor, hyper reflexia, spasticity, bradycardia, hypotension, hypothermia, pallor; nausea, anorexia, weight loss; hallucinations, convulsions, coma, eye irritation	0.1 mg/M^3 TWA TL 0.075 mg/M^3 TWA PEL	40 mg/M^3	11.1 eV
Cadmium dust	Unk	L	Inh ing	pulmonary edema, cough, tight chest, substernal pain; headache, chills, muscle ache; nausea, diarrhea; anosmia, emphysema; proteinuria; anemia; (carc.)	(0.05) mg/M^3 TWA TL 0.2 mg/M^3 TWA PEL 0.6 mg/M^3 CEIL PEL	40 mg/M^3 (Ca)	

Key: A = Air A1 = ACGIH Known Human Carcinogen A2 = ACGIH Suspect Carcinogen Abs = Absorption Ca or CARC = Carcinogen Ceil = Ceiling limit

Con = Contact GW = Groundwater L = Low M = Medium H = High Inh = Inhalation Ing = Ingestion NA = Not available S = Soil SP = Seeps

Skin = Skin Permeation STEL = Short Term Exposure Limit SW = Surface Water T = Tailings TWA = Time-weighted average (TLV)=TLV Change Pending

Table 4-1 - Continued

Potential Contaminants for Fort Wingate Site

Contaminant	Highest Observed Concentration (units in media)	Health Hazard Rating	Route of Entry	Symptoms/Effect of Exposure	PEL/TLV ppm or mg/m³ (specify)	IDLH ppm or mg/m³ (specify)	Photo-Ionization Potential
Selenium compounds	Unk	L	Inh ing abs con	irritation of eyes, nose, and throat; visual disturbances; headache, chill, fever; dyspnea, bronchitis; metallic taste, garlic breath, GI, dermatitis; blurring eyes, skin	0.2 mg/M^3 TWA TLV 0.2 mg/M^3 TWA PEL	100 mg/M^3	
Iron oxide (fume hazard data)	Unk	L	Inh	benign pneumoconiosis; x-ray shadows indistinguishable from fibrotic pneumoconiosis	10 mg/M^3 TWA PEL	(N. A.)	
SOLVENTS:							
Carbon tetrachloride	Unk	L	Inh ing abs con	central nervous system depression; nausea, vomiting; liver, kidney damage; skin irritation; (carc.)	5 A2 ppm TWA TLV SK 2 ppm TWA PEL	300 ppm	
Toluene	Unk	L	Inh ing abs con	fatigue, weakness; confusion, euphoria, dizziness, headache; dilated pupils, lacrimation; nervousness, muscle fatigue, insomnia; paresthesias, dermatitis, photophobia	(100) ppm TWA TLV 100 ppm TWA PEL 150 ppm STEL PEL (150) ppm STEL TLV	2000 ppm	8.82 eV
Stoddard solvent	Unk	L	Inh ing con	irritation of eyes, nose, throat; dizziness; dermatitis	100 ppm TWA TLV 100 ppm TWA PEL	5000 ppm	

Key: A = Air A1 = ACGIH Known Human Carcinogen A2 = ACGIH Suspect Carcinogen Abs = Absorption Ca or CARC = Carcinogen Ceil = Ceiling limit

Con = Contact GW = Groundwater L = Low M = Medium H = High Inh = Inhalation Ing = Ingestion NA = Not available S = Soil SP = Seeps

Skin = Skin Permeation STEL = Short Term Exposure Limit SW = Surface Water T = Tailings TWA = Time-weighted average (TLV)=TLV Change Pending

Table 4-1 - Continued

Potential Contaminants for Fort Wingate Site

Contaminant	Highest Observed Concentration (units in media)	Health Hazard Rating	Route of Entry	Symptoms/Effect of Exposure	PEL/TLV ppm or mg/m³ (specify)	IDLH ppm or mg/m³ (specify)	Photo-Ionization Potential
Petroleum distillates mixture (naphtha)	Unk	L	Inh ing con	dizziness, drowsiness, headache, nausea; irritation of eyes, nose, and throat; dry cracked skin	Not def. 400 ppm TWA PEL	10,000 ppm	
SANFAX CLEANER, i.e.,							
Methylene chloride (component)	Unk	L	Inh ing con	fatigue, weakness, sleepiness, lightheadedness; limbs numb, tingle; nausea; irritation of eyes, skin; vertigo;	50A2 ppm TWA TLV 500 ppm TWA PEL	5000 ppm	11.35 eV
Methyl chloroform (component)	Unk	L	Inh ing con	headache, lassitude; CNS depression; poor equilibrium, irritation of eyes; dermatitis; cardiac arrhythmia	350 ppm TWA TLV 350 ppm TWA PEL 450 ppm STEL PEL 450 ppm STEL TLV	1000 ppm	
PESTICIDES, HERBICIDES:							
2,4-D	Unk	L	Inh ing abs con	weakness; stupor; hypereflexia; muscle twitch; convulsions; dermatitis	10 mg/M³ TWA TLV 10 mg/M³ TWA PEL	500 mg/M³	
2,4,5-T	Unk	L	Inh ing con	animal studies: ataxia, skin irritation, acne-like rash; blood in stool	10 mg/M³ TWA TLV 10 mg/M³ TWA PEL	5000 mg/M³	
Chlordane	Unk	L	Inh ing abs con	blurred vision; confusion; ataxia, delirium; cough; abdominal pain, nausea, vomiting, diarrhea; irritability, tremor, convulsions; anuria	0.5 mg/M³ TWA TLV 0.5 mg/M³ TWA PEL Skin	500 mg/M³	

Key: A = Air A1 = ACGIH Known Human Carcinogen A2 = ACGIH Suspect Carcinogen Abs = Absorption Ca or CARC = Carcinogen Ceil = Ceiling limit

Con = Contact GW = Groundwater L = Low M = Medium H = High Inh = Inhalation Ing = Ingestion NA = Not available S = Soil SP = Seeps

Skin = Skin Permeation STEL = Short Term Exposure Limit SW = Surface Water T = Tailings TWA = Time-weighted average (TLV)=TLV Change Pending

Table 4-1 - Continued

Potential Contaminants for TC Sites

Contaminant	Highest Observed Concentration (units in media)	Health Hazard Rating	Route of Entry	Symptoms/Effect of Exposure	PEL/TLV ppm or mg/m³ (specify)	IDLH ppm or mg/m³ (specify)	Photo-Ionization Potential
DALAPON (2,2-Dichloropropionic acid) (sodium salt)				eye, resp irrit	1 ppm TWA TLV 1 ppm TWA PEL		
DDT	Unk	L	Inh ing abs con	paresthesias of tongue lips, face; tremor, apprehension, dizziness confusion, malaise, headache; convulsions; partial loss of muscle power in hands (paresi vomiting, irritation o eyes, skin (carc)	1 mg/M³ TWA TLV 1 mg/M³ TWA PEL SKI	(Ca)	
Diazinon	Unk	L	Inh ing abs con	weakness, headache chest tightness blurred vision, miosis salivation, sweating, nausea, diarrhea, abdominal cramps, slurred speech, moist rales in lung (ACGIH TLV Documentation)	0.1 mg/M³ TWA TLV Skin 0.1 mg/M³ TWA PEL Skin		
Dieldrin	Unk	L	Inh ing abs con	headache, dizziness, nausea, vomiting, malaise, sweating; myoclonic limb jerks; clonic, tonic convulsions; coma (carc)	0.25 mg/M³ TWA TLV 0.25 mg/M³ TWA PEL	450 mg/M³	
Malathion	Unk	L	Inh ing abs con	miosis; eye, skin irritation; rhinorrhea, headache; tight chest, wheezing, laryngeal spasms, salivation; anorexia, nausea, vomiting, abdominal cramping, diarrhea, ataxia	10 mg/M³ TWA TLV 10 mg/M3 TWA PEL Total Skin	5000 mg/M³	

Key: A = Air A1 = ACGIH Known Human Carcinogen A2 = ACGIH Suspect Carcinogen Abs = Absorption Ca or CARC = Carcinogen Ceil = Ceiling limit

Con = Contact GW = Groundwater L = Low M = Medium H = High Inh = Inhalation Ing = Ingestion NA = Not available S = Soil SP = Seeps

Skin = Skin Permeation STEL = Short Term Exposure Limit SW = Surface Water T = Tailings TWA = Time-weighted average (TLV)=TLV Change Pending

Table 4-1 - Continued

Potential Contaminants for Fort Wingate Site

Contaminant	Highest Observed Concentration (units in media)	Health Hazard Rating	Route of Entry	Symptoms/Effect of Exposure	PEL/TLV ppm or mg/m^3 (specify)	IDLH ppm or mg/m^3 (specify)	Photo-Ionization Potential
Warfarin	Unk	L	Inh ing abs con	hematuria, back pain, hematomas of arms, legs; epistaxis, bleeding lips, mucous membrane hemorrhages, abdominal pain, vomiting, fecal blood; petechial rash; abnormal hematology	0.1 mg/M^3 TWA TLV 0.1 mg/M^3 TWA PEL	200 mg/M^3	
EXPLOSIVES RELATED:							
Dinitrotoluene	0.3 mg/kg Soil	L	Inh ing abs con	anoxia, cyanosis; anemia, jaundice	(1.5) mg/M^3 TWA TLV 1.5 mg/M^3 TWA PEL Skin	200 mg/M^3	
CYCLONITE (RDX)					1.5 mg/M^3 TWA TLV Skin 1.5 mg/M^3 TWA PEL Skin		
Trinitrotoluene	8.3 mg/kg Soil	L	Inh ing abs con	liver damage; jaundice; cyanosis; sneezing; coughing, sore throat; peripheral neuropathy, muscle pain; kidney damage; cardiac; cataract; dermatitis; leukocytoses, anemia	0.5 mg/M^3 TWA TLV 0.5 mg/M^3 TWA PEL (Skin)	(N. A.)	
Tetryl	Unk	L	Inh ing abs con	sensitization dermatitis, itch, erythema, edema on nasal folds, cheeks, neck; keratitis; epistaxis; irido-cyclitis; sneezing; coughing, coryza; irritation, fatigue, malaise,	1.5 mg/M^3 TWA TLV 1.5 mg/M^3 TWA PEL S	(N. A.)	

Key: A = Air A1 = ACGIH Known Human Carcinogen A2 = ACGIH Suspect Carcinogen Abs = Absorption Ca or CARC = Carcinogen Ceil = Ceiling limit

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Skin = Skin Permeation STEL = Short Term Exposure Limit SW = Surface Water T = Tailings TWA = Time-weighted average (TLV)=TLV Change Pending

Table 4-1 - Continued

Potential Contaminants for Fort Wingate Site

Contaminant	Highest Observed Concentration (units in media)	Health Hazard Rating	Route of Entry	Symptoms/Effect of Exposure	PEL/TLV ppm or mg/m^3 (specify)	IDLH ppm or mg/m^3 (specify)	Photo-Ionization Potential
OTHER:							
Oil, mineral	Unk	L	Inh	lung inflammation	5 mg/M^3 TWA TLV 5 mg/M^3 TWA PEL 10 mg/M^3 STEL TLV	(N. A.)	
Sulfuric acid	Unk	L	Inh ing con	eye, nose, throat irritation; pulmonary edema, bronchitis emphysema; conjunctivitis; stomatitis, dental erosion; tracheobronchitis; skin, eye burns; dermatitis	1 mg/M^3 TWA TLV 1 mg/M^3 TWA PEL 3 mg/M^3 STEL TLV	80 mg/M^3	
ETHYLENE GLYCOL				Not found	C50 ppm CEIL TLV 50 ppm CEIL PEL		
Chlorodiphenyl (42% Cl) (PCB w/low Cl	Unk	L	Inh ing abs con	irritation of eyes; chloracne; liver damage (carc.)	1 mg/M^3 TWA TLV 1 mg/M^3 TWA PEL Skin	10 mg/M^3 (Ca)	
Chlorodiphenyl (54% Cl) (PCB high Cl)	Unk	L	Inh ing abs con	irritation of eyes, skin; acne-form dermatitis; jaundice; dark urine (carc.)	0.5 mg/M^3 TWA TLV S 0.5 mg/M^3 TWA PEL S	5 mg/M^3 (Ca)	
Phosphorus, yellow (white) *(Hazard rating would be high if actually encountered)	Unk	L*	Inh ing con	irritation of eyes, respiratory tract; abdominal pain, nausea, jaundice, anemia; cachexia; dental pain; excessive salivation, jaw pain, swelling; burns of skin, eyes	0.02 ppm TWA TLV 0.1 mg/M^3 TWA PEL	(N. A.)	

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Skin = Skin Permeation STEL = Short Term Exposure Limit SW = Surface Water T = Tailings TWA = Time-weighted average (TLV)=TLV Change Pending

Table 4-1 - Continued

Potential Contaminants for Fort Wingate Site

Contaminant	Highest Observed Concentration (units in media)	Health Hazard Rating	Route of Entry	Symptoms/Effect of Exposure	PEL/TLV ppm or mg/m³ (specify)	IDLH ppm or mg/m³ (specify)	Photo-Ionization Potential
Fluorides (as F) (Fluorspar)	Unk	L	Inh ing con	irritation of eyes, respiratory system; acute exposure: nausea, abdominal pain, diarrhea, excess salivation, thirst, sweat; chronic exposure: stiff spine, dermatitis; calcification of	2.5 mg/M³ TWA TLV 2.5 mg/M³ TWA PEL	500 mg/M³	
Di-sec-octyl phthalate	Unk	L	Inh ing con	irritation of eyes, mucous membranes; nausea, diarrhea (carc)	5 mg/M³ TWA TLV 5 mg/M³ TWA PEL 10 mg/M³ STEL PEL 10 mg/M³ STEL TLV	(Ca)	

Key: A = Air A1 = ACGIH Known Human Carcinogen A2 = ACGIH Suspect Carcinogen Abs = Absorption Ca or CARC = Carcinogen Ceil = Ceiling limit
Con = Contact GW = Groundwater L = Low M = Medium H = High Inh = Inhalation Ing = Ingestion NA = Not available S = Soil SP = Seeps
Skin = Skin Permeation STEL = Short Term Exposure Limit SW = Surface Water T = Tailings TWA = Time-weighted average U = Unknown

Appendix 9.3

- *"Appendices C and D" from the Final Health and Safety Plan for the Environmental Investigation (EI) at Fort Wingate Depot Activity (FWDA) Gallup, New Mexico, dated 6 November 1992, prepared by Metcalf & Eddy, Inc.*

FINAL

APPENDIX C

PERSONAL PROTECTIVE EQUIPMENT

APPENDIX C: PERSONAL PROTECTIVE EQUIPMENT

C.1 PURPOSE

Anyone entering a hazardous waste site must be protected against the hazards that may be encountered. The purpose of Personal Protective Equipment (PPE) is to shield or isolate workers from the chemical, physical and biological hazards that may be encountered at a hazardous waste site or operation. Careful selection and use of adequate PPE should protect the respiratory system, skin, eyes, face, hands, feet, head, body, and hearing. Use of PPE is required by OSHA regulations in 29 CFR Part 1910 and reinforced by the U.S. Environmental Protection Agency (EPA) regulations in 40 CFR Part 300.

No single combination level of PPE is capable of protecting workers against all hazards. Thus, PPE should be used in conjunction with other protective methods. In fact, the use of PPE can itself create significant worker hazards such as heat stress, physical and psychological stress, and impaired vision, mobility, and communications. For any given situation, PPE should be selected that provides an adequate level of protection. Over-protection as well as under-protection can be hazardous and should be avoided.

In all cases, the Contractor Health and Safety Officer will select the PPE necessary to protect employees from an injury or illness that may result from exposures or hazards when Contractor personnel are involved in the performance of hazardous or chemical waste activities. Employees can upgrade their level of protection established for an operation, but may not downgrade without formally modifying the Health and Safety Plan.

C.2 RESPIRATORY PROTECTIVE EQUIPMENT

Respiratory protection is of primary importance in protecting workers, since inhalation is the most common route of exposure to hazardous substances. Respiratory protection is provided by either supplied-air respirators or air-purifying respirators. Use and selection of respirator type should be based on the potential of airborne hazards and air monitoring results.

Prior to using respiratory protective equipment in Contractor operations, the individual should pass a baseline medical surveillance physical (including a pulmonary function test) and must receive training in the proper use and maintenance of the equipment. In addition, the fit or integrity of the respirator face seal must be checked. A secure fit is important with air supplied (positive-pressure) equipment, and is essential to the safe functioning of air purifying (negative-pressure) equipment. Each respirator facepiece will fit only a certain percentage of the population; thus a tentatively-selected facepiece must be tested on the potential wearer in order to ensure a tight seal. Lastly, respirator users may not have long sideburns, beards, or other hair that protrudes into the seal area. OSHA standards also forbid them to wear contact lenses during respirator use.

Federal regulations require the use of respirators that have been tested and approved by the Mine Safety and Health Administration (MSHA) and/or the National Institute of Occupational Safety and Health (NIOSH).

All Contractor employees who are required to use respirators under this Plan must at least annually pass a face fit test in order to be qualified for respirator use. All respiratory equipment must be used in accordance with OSHA 29 CFR 1910.134 and ANSI Standard Z88.2, along with any specific requirements that may apply from 29 CFR Subpart Z.

Types of Respirators:

Respirators with an air source are called air- or atmosphere-supplied respirators. Hazardous waste operations ordinarily make use of two (2) types:

- Self-Contained Breathing Apparatus (SCBA). The SCBA supplies air from a source carried by the user. The source usually consists of a tank of compressed breathing air.
- Air-line/Supplied-Air Respirator (SAR). The SAR supplies air from a source up to 300 feet away through an air line hose connected to the user. The source usually consists of either an air compressor or large tanks of compressed breathing air.

Consistent with OSHA requirements, and accepted good practice, all supplied air respirators used during hazardous waste activities under this Plan will be of the positive-pressure type. A positive-pressure breathing device is one that maintains a positive pressure in the face mask during both inhalation and exhalation.

Respirators which "purify" ambient air and do not have a separate air source are called air-purifying respirators. The ambient air is usually purified by filter cartridges or canisters which are connected to the face mask. Advantages and disadvantages of each type of respirator are shown below in Table C-1.

TABLE C-1
RELATIVE ADVANTAGES AND DISADVANTAGES OF RESPIRATORY PROTECTIVE EQUIPMENT

TYPE OF RESPIRATOR	ADVANTAGES	DISADVANTAGES
ATMOSPHERE-SUPPLYING		
Self-Contained Breathing Apparatus (SCBA)	• Provides the highest available level of protection against airborne contaminants and oxygen deficiency. • Provides the highest available level of protection under strenuous work conditions.	• Bulky, heavy (up to 35 pounds). • Finite air supply limits work duration. • May impair movement in confined spaces. • Not approved for use in atmosphere immediately dangerous to life or health (IDLH) or in oxygen-deficient atmospheres unless equipped with an emergency egress unit such as an escape-only SCBA that can provide immediate emergency respiratory protection in case of air-line failure.
Positive-Pressure Supplied-Air Respirator (SAR) (also called air-line respirator)	• Enables longer work periods than an SCBA. • Less bulky and heavy than an SCBA. SAR equipment weighs less than 5 pounds (or around 15 pounds if escape SCBA protection is included). • Protects against most airborne contaminants.	• Impairs mobility. • MSHA/NIOSH certification limits hose length to 300 feet (90 meters). • As the length of the hose is increased, the minimum approved air flow may not be delivered at the facepiece. • Air line is vulnerable to damage, chemical contamination, and degradation. Decontamination of hoses may be difficult. • Worker must retrace steps to leave work area. • Requires supervision/monitoring of the air supply line.
AIR-PURIFYING		
Air-Purifying Respirator (including powered air-purifying respirators (PAPRs)	• Enhanced mobility. • Lighter in weight than an SCBA. Generally weighs two pounds (1 kg) or less (except for PAPRs).	• Cannot be used in IDLH or oxygen-deficient atmospheres (less than 19.5 percent oxygen at sea level). • Limited duration of protection. May be hard to gauge safe operating time in field conditions. • Only protects against specific chemicals and up to specific concentrations. • Use requires monitoring of contaminant and oxygen levels. • Can only be used (1) against gas and vapor contaminants with adequate warning properties, or (2) for specific gases or vapors provided that the service is known and a safety factor is applied or if the unit has an ESLI (end-of-service-life indicator).

C.3 HEARING CONSERVATION

Protection against the effects of noise exposure shall be provided to all Contractor personnel. Any employee whose TWA noise exposure meets or exceeds 85 dB(A) shall be required to participate in the hearing conservation program. This program includes annual training on the proper selection, use, and limitations of hearing protectors, as well as annual audiometric testing. In addition, hearing protection is required any time noise levels exceed 85 dB(A). All training and testing shall be in accordance with 29 CFR 1910.95, Occupational Noise Exposure.

C.4 PROTECTIVE CLOTHING

Chemical Protective Clothing (CPC) is available in a variety of materials that offer a range of protection against different types of chemical and physical hazards. The most appropriate clothing material will depend on the chemicals present and the task to be accomplished. Ideally, the chosen material will resist permeation, degradation, and penetration of both chemicals and physical hazards. Selection of CPC can be a complex task and should be selected by evaluating the performance characteristics of the clothing against the requirements of the job to be performed. This equipment may include:

- Fully-encapsulating suits
- Non-encapsulating suits
- Hard hats
- Aprons, leggings, and sleeve protectors
- Gloves
- Proximity or approach garments
- Blast and fragment suits
- Cooling garments
- Foot protection
- Eye and face protection

C.5 EPA LEVELS OF PROTECTION

The U.S. Environmental Protection Agency (U.S. EPA) has established standard terminology describing levels of protective equipment: Levels A, B, C, and D. These levels are described as follows:

Protective Equipment	Protection Provided	Should Be Used When:	Limiting Criteria
		LEVEL A	
• Recommend use of: - Pressure-demand, full-facepiece SCBA or pressure-demand supplied-air respirator with escape SCBA - Fully-encapsulating, chemical-resistant suit - Inner chemical-resistant gloves - Chemical-resistant safety-boots/shoes - Two-way radio communications • Optional use of: - Cooling vest - Coveralls - Long cotton under-wear	• The highest available level of respiratory, skin, and eye protection	• The chemical substance has been identified and requires the highest level of protection for skin, eyes, and the respiratory system based on either: - measured (or potential for) high concentration of atmospheric vapors, gases, or particulates or - site operations and work functions involving a high potential for splash, immersion, or exposure to unexpected vapors, gases or particulates or materials that are harmful to skin or capable of being absorbed through the intact skin • Substances with a high degree of hazard to the skin are known or suspected to be	• Fully encapsulating suit material must be compatible with the substances involved

Protective Equipment	Protection Provided	Should Be Used When:	Limiting Criteria
- Hard Hat - Disposable gloves and boot covers		present, and skin contact is possible • Operations must be conducted in confined poorly ventilated areas until the absence of conditions requiring Level A protection is determined	
		LEVEL B	
• Recommend use of: - Pressure-demand, full-facepiece SCBA or pressure-demand supplied-air respirator with escape SCBA - Chemical resistant clothing (overalls) and long-sleeved Jacket; hooded, one- or two-piece chemical splash suit; disposable chemical-resistant one-piece suit) - Inner and outer chemical-resistant gloves - Chemical-resistant safety-boots/shoes - Hard hat - Two-way radio	• The same level of respiratory protection but less skin protection than Level A • Recommended for initial site entries until the hazards have been further identified	• The type and atmospheric concentration of substances have been identified and require a high level of respiratory proprotection (but less skin protection than Level A) such as atmospheres: - with IDLH concentrations of specific substances that do not represent a severe skin hazard or - that do not meet the criteria for use of air-purifying respirators • Atmosphere contains less than 19.5 percent oxygen	• Use only when vapor or gases present are not suspected of containing high concentrations of chemicals that are harmful to skin or capable of being absorbed through the intact skin. • Use only when it is highly unlikely that the work being done will generate either high concentrations of vapors, gases, or particulates or splashes of material that will affect exposed skin

Protective Equipment	Protection Provided	Should Be Used When:	Limiting Criteria
• Optional use of: - Cooling vest - Coveralls - Disposable boot covers - Face shield - Long cotton underwear		• Presence of incompletely identified vapors or gases is indicated by direct reading organic vapor detection instrument, but vapors and gases are not suspected of containing high levels of chemicals harmful to skin or capable of being absorbed through the intact skin	
		LEVEL C	
• Recommend use of: - Full-facepiece, air-purifying, canister-equipped respirator - Chemical-resistant clothing (overalls and long-sleeved jacket; hooded, one-or two-piece chemical splash suit; disposable chemical-resistant one-piece suit) - Inner and outer chemical-resistant gloves - Chemical-resistant safety boots/shoes - Hard hat - Two-way radio communication	• The same level of skin protection as Level B, but a lower level of respiratory protection	• The atmospheric contaminants, liquid splashes, or other direct contact will not adversely affect any exposed skin • The types of air contaminants have been identified, concentrations measured, and a canister is available that can remove the contaminant • All criteria for the use of air-purifying respirators are met	• Atmospheric concentration of chemicals must not exceed IDLH levels • The atmosphere must contain at least 19.5 percent oxygen

Protective Equipment	Protection Provided	Should Be Used When:	Limiting Criteria
• Optional use of: - Cooling vests - Coveralls - Disposable boot covers - Face shield - Escape mask - Long cotton underwear			
LEVEL D			
• Recommend use of: - Coveralls - Safety boots/shoes - Safety glasses or chemical splash goggles - Hard hat • Optional use of: - Gloves - Escape mask - Face shield	• No respiratory protection and minimal skin protection	• The atmosphere contains no known hazard • Work functions preclude splashes, immersion, or the potential for un-expected inhalation of or contact with hazardous levels of any chemicals	• This level should not be worn in an Exclusion Zone • The atmosphere must contain at least 19.5 percent oxygen

C.6 PPE MAINTENANCE AND CARE

The PPE user must understand all aspects of protective clothing and respiratory protective equipment operation and limitations. Operation and maintenance of each piece of PPE should be performed to meet the manufacturer's guidelines. During PPE use, the user should report all equipment problems or difficulties to the Contractor Health and Safety Officer.

PPE INSPECTION CHECKLIST

- **CLOTHING** - Use all the following that apply:

  Before Use:

  - Determine that the clothing material is correct for the specified task at hand.
  - Visually inspect it for:
    - Imperfect seams
    - Non-uniform coatings
    - Tears
    - Malfunctioning closures
  - Hold it up to the light and check for pinholes.
  - Flex the product and inspect for:
    - Cracks
    - Other signs of shelf deterioration
  - If the product has been used previously, inspect inside and out for signs of chemical attack such as:
    - Discoloration
    - Swelling
    - Stiffness

  During the work task, periodically inspect for:

  - Evidence of chemical attack such as discoloration, swelling, stiffening, and softening (Keep in mind, however, that chemical permeation can occur without any visible effects.)
  - Closure failure
  - Tears
  - Punctures

- Seam discontinuities

- **GLOVES**

Before use:

- Pressurize the gloves to check for pinholes. (Inflate the gloves by quickly sealing the cuff with your hand and then roll the gauntlet towards the fingers, no air should escape.)

- **FULLY-ENCAPSULATING SUITS**

Before Use:

- Check the operation of the pressure relief valves.
- Inspect the fitting of the wrists, ankles, and neck.
- Check the faceshield, if so equipped, for:
  - Cracks
  - Crazing
  - Fogginess

- **RESPIRATORS**

SCBA:

- Inspect the SCBAs:
  - Before and after each use
  - At least monthly when in standby, with written records
  - Every time they are cleaned
- Check all connections for tightness.
- Check the material conditions for signs of:
  - Pliability (without cracking)
  - Deterioration (cracking, crazing, swelling)
  - Distortion
- Check for the proper setting and operation of the regulators and valves (according to manufacturers' recommendations).
- Check the operation of the alarm(s).

- Check the faceshields and lenses for:

  - Cracks
  - Crazing
  - Fogginess

- SCBAs should be stored in the storage chest supplied by the manufacturer.

Supplied-Air Respirators (SARs):

- Inspect the SARs:

  - Daily when in use
  - At least monthly when in standby, with written records
  - Every time they are cleaned

- Inspect the air lines prior to each use for cracks, kinks, cuts, frays, and weak areas.

- Check for the proper setting and operation of regulators and valves (according to manufacturer's recommendations).

- Check all connections for tightness. Use a leak detection solution to identify any leaks prior to use, or follow manufacturer's instructions.

- Check the material conditions for signs of:

  - Pliability
  - Deterioration
  - Distortion

- Check the faceshields and lenses for:

  - Cracks
  - Crazing
  - Fogginess

Air-Purifying Respirators:

- Inspect the air-purifying respirators:

  - Before each use
  - After each use
  - During cleaning
  - Monthly if in standby for emergency use

- Check the material conditions for signs of:

  - Pliability
  - Deterioration
  - Distortion

- Examine the cartridges or canisters to ensure that:
  - They are the proper type for the intended use
  - They have not been opened or used previously
  - The expiration date has not passed (where applicable)

- Check the faceshields and lenses for:
  - Cracks
  - Crazing
  - Fogginess

- Air-purifying respirators should be stored individually in their original cartons or carrying cases, or in heat-sealed or resealable plastic bags.

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APPENDIX D

FIELD MONITORING EQUIPMENT AND MATERIALS

APPENDIX D: FIELD MONITORING EQUIPMENT AND MATERIALS

Airborne contaminants can present a significant threat to worker health and safety. Thus, identification and quantification of these contaminants through air monitoring is an essential component of this health and safety program. Reliable measurements of airborne contaminants are useful for:

- Selecting personal protective equipment (including upgrading or downgrading)
- Establishing areas where protection is required
- Assessing the potential health effects of exposure
- Determining the need for specific medical monitoring.

The purpose of air monitoring is to identify and quantify airborne contaminants. To accomplish this, two principal approaches are available:

- On-site use of direct-reading instruments
- Off-site laboratory analysis of samples

D.1 AIR MONITORING INSTRUMENTS

The air monitoring instruments used on hazardous waste sites are mostly designed for industrial applications in controlled environments. However, because of their ability to provide real-time information, they now see wide use in hazardous waste applications. Table D-1 provides a description of the most commonly used air monitoring instruments.

Field calibration procedures for air-monitoring equipment are outlined in booklets which accompany this equipment to the field. Field calibration should be documented in the field log book.

D.2 EXPOSURE LIMITS

Exposure limits to chemical substances are regulated by the Occupational Safety and Health Administration (OSHA) in 29 CFR 1910 Subpart Z, 1910.1000 and accompanying standards. These limits are known as permissible exposure limits or PELs and are concentrations of contaminants above which workers may not be exposed.

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TABLE D-1
AIR MONITORING INSTRUMENTS
DIRECT READING INSTRUMENTS

INSTRUMENT	HAZARD MONITORED	APPLICATION	DETECTION METHOD	LIMITATIONS	EASE OF OPERATION	GENERAL CARE AND MAINTENANCE	TYPICAL OPERATING TIMES
Combustible Gas Indictor (CGI)	Combustible gases and vapors	Measures the concentration of a combustible gas or vapor.	A filament, usually made of platinum, is heated by burning the combustible gas or vapor. The increase in temperature is measured.	Accuracy depends, in part, on the difference between the calibration and sampling temperatures. Sensitivity is a function of the chemical and physical properties of the calibration gas and the gas being sampled. The filament can be damaged by substances such as silicones, halides, and tetraethyl lead. Does not provide a valid reading under oxygen-deficient conditions.	Effective use requires that operator understand the operating principles and procedures.	Recharge or replace battery. Calibrate immediately before use.	Can be used for a long as the battery lasts, or for the recommended interval between calibrations whichever is less.

TABLE D-1 (cont.)
AIR MONITORING INSTRUMENTS
DIRECT READING INSTRUMENTS

INSTRUMENT	HAZARD MONITORED	APPLICATION	DETECTION METHOD	LIMITATIONS	EASE OF OPERATION	GENERAL CARE AND MAINTENANCE	TYPICAL OPERATING TIMES
Ultraviolet (UV) Photoionization Detector (PID)	Many organic and some inorganic gases and vapors.	Detects total concentrations of many organic and some inorganic gases and vapors. Some identification of compounds is possible if more than one probe is used.	Ionizes molecules using UV radiation; produces a current that is proportional to the number of ions.	Does not detect methane; percent levels of methane will cause significant reduction in indication of other contaminants. Does not detect a compound if the UV lamp (probe) used has a rated photon energy munch below the ionization potential of the contaminant. Response may change when gases are mixed. Humidity effects are sometimes substantial Readings are nominally in PPM but do not give PPM of any substance unless the air makeup is known and the instrument has been calibrated accordingly.	Effective use requires that the operator understand the operating principles and procedures and be competent in calibrating, reading and interpreting the instrument.	Recharge or replace battery. Regularly clean lamp window. Regularly clean and maintain the instrument and accessories.	10 hours; 5 hour with strip chart recorder.

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TAB... D-1 (cont.)
AIR MONITORING INSTRUMENTS
DIRECT READING INSTRUMENTS

INSTRUMENT	HAZARD MONITORED	APPLICATION	DETECTION METHOD	LIMITATIONS	EASE OF OPERATION	GENERAL CARE AND MAINTENANCE	TYPICAL OPERATING TIMES
Portable infrared (R) Spectro-photometer.	Many gases and vapors.	Measures concentration of many gases and vapors in air. Designed to quantify one- or two-component mixtures.	Passes different frequencies of IR through the sample. The frequencies absorbed are specific for each compound.	In the field, must make repeated passes to achieve reliable results. Requires 115 volt AC power. Not approved for use in a potentially flammable or explosiveatmosphere. Interference by water vapor and carbon dioxide. Certain vapors and high moisture may attack the instruments optics, which must then be replaced.	Requires personnel with extensive experience in IR spectro-photometry.	As specified by manufacturer.	

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TABLE D-1 (cont.)
AIR MONITORING INSTRUMENTS
DIRECT READING INSTRUMENTS

INSTRUMENT	HAZARD MONITORED	APPLICATION	DETECTION METHOD	LIMITATIONS	EASE OF OPERATION	GENERAL CARE AND MAINTENANCE	TYPICAL OPERATING TIMES
Flame Ionization Detector (FID) with Gas Chromatography Option.	Many organic gases and vapors.	In survey mode, detects the total concentrations of many organic gases and vapors. In gas chromatography(GC) mode, identifies and measures specific compounds. In survey mode, all the organic compounds are ionized and detected at the same time. In GC mode, volatile species are separated.	Ions are created when contaminants pass through a small hydrogen flame. A current is produced in proportion to the number of ions produced.	Does not detect inorganic gases and vapors, or some synthetics. Sensitivity depends on the compound. Should not be used at temperatures less than 40°F (4° C). Difficult to absolutely identify compounds. High concentration of contaminants or oxygen-deficient atmospheres require system modification. In survey mode, readings can be only reported relative to the calibration standard used.	Requires experience to interpret data correctly, especially in the GC mode. Specific identification requires calibration with the specific analyte of interest.	Recharge or replace battery. Monitor fuel and/or combustion air supply gauges. Perform routine maintenance as described in the manual. Check for leaks.	8 hours; 5 hours with strip chart recorder.

TABLE D-1 (cont.)
AIR MONITORING INSTRUMENTS
DIRECT READING INSTRUMENTS

INSTRUMENT	HAZARD MONITORED	APPLICATION	DETECTION METHOD	LIMITATIONS	EASE OF OPERATION	GENERAL CARE AND MAINTENANCE	TYPICAL OPERATING TIMES
Oxygen Meter	Oxygen (O_2)	Measures the percentage of O_2 in the air.	Uses an electrochemical sensor to measure the partial pressure of O_2 in the air and converts that reading to O_2 concentration.	Must be calibrated prior to use to compensate for altitude and barometric pressure. Certain gases, especially oxidants such as ozone, can affect readings. Carbon dioxide (CO_2) poisons the detector cell.	Effective use requires that the operator understand the operating principles and procedures.	Replace detector cell according to the manufacturer's recommendations. Recharge or replace batteries prior to expiration of the specified interval. If the ambient air is more than 0.5% CO_2, replace or rejuvenate the O_2 detector cell frequently.	8 to 12 hours.

TABLE D-1 (cont.)
AIR MONITORING INSTRUMENTS
DIRECT READING INSTRUMENTS

INSTRUMENT	HAZARD MONITORED	APPLICATION	DETECTION METHOD	LIMITATIONS	EASE OF OPERATION	GENERAL CARE AND MAINTENANCE	TYPICAL OPERATING TIMES
Direct-Reading Colorimetric Indicator Tube.	Specific gases and vapors.	Measures concentrations of gases and vapors.	The compound reacts with the indicator chemical in the tube, producing a stain whose length or color change is proportional to the compound's concentration.	The measured concentration of the same compound may vary among different manufacturer's tubes. Many similar chemicals interfere. Greatest sources of error are (1) how the operator judges stain's end point, and (2) the tube's limited accuracy. Affected by high humidity.	Minimal operator training and expertise required.	Do not use a previously opened tube even if the indicator chemical is not stained. Check pump for leaks before and after use. Refrigerate prior to use to maintain shelf life of about two years. Check expiration date of tubes. Calibrate pump volume at least quarterly. Avoid rough handling which may cause channeling.	

The OSHA PELs may be separated into three categories including an 8-hour time-weighted average (8-hour TWA), a short-term exposure limit (STEL), and a ceiling (C) limit concentration. OSHA PELs from 1910.1000 may carry a "Skin" designation, meaning that skin exposure must be prevented or reduced as necessary in the circumstances.

If the chemical substance is regulated by a specific OSHA standard, additional considerations such as an "action level" may be required to be incorporated into a health and safety plan. The words "action level" also refer to a monitoring result that will signal the need to take a particular action. For example, a PID or FID reading of 1 ppm sustained in a worker's breathing zone may require upgrading to use respiratory protection or alternatively making colorimetric indicator tube measurements to ensure that benzene overexposure (above the OSHA 1-ppm TWA PEL) is not occurring.

In addition to the required OSHA exposure limits, the American Conference of Governmental Industrial Hygienists (ACGIH) has established a list of more than 600 Threshold Limit Values (TLVs) as recommended standards for occupational exposures to chemicals.

These TLVs are also categorized into three types, the 8-hour time-weighted average (8-hour TWA), short-term exposure limit (STEL) and ceiling (C) limit concentrations. TLVs may carry a "Skin" notation to inform the user that there is potential for a significant component of overall exposure to result from skin contact (including eye and mucous membrane contact).

A third set of exposure guidelines for airborne chemical substances, the recommended exposure limits (RELs), are developed by the National Institute of Occupational Safety and Health (NIOSH) as recommendations to OSHA. These have generally been established in two categories, a 10-hour time-weighted average (10-hour TWA) and a ceiling (C) limit.

A fourth group, the American Industrial Hygiene Association, has developed workplace environmental exposure levels (WEELs). These limits have been developed for a number of substances for which no other "standards" have been established.

This Health and Safety Plan defines exposure limits that are in compliance with OSHA standards and are based upon the lowest published values or, if no published limits have been established, upon toxicological data and other available resources. In any case, because of the wide variation in individual susceptibility and limitations of supporting scientific data, exposures shall be maintained as low as practical and well under applicable guidelines.

D.3 IMMEDIATELY DANGEROUS TO LIFE OR HEALTH (IDLH)

A major purpose of monitoring with direct-reading instruments at a site is to detect IDLH or other dangerous exposure conditions.

Several different definitions exist for the term "IDLH." For hazardous waste site purposes, the definition most relevant is that of the OSHA standard, "...an atmospheric concentration of any toxic, corrosive, or asphyxiant substance that poses an immediate threat to life or would cause irreversible or delayed adverse health effects or would interfere with an individual's ability to escape from dangerous atmosphere." Using a slightly different definition, the Standards Completion Program of NIOSH and OSHA compiled IDLH concentration values from various sources as a guideline for respirator selection. These IDLH concentration values are found in the NIOSH "Pocket Guide to Chemical Hazards." The latest (purple) version contains the most complete information.

D.4 EXPLOSION AND FLAMMABILITY RANGES

The lower explosion limit (LEL) or lower flammable limit (LFL) of a substance is the minimum concentration of gas or vapor in air below which propagation of flame does not occur on contact with a source of ignition. This concentration is usually expressed in percent by volume. Below this concentration, the mixture is too "lean" to burn or explode.

The upper explosive limit (UEL) or upper flammable limit (UFL) of a substance is the maximum concentration of gas or vapor in air above which propagation of flame does not occur on contact with a source of ignition. Above this concentration, the mixture is too "rich" to burn or explode.

The flammable/explosive range of concentrations lies between the LFL/LEL and the UFL/UEL where the gas-air mixture will support combustion. As a general rule, when 25 percent of the LFL/LEL is detected in a significant volume of space on a site, all work in potentially affected areas should cease and appropriate sources of assistance should be contacted.

D.5 OXYGEN DEFICIENCY

The oxygen concentration of normal air is approximately 21 percent. Physiological effects of oxygen deficiency in humans may be apparent when the oxygen concentration in air (at sea level) decreases to 16 percent. Such effects may include impaired attention, judgment, coordination, and increased breathing and heart rate. Still lower oxygen concentrations can result in nausea, vomiting, unconsciousness, brain damage, heart damage, and death. One must take into account individual physiological responses, and errors in measurements. Effects of elevation are important in determining hazards, but are usually ignored in regulation. Concentrations of 19.5 percent oxygen or lower are considered oxygen-deficient under the OSHA Hazardous Waste Operations and Emergency Response standard, 29 CFR 1910.120. ANSI Standard Z88.2 usage has defined concentrations below approximately 16 percent, at sea level, as oxygen-deficient IDLH conditions.

When oxygen concentrations are at or below 19.5 percent by volume, atmosphere-supplying respiratory equipment must be used. Significantly-elevated concentrations of oxygen in the air will greatly enhance the flammability of ordinary materials. Such a condition would be rare and indicative of very unusual circumstances or malfunctioning instrumentation. Accordingly, any indication of oxygen concentration above 25% is also cause for evacuating affected areas and evaluating the conditions before proceeding.

D.6 IONIZING RADIATION

Radioactive materials emit one or more of three types of harmful radiation: alpha, beta, and gamma. Alpha radiation poses little threat outside the body, but can be hazardous if materials that emit alpha radiation are inhaled or ingested. Beta radiation can cause harmful "beta burns" to the skin and damage the subsurface blood system. Beta radiation is also hazardous if materials that emit beta radiation are inhaled or ingested. Use of personal protective equipment, coupled with scrupulous personal hygiene and decontamination, affords good protection against some types of alpha and beta emitters. Gamma radiation passes through clothing and human tissue and can also cause serious permanent damage to the body. Personal protective equipment affords almost no protection against gamma radiation itself; however, use of respiratory and other protective equipment can help keep radiation-emitting materials from entering the body by inhalation, ingestion, injection, or skin absorption. A background of alpha, beta, and gamma radiation is always present.

Exposures to ionizing radiation should be in accordance with the Nuclear Regulatory Commission (NRC) Regulations. In all cases, exposures should be maintained As Low As Reasonably Achievable (ALARA Principle). As a general rule, normal radiation levels in the natural background are around 0.01 to 0.02 mrem/hr (milliRoentgen equivalent in man per hour). If radiation exposure potentials significantly above natural background are identified, personnel should cease all site activities in potentially affected areas until the situation has been assessed by Contractor's Corporate Health and Safety Officer in conjunction with a health physicist.

D.7 EXPOSURE MONITORING INCLUDING OFF-SITE LABORATORY ANALYSIS

Action levels for direct-reading instrument monitoring in each site-specific health and safety plan are set to preclude exposure to hazardous concentrations of air contaminants and identify situations where the potential for such exposure exists. Where monitoring by means of direct-reading instruments suggests that there is a question of employee exposure to a hazardous concentration or to an OSHA Action Level of a hazardous substance, monitoring to represent actual employee exposure will be carried out by or under the direction of an industrial hygienist. Such monitoring uses a procedure specific for the air contaminant of interest, and nearly always involves collecting an air sample from the employee's breathing zone over time, so as to represent the exposure of the employee. In most cases, air is drawn through a sorbent or filter, which is normally shipped to an industrial hygiene laboratory for analysis.

In addition to the initial monitoring, periodic monitoring will be conducted whenever there is indication that exposure may have risen over applicable limits or guidelines since prior monitoring. The possible need for monitoring is to be considered when contaminants other than those previously identified are being handled, or when a different type of operation is initiated (e.g., a spill or lagoon). Note that both of these eventualities require a modification to the site-specific health and safety plan.

10.0 CONTINGENCY PLANNING AND EMERGENCY RESPONSE

10.1 EMERGENCY PHONE NUMBERS

Emergency Contact	Name	Phone Number(s)
Ambulance	City of Gallup Ambulance	505-722-7746
Hospital-Emergency Care	Rehoboth McKinley Christian Hospital Gallup, NM	505-863-6832
Police	City of Gallup	505-863-9365
FWDA-Fire	(505) 488-5411	Ext. 217
FWDA-Security	(505) 488-5411	Ext. 222
ERM Project Manager	Steven Egnaczyk	(215) 524-3615 (work) (215) 458-7178 (home)
ERM Project Safety Supervisor	Joe Baker	(215) 524-3675 (work)
ERM Field Operations Manager	Robert Arnott	(505) 889-3330 (Albuquerque Office) (303) 741-5050 (Denver Office)
USATHAMA Project Officer	Michael Gaborek	410-671-1627
CHEMTREC		1-800-424-9300
TSCA Hotline		202-554-1404
National Response Center		1-800-424-8802
RCRA Hotline		1-800-424-9346
Bureau of Explosives		202-835-9500
USEPA Region VI (Dallas, TX)		214-655-6720
State of New Mexico - Environment Department		1-800-879-3421 (Environmental Response)

10.2 DIRECTIONS TO HOSPITAL

The local hospital is the Rehoboth McKinley Christian Hospital located at 1901 Redrock Drive in Gallup. The hospital location is noted on Figure 10-1. The route to the hospital will vary depending upon where the individual is located, i.e., at which site the individual is located. The route to the hospital will be verified immediately prior to the commencement of field work by the Site Safety Officer.

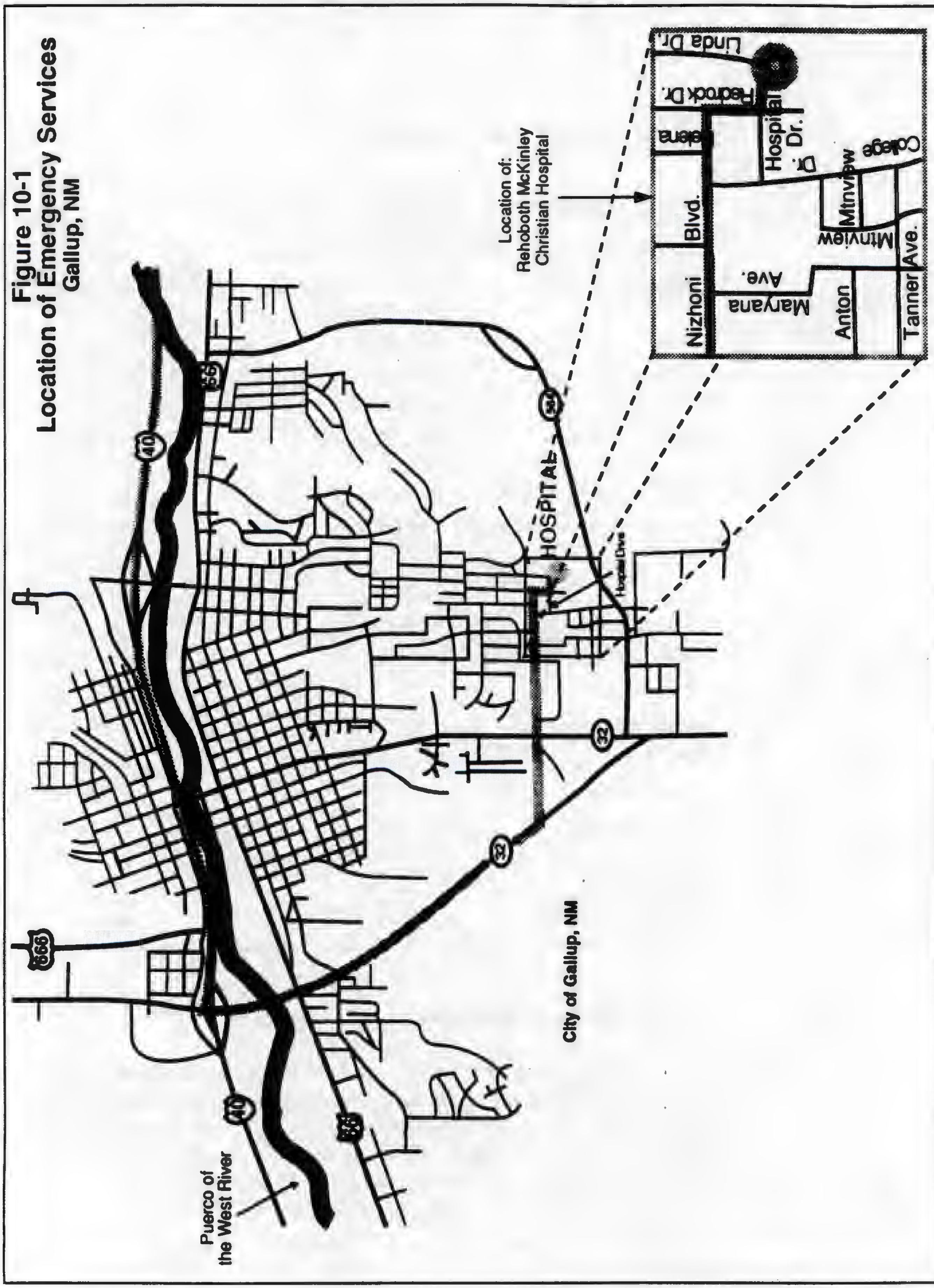


Figure 10-1
Location of Emergency Services
Gallup, NM

In the event of a serious injury requiring transport of on-site personnel to the designated hospital, an ambulance will be used. For minor injuries, or illnesses, the Site Safety Officer may elect to have the person(s) transported to the hospital by company vehicle. If there is any doubt about the severity of the injury, an ambulance will be used.

10.3 *RESPONSIBILITIES*

The Site Safety Officer will be responsible for responding to all emergencies. In the event that the Site Safety Officer is involved in the emergency, a designee will assume responsibility. In the event of an emergency, the specific reporting responsibilities are as follows:

1. Notify appropriate emergency response, and/or health care facilities of the activities and hazards of the emergency, the number of persons involved and the required location of pick-up (for the ambulance) or expected time of arrival (for the hospital);
2. Notify the appropriate FWDA personnel (i.e., Base Commander or authorized person);
3. Notify the ERM Project Manager and the Project Safety Supervisor.

10.4 *ACCIDENTS AND INJURIES*

In the event of a safety or health emergency at the site, all in-place emergency measures will be activated immediately. The goal is to quickly and effectively assist those who have been injured or exposed and to protect others from the hazard(s). The Site Safety Officer or his designee will be immediately notified and will respond according to the seriousness of the injury. The ERM Project Manager will be informed in writing by the Site Safety Officer of any injuries or exposures during the performance of site activities whether minor or serious.

Accidents resulting in a fatality, lost-time injury or illness, hospitalization of five or more personnel, or property damage to government or ERM property (which occurred during performance of the task order) equal to or exceeding $2,000.00 must be telephonically reported to USATHAMA, CETHA-TS-S, (410) 671-4811, as soon as possible, but not later than two hours after occurrence, and reported in writing within five days of occurrence on an Accident Investigation Report Form; ENG Form 3394 (a copy of the form is provided as Appendix F). All other accidents/incidents must be telephonically reported to USATHAMA, CETHA-TS-S, (410) 671-4811, within two hours of occurrence.

10.5 COMMUNICATIONS

The ERM field office will be located within the FWDA Administration Building which is equipped with telephone service. The main telephone number for the FWDA is (505) 488-5411. In addition, mobile phones will be present during site activities to facilitate emergency response and office communications. Public telephones will also be located prior to initiation of field activities as back-up to the mobile phones.

10.6 FIRE CONTROL

No smoking will be allowed during field investigation activities. Fire extinguishers (Type ABC), buckets, and shovels will be available at drilling sites for use on small fires. All fires will be reported to the FWDA Fire Department (Ext. 217) and Security Office (Ext. 222) immediately. Smoking is not permitted in unoccupied areas or buildings, even though such locations may not be marked as restricted.

10.7 SPILL CONTROL

The chances of a chemical spill are minimal during the FWDA-EI. However, in the event of a spill, the Field Operations Manager or his designee will notify the Base Commander or an authorized FWDA representative and the ERM Project Manager. The important precautions in the event of such a spill are that no personnel are exposed to vapors, gases, or mists and that any spilled liquid does not ignite. In addition, waste spillage must not be allowed to contaminate any local water source. Small earthen dikes are to be erected to contain spills, if necessary, until proper containment and disposal can be completed. The Site Safety Officer will coordinate cleanup activities. Subsequent to cleanup activities, the Site Safety Officer will survey the area to ensure that no materials resulting from the spill remain and notify the Project Manager so that the required reporting can be completed.

11.0 *UNEXPLODED ORDNANCE (UXO), UXB, INTERNATIONAL, INC.*

Due to the nature of previous activities at the FWDA, the potential has been identified for unexploded ordnance (UXO) to exist. Specific areas of potential UXO concern have been identified during past site investigations and project scoping activities.

These areas include:

- Functional Test Ranges 1, 2, and 3;
- Group C Disposal Area, and
- Burning Ground and Demolition Areas.

In addition, other site areas of potential UXO concern could be identified during the performance of site activities. UXO subcontractor support will be provided by UXB International, Inc. (UXB) during the installation of borings and monitoring wells (if required) and in the performance of sampling within these identified area. Mr. Tom Yancy is the UXB Project Manager and Mr. Bob Diekmann is the UXB Project Leader.

No ERM Site Personnel are to contact (i.e., touch or attempt to pick-up) any metal debris or objects in the identified areas. The UXB Project Leader is to be immediately contacted.

Appendix 11.1 contains the "Work Plan for UXO Support Services at Fort Wingate, New Mexico," dated November 1992, prepared by UXB as well as UXO Safety Precautions (Section I) and Standard Operating Procedures for UXO (Section II).

Appendix 11.1
UXB International, Inc.
"Work Plan for UXO Support Services at Fort Wingate, New Mexico, November 1992"

- *Section I: Ordnance Safety Precautions*
- *Section II: Standard Operating Procedures*

SUBMITTED TO:

ENVIRONMENTAL RESOURCES MANAGEMENT, INC.
855 SPRINGDALE DRIVE
EXTON, PENNSYLVANIA 19341

WORK PLAN

FOR
UXO SUPPORT SERVICES

AT
FORT WINGATE, NEW MEXICO

NOVEMBER, 1992

SUBMITTED BY:

UXB INTERNATIONAL, INC.
14800 CONFERENCE CENTER DR., SUITE 100
CHANTILLY, VA. 22021

1.0 INTRODUCTION

UXB International, Inc. is providing unexploded ordnance (UXO) support to Environmental Resources Management, Inc. during the installation of monitoring wells, soil borings, and sampling within the boundaries of Fort Wingate, New Mexico. UXB will also perform a UXO survey of Functional Test Ranges (FTR) Numbers 1, 2, and 3 and a surface survey of the current demolition and burning grounds. UXB will perform the following UXO related tasks at these designated sites:

a. Current Demolition and Burning Grounds - Perform a visual survey to determine the extent of kick-outs from the demolition pits. Assume a 25 yard safety margin past the most distant kick-out and map this perimeter using the Global Positioning System (GPS). Within this perimeter, perform a surface survey and removal of all ordnance debris. All live ordnance will be staged (if deemed safe to move) in an active demolition pit for final disposition by 41st Ordnance Detachment (EOD), Fort Bliss, TX. Ordnance which is too sensitive or dangerous to move will be marked for visual relocation and disposed of by 41st Ord Det (EOD). All ordnance debris which is recovered will be staged near the active demolition pits in a location designated by ERM. No sub-surface investigation or removal will occur inside the perimeter described above. Soil boring locations within the active demolition pits are saturated with metal debris which makes down-hole monitoring impossible. To ensure a UXO-free boring location, a test pit will be mechanically excavated down to undisturbed soil or soil void of metallic contacts, which ever comes first. The pit will be back filled with the original soil less any UXO removed and the site released to the drilling contractor.

b. Old Demolition and Burning Ground Sites - UXB will clear safety zones around each monitoring well and soil boring and access paths from established roads to the safety zone to allow safe entry and exit of equipment and personnel. Pre-clear each well and boring by performing down-hole monitoring for subsurface UXO to a depth of 12 feet or when undisturbed soil is reached (determined by ERM geologist).

c. Functional Test Range 1 - UXB will perform a surface survey (0" to 6") of FTR 1. This survey will use a combination of visual and geophysical survey methods. The Schonstedt GA52-B will be used to augment the visual survey by permitting inspection of vegetated areas without requiring brush clearance. All ordnance debris on the surface will be collected and staged near the active demolition pits in a location designated by ERM. All metallic contacts will be marked and excavated to a depth of 6 inches. All live ordnance found will be staged (if deemed safe to move) in an active demolition pit for final disposition by the 41st Ord Det (EOD). Ordnance which is too sensitive or dangerous to move will be marked for visual relocation and disposed of by 41st Ord Det (EOD). All contacts below 6 inches will be logged by latitude and longitude using the GPS and become part of the list of uncharacterized contacts contained in the final report. Distinguishable debris piles which are listed in the site description will be left in place and their surface layers visually surveyed for suspected live ordnance items.

d. Functional Test Range 2 - UXB will perform a surface survey (0" to 6") of FTR 2. This survey will use a combination of visual and geophysical survey methods. The Schonstedt GA52-B will be used to augment the visual survey by permitting inspection of vegetated areas without requiring brush clearance. All ordnance debris on the surface will be collected and staged near the active demolition pits in a location designated by ERM. All metallic contacts will be marked and excavated to a depth of 6 inches. All live ordnance found will be staged (if deemed safe to move) in an active demolition pit for final disposition by the 41st Ord Det (EOD). Ordnance which is too sensitive or dangerous to move will be marked for visual relocation and disposed of by the 41st ORD Det (EOD). All contacts below 6 inches will be logged by latitude and longitude using the GPS and become part of the list of uncharacterized contacts contained in the final report.

c. Functional Test Range 3 - UXB will perform a surface survey (0" to 6") of FTR 3. This survey will use a combination of visual and geophysical survey methods. The Schonstedt GA52-B will be used to augment the visual survey by permitting inspection of vegetated areas without requiring brush clearance. All ordnance debris on the surface will be collected and staged near the active demolition pits in a location designated by ERM. All metallic contacts will be marked and excavated to a depth of 6 inches. All live ordnance found will be staged (if deemed safe to move) in an active demolition pit for final disposition by the 41st ORD Det (EOD). Ordnance which is too sensitive or dangerous to move will be marked for visual relocation and disposed of by the 41st EOD DET (EOD). All contacts below 6 inches will be logged by latitude and longitude using the GPS and become part of the list of uncharacterized contacts contained in the final report.

UXB personnel will follow the general guidance contained in the Sampling Design Plan, Work Plan and Safety Plan prepared for the project by Environmental Resources Management and approved by USATHAMA. The information in this UXO Work Plan is intended to guide UXB personnel in the safe and efficient performance of their operations. Any conflicts between this work plan and any other documents governing the performance of field operations at Fort Wingate will be rectified by the ERM and UXB Project Managers.

UXB personnel will be specifically guided by the Standard Operating Procedures (SOP's) for conducting geophysical surveys, manual excavation of contacts, and down-hole monitoring that are included as a separate section of the UXO work plan.

UXB team assigned to the project can perform concurrent field operations. The minimum number of personnel assigned to perform an intrusive UXO task will be two qualified UXO Technicians. UXO escort and UXO detection\marking can be done by a single UXO Technician as long as radio communications between the concurrent operations can be maintained.

1.1 PERSONNEL ASSIGNMENTS

<u>PROJECT MANAGER</u> - Tom Yancey will serve as UXB Project Manager and have overall responsibility for UXB personnel and their performance. His presence will not be required on site except in the event of unforseen difficulties, or at the request of the ERM Field Operations Leader.

<u>PROJECT LEADER</u> - Bob Diekmann will be the UXB Project Leader and will be on site for the duration of UXB's field operations at Fort Wingate. He will be responsible for the safety of assigned personnel and the efficient performance of all daily field operations involving UXO and will assist ERM in any other field work requested. The Project Leader will also act as the UXB Quality Control Coordinator and perform percentage and random QC checks on sweep line operations and UXO excavations.

<u>UXO SPECIALISTS</u> - will be responsible for supervising the ordnance sweep lines and excavation teams. They will assist the Project Leader in other duties such as UXO Safety Escort and marking safe perimeters around the rocket motor burials. The UXO Specialists will be selected from the following list of UXB employees, all meeting the UXO contractor qualifications specified by USATHAMA in the scope of work:

W. Whitten	P. Kirwan	B. Moe
J. Thoren	G. Cole	G. Childers
R. Wilson	C. Post	L. Dickson
C. Galbreath	M. Cooper	D. Randall
G. Payne	N. Doguet	S. Eanes

D. Isbell	J. Foster	D. Miller
J. Kerr	J. Booker	S. Brown

UXO TECHNICIANS - will be responsible for safely conducting UXO field operations such as UXO Safety Escort, Sweep Line members, Excavation Team members, well and boring site clearance, down-hole monitoring, and equipment maintenance as assigned by, and under the supervision of, the Project Leader. The UXO Technicians will also be selected from the list above.

LOCALLY HIRED LABORERS - UXB will interview laborers with an explosive safety background from the following categories who may be residing in the Gallup, NM area:

a. Former Fort Wingate ordnance workers.
b. Former military personnel with ordnance experience.
c. Former mining industry personnel who have worked as blasters or blasters' helpers.

UXB will verify this experience through documentation such as DD Form 214, Civil Service personnel performance records, or state blasting licenses. UXB will also provide instruction on basic explosive safety as a refresher. This instruction will cover:

a. Explosives Safety Precautions.
b. Ordnance Safety Precautions.
c. Recognition of explosives and ordnance after exposure to weathering and erosion.

In addition to basic explosive safety, UXB will provide training in:

a. Schonstedt GA52-B locator operation.
b. Sweep-line procedures.
c. Site orientation which will include an ordnance identification line consisting of ordnance items found to date.
d. Basic ordnance identification and hazard recognition.
e. UXB SOP for Geophysical Surveys at Fort Wingate, NM.

These locally hired employees may be used in logistical support of the FTR surveys, but **will not**:

a. Handle any ordnance item until it has been inspected by a UXB UXO Specialist and determined to be inert.
b. Perform any excavation of subsurface contacts.
c. Perform any functions in the current demo/burn area.
d. Perform as a sweep-line member until the above training has been received.

The UXB Project Leader will monitor the locally hired employees for any drug or alcohol intoxication at the start of each work day. Any employee suspected of drug or alcohol intoxication will be dismissed permanently.

If local labor of adequate qualifications is not available, UXB personnel will be used to the extent necessary to perform all tasks in absolute safety.

1.2 EQUIPMENT

The following major equipment items will be required to provide UXO services in support of the field activities at Fort Wingate, New Mexico:

EQUIPMENT	QUANTITY
GEOPHYSICAL EQUIPMENT	
White's Eagle II Metal Detector	3
Foerster Ferex Ordnance Locator	3
Schonstedt Model GA-52B	15
SUPPORT EQUIPMENT	
Generator	1
High Cube Van	1
Back-hoe	TBD
Motorola HT-90 Portable Radios	5
General Support Tool Kit	1
Excavation Tool Kit	1
GPS	1
Computer	1
EMT kit	1
Mobile phone	1

2.0 TECHNICAL APPROACH

All of the tasks described in section 1.0 consist of the following UXO operations:

a. SURFACE SURVEY - Using magnetometers or metal detectors to augment a visual examination of the surface to a depth of six inches in a non-intrusive manner.

b. EXCAVATION - Using hand excavation tools to expose subsurface contacts for identification as UXO or non-UXO for characterization of the contamination present.

c. DOWN-HOLE MONITORING - Using the Foerster Magnetometer reconfigured to the underwater mode to check hand-augered boreholes for subsurface ferrous contacts. When performing down-hole magnetometry surveys during drilling /boring operations in suspect or known unexploded ordnance areas, measurements must be taken at intervals of every 4 feet.

The decision to perform down-hole magnetometry at intervals other than every 4 feet must be justified by a site specific analysis which supports the need. Prior to each measurement, the drill rig and equipment (augers) must be "backed off" the hole to a distance of approximately 20 feet to eliminate interference to the magnetometry equipment. To reduce the hazard to personnel due to moving the rig/equipment, only the minimum number of moves necessary to accomplish UXO clearance will be performed. In this specific case, hand augering in the OB/OD area every two feet is acceptable.

The survey methods described above will be used to conduct the UXO portions of the field activities. A more detailed explanation of the UXO techniques follows.

2.1 GEOPHYSICAL SURVEY

USATHAMA requires that two distinct methods of geophysical survey be conducted. The Foerster Ferex Ordnance Locator will be used, in conjunction with the White's commercial metal detector, for all subsurface geophysical surveys. The following are descriptions of these two electronic detectors:

a. Foerster Ferex Electromagnetic Detector - The Foerster Ferex Ordnance Locator is the most recent military approved locator and is in use by the U.S. Military EOD forces, designated the MK 26 Ordnance Locator, for detecting subsurface ordnance items. The locator is a hand-held unit and uses 2 fluxgate magnetometers, aligned and mounted a fixed distance apart to detect changes in the earth's ambient magnetic field caused by ferrous metal or disturbances caused by soil conditions. Both an audio and metered signal are provided to the operator. The metered signal indicates whether the disturbance is geodetic or metal-related. The detection capability of the Foerster Ferex is dependent on the size of the item versus its depth. The Foerster Ferex is capable of ordnance location to the following depths:

ITEM	DEPTH
Small Arms Round	1 ft
Hand Grenade	2 ft
Anti-Personnel Mine	3 ft
Anti-Tank Mine	4.5 ft
Medium Projectile	10 ft
Small Bomb	15 ft
Large Bomb	19 ft

Although the Foerster Ferex Ordnance Locator will detect disturbances caused by changes in soil conditions, its ability to detect metallic items is not affected by local soil conditions because it is nulled to accept local soil conditions as normal background readings on-site.

b. WHITE'S EAGLE II METAL DETECTOR - A man-carried, microprocessor controlled metal detector with a Liquid Crystal Display and a keypad user interface. This metal detector operates on the induction principle whereby a transmitter coil induces eddy currents within buried metal and these induced eddy currents are received by a receiver unit. The advantage of this detector is that it can detect both ferrous and non-ferrous metals.

The instruments detailed above will be used, during the investigation, to locate subsurface metallic objects. They are very effective in areas where there is sparse metallic contamination and, conversely, of limited usefulness in areas that are heavily saturated with miscellaneous metallic debris and slag.

2.1.1 GEOPHYSICAL SURVEY PROCEDURES

The area to be surveyed is identified and its perimeter is marked with wooden stakes. This search area is then divided into search lanes two meters apart using surveyor's line. The ordnance locator operator walks the lanes using the ordnance locator to survey the entire area within each lane and marks all metallic contacts with a marker flag or spray paint for possible further inspection by excavation. A visual survey of the entire search area is conducted simultaneously.

2.2 EXCAVATION

The only way to positively identify a contact located during a geophysical survey is by excavation. UXB will use excavation under the following circumstance:

WHERE INDICATED BY THE GEOPHYSICAL SURVEY - In the case of site clearance to ensure the safety of well drilling personnel operating in the area, all potential UXO contacts will be carefully hand excavated and identified to a depth of two feet.

Any subsurface contacts found deeper than 2 feet at the drilling point for a well or boring will cause the drilling point to be relocated a minimum of 10 feet. The new location will be determined by the ERM Field Operations Leader with recommendations by UXB for clear areas. Please refer to paragraph 2.0, c.

2.2.1 METHOD OF EXCAVATION

HAND EXCAVATION - UXO Technicians will use hand tools to carefully remove soil and debris to uncover a known metallic contact located during the geophysical survey. The purpose of hand excavation is to identify a single previously located metallic contact.

2.2.2 EXCAVATION EQUIPMENT

The following type of excavation equipment will be used during excavation operations at Fort Wingate:

a. HAND TOOLS - Beryllium and stainless steel shovels, spades and trowels.

b. MECHANIZED EXCAVATOR - A back-hoe <u>may</u> be used to clear boring sites in the current demolition area when the sites are located within the demo pit or berm. The bucket path will be monitored by a safety observer visually and geophysically as the bucket skims no more than 6 inches of soil per pass.

3.0 OPERATIONAL PROCEDURES

3.1 GEOPHYSICAL SURVEY PROCEDURES

a. ESTABLISH THE COMMAND POST - A command post (CP) will always be established whenever field operations are being conducted in more that one location. The purpose of the CP is to allow a responsible person, who is familiar with on-site operations, to be present and to take appropriate action in case of an emergency at the work site. The person manning the CP will have communications with the field crews and outside assistance (fire dept., ambulance, base security, etc.) at all times. The CP will be the UXB mobile laboratory and will provide shelter, office space, and equipment storage at the work site. The CP has a permanently installed generator, lighting system and will have first aid equipment, eye wash station, potable water and a heating and cooling system.

b. ESTABLISH THE SURVEY AREA - Prior to conducting the geophysical survey, the area to be surveyed must be accurately established. Field crews will use the base maps provided by ERM and U. S. G. S. topographic maps to locate the desired survey area. The survey grids will be marked with wooden stakes and flagging tape. Existing boundaries such as fence lines, roads, and arroyos will be used to ensure all areas are 100 % searched with a slight overlap of the search areas. If the survey area is to be further divided into search lanes, these will be established and marked prior to beginning survey operations.

c. CONDUCT THE SURVEY - The geophysical survey team will consist of two teams of five UXB UXO Technicians. Each technician will carry a Schonstedt GA52-B locator and the sweep team leader will carry a Foerster Ferex Ordnance Locator. The team will search the predetermined lanes and record all contacts on their field site map. All positive contacts will be marked with a marking flag or spray paint to facilitate relocating the contact for excavation. A visual survey will take place simultaneously with the geophysical survey. Areas with vegetation will require a slower pace to allow probing of the brush with the GA52-B probe.

3.2 EXCAVATION

a. DETERMINE THE APPROPRIATE EXCAVATION METHOD - UXB will use the following criteria to determine the excavation method to be used:

1. HAND EXCAVATION - To be used for isolated contacts located during a geophysical survey that are suspected to be within six inches of the surface.

2. MECHANIZED EXCAVATION - Will not be required at any of the area survey sites, but may be selected for clearance of boring sites within the current demolition area.

3.2.1 HAND EXCAVATION PROCEDURES

A team of at least two UXB Technicians will approach the excavation site with suitable hand tools and the ordnance locator best able to detect the metallic contact to be excavated. Upon arrival at the marked contact, the contact will be reestablished using the ordnance locator and one technician will then carefully begin to excavate. The other UXB/UXO Technician will man the ordnance locator and frequently resurvey the contact to estimate its depth below the soil cover. When the object is located, it will carefully be uncovered, identified, and recorded. If the object is inert ordnance, small arms ammunition, or expended ordnance it will be moved to a designated nearby holding area for later disposition. If the item is UXO, the 41st ORD Det (EOD) will be notified for final disposition. No further work will be performed in this specific access lane or drill site safety radius until the UXO has been removed.

3.3 DOWN-HOLE GEOPHYSICS

A team of at least two UXB Technicians will pre-clear each monitoring well and soil boring point of subsurface UXO by hand-augering down to a depth of 2 feet. The hand auger will be retracted and the Foerster Ferex Ordnance locator, reconfigured to the underwater mode, will be slowly lowered to the bottom of the hole and the indicator dial allowed to stabilize. A check for subsurface ferrous objects will be made on each sensitivity scale. If no ferrous objects are indicated, the Foerster probe will be retracted and hand-augering will continue another 2 feet. This procedure will continue at 2 foot intervals until a depth of 10 feet or undisturbed soil is reached. At this depth, the final borehole check with the Foerster will clear the borehole to a depth of 12 feet. **Note**: If a subsurface ferrous object is detected, the well or boring must be relocated a minimum of 10 feet. Please refer to paragraph 2.0, c.

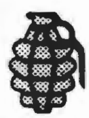
This procedure pre-clears the monitoring well and soil boring sites which allows the drill rig and soil samplers to operate independently of the UXO clearance team. The drill rig **MUST DRILL WITHIN ONE FOOT** of the pre-cleared, hand-augered hole to be assured of an auger path clear of UXO. Note: Drilling crew and samplers in the current OB/OD area will be accompanied by a UXB UXO Safety Escort or down-hole magnetometry team at all times.

Hand-augering may be assisted through the first four feet of dry, hard packed soil by a gasoline powered auger.

SECTION I

ORDNANCE SAFETY PRECAUTIONS

Ordnance Safety Precautions



Ft. Wingate

There is no "safe" procedure for dealing with UXO, merely procedures which are considered least dangerous. However, maximum safety in any UXO operation can be achieved through adherence to applicable safety precautions, a preplanned approach and intensive supervision. Plans shall be based upon the minimum number of personnel, for a minimum amount of time, to the minimum amount of UXO consistent with efficient operations and maximum safety. Only those personnel absolutely necessary to the operation shall be allowed in the exclusion zone during UXO activities(DoD 6055.9-STD). All personnel engaged in UXO operations shall be thoroughly trained in explosive safety and be capable of recognizing hazardous explosive exposures. Only personnel who have graduated from the US Naval EOD School, Indian Head MD are authorized to handle UXO. Hazardous Devices Technicians who have graduated from the Hazardous Devices School, Redstone Arsenal AL are not trained nor qualified to handle military UXO and will not be involved in UXO operations on a CE project. Safety must become a firmly established habit when working with UXO.

I. Care must be observed in searching for, probing for, excavating, moving, and handling UXO. Operations on the UXO should be conducted only after the establishment of a complete plan for the operation involved and careful preparation to insure its implementation.

II. As a general rule, UXO will be detonated in place when the situation allows. All detonation-in-place shall be conducted by electrical means to assure maximum control of the site, except is extreme sandy soil which creates a static electricity hazard. No UXO shall be destroyed until it has been positively identified.

A. Make every effort to identify the UXO. Carefully examine the item for markings and other identifying features such as shape, size, and external fittings. However, do not move the item to inspect it. If an unknown UXO is encountered, photographs shall be taken and express-mailed to CEHND-ED-SY, which has access to the TM 60-Series publications.

B. Foreign UXO were returned to the United States for exploitation and disposal. Records search should indicate the possibility of foreign UXO being on the site.

C. If the records search indicates UXO containing military toxic chemical agents may be on the site, a decontamination plan shall be approved prior to entry onto the site.

(1) Any time a suspected chemical UXO is encountered, the 2-man concept is immediately implemented and notification shall be made through proper channels. The UXO shall be secured until the military arrives and assumes ownership.

D. If the situation dictates, protective measures to reduce shock, blast, and fragmentation damage shall be taken. Army Technical Manual (TM) 5-855-1, Fundamentals of Protective Design for Conventional Weapons and associated software program "CONWEP" contains data on blast effects, groundshock, cratering, ejecta, and fragmentation.

(1) For non-fragmenting explosive materials, evacuation distance should be a minimum of 1250 feet.

(2) For fragmenting explosive materials, evacuation distance should be a minimum of 2500 feet. For bombs and projectiles with caliber 5-inch or greater, use a minimum evacuation distance of 4000 feet.

(3) Items with lugs and/or strongbacks and nose and/or tail plate sections should be oriented away from personnel locations.

E. Consideration shall be given to tamping the UXO to control fragments, if the situation warrants. Fragments shall be minimized not only to protect personnel but property such as buildings, trees, etc.

F. Do not allow one person to work alone in disposal operations. At least one person shall be available near the disposal site to give warning and assist in rescue activities in the event of an accident. Only UXO qualified personnel shall be involved in disposal operations.

(1) Plan for, provide, and know the measures to be taken in the event of an accident.

(2) Provide a designated emergency vehicle in the area in case of an accident or other emergency.

G. Coordination with the appropriate airspace representative shall be conducted and the appropriate notification procedures arranged.

H. A post-search of the detonation site shall be conducted to assure a complete disposal was accomplished.

I. Open burning of explosives and smokeless powder or chemical decomposition of explosives shall not be accomplished without prior approval of the contracting officer.

(1) If loose explosives are to be disposed of by detonation, detonate only one kind of explosive in any one given shot.

(2) Exercise extreme care in handling and preparing high explosives for detonation. They are sensitive to detonation by heat, shock, and friction.

(3) Keep initiating explosives in a water-wet condition at all times until ready for final preparation for detonation. The sensitivity of these explosives is greatly increased when dry.

(4) When disposing of high explosives by detonation, do not approach the disposal site for at least 30 minutes in the event of a misfire.

J. Carry blasting caps in approved containers and keep them out of the direct rays of the sun.

K. Do not handle, use, or remain near explosives during the approach or progress of an electrical storm. All persons should retire to place of safety.

L. Do not use explosives or accessory equipment that are obviously deteriorated or damaged. They may detonate prematurely or fail completely.

M. Always point the explosive end of blasting caps, detonators, and explosive devices away from the body during handling. This will minimize injury should the item explode.

N. Use only standard blasting caps of at least the equivalent of a commerical No. 8 blasting cap.

(1) Use electric blasting caps of the same manufacture, whenever possible, for each demolition shot involving more than one cap.

(2) Keep blasting caps in approved containers, located at least 25 feet from other explosives, until they are needed for priming.

(3) Do not bury blasting caps. Use detonating cord to position blasting caps above the ground. Buried blasting caps are subject to unobserved pressures and movement which could lead to premature firing or misfires.

(4) Test electric blasting caps for continuity at least 25 feet downwind from any explosives prior to connecting them to the firing circuit. Upon completion of testing, the lead wires will be short-circuited by twisting the bare ends of the wires together. The wires will remain shunted until ready to connect to the firing circuit.

O. UXOs, UXO-components, packing materials or empty boxes will not be stored in magazines containing explosives.

(1) A fire plan for the storage of explosives shall be prepared and coordination with the nearby fire department shall be conducted.

III. UXO which penetrates the earth to a depth where the force of the explosion is not enough to rupture the earth's surface forms an underground cavity called a camouflet. Camouflets will be filled with the end product of the explosion, carbon monoxide gas. Camouflet detection and precautions must be considered if records search indicates the site was used as an impact area.

IV. Avoid inhalation of, and skin contact with smoke, fumes, and vapors of explosives and related hazardous materials.

V. Consider UXO which has been exposed to fire as extremely hazardous. Chemical and physical changes may have occurred to the contents which render it much more sensitive that it was in its original state.

VI. Do not depress plungers, turn vanes, or rotate spindles, levers, setting rings, or other external fittings on the UXO. Such action may arm, actuate, or function the UXO.

A. DO NOT dismantle, strip, or subject any UXO to unnecessary movement, except in response to a valid requirement.

B. Before any movement of an UXO, the fuze condition must be ascertained. If the condition is questionable, consider the fuze armed. The fuze is considered the most hazardous component of UXO, regardless of type or condition.

(1) In general, the condition of a BD fuze in an unexploded projectile cannot be determined through examination of its external features. When there is evidence that the projectile has been fired, the BD fuze is considered to be in the armed condition.

(2) Arming wires and popout pins on unarmed fuzes should be secured by taping in place prior to movement.

C. Perform any initial movement of an armed fuze remotely and avoid any unnecessary movement of an armed fuze.

D. When transporting a possible armed fuze, position the fuze in the most neutral orientation possible.

E. Do not subject a mechanical time fuze to any unnecessary movement.

F. Do not unscrew a fuze from a fuze well that does not contain a fuze cavity liner. High explosives may be on the threads.

VII. Do not allow unauthorized or unnecessary personnel to be present in the vicinity of UXO. Limit personnel exposure time. Operations shall always be based upon minimum exposure consistent with efficient operations.

VIII. Do not rely on the color coding of UXO for positive identification of contents. Munitions having none, incomplete, or improper color coding have been encountered.

IX. Avoid the area forward of the nose of a munition until it can be determined that the item is not a shaped charge and High Explosive Anti-tank (HEAT) UXO. The explosive jet can be fatal to great distances forward of the longitudinal axis of the item.

A. Assume any shaped charge munition to contain a piezoelectric (PZ) fuzing system until the fuzing is otherwise identified. A PZ fuze is extremely sensitive, can fire at the slightest physical change, and may remain hazardous for an indefinite period of time.

X. Examine a projectile for the presence or absence of an unfired tracer.

XI. Perform initial movement of an embedded projectile remotely. First movement of an embedded projectile may cause fuze functioning. During this remote operation, precautions shall be taken for a high-order detonation.

XII. Do not inhale the smoke or fumes of burning pyrotechnic or incendiary materials. The fumes and dust from many of these materials are irritating and/or toxic if inhaled.

A. Use sand to smother incendiary fires. Water may induce a violent reaction or be completely ineffective, depending on the mixture.

B. Bury incendiary-loaded munitions in sand when transporting them. This will smother any fire which should start until other corrective action can be taken.

C. Anticipate a high-order detonation when burning pyrotechnics or incendiary-loaded UXO. Safety measures for personnel and property must be based on this possibility.

D. Expended pyrotechnic/practice devices may contain red/white phosphorus

E. Do not approach a smoking white phosphorus (WP) UXO. Burning WP may detonate the burster or dispersal explosive charge at any time.

F. Do not transport a WP munition, unless it is immersed in water, mud or wet sand.

G. Extra care shall be taken when uncovering a buried UXO, if records search indicated WP munitions were fired or destroyed in the area. A buried WP munition may be damaged and when exposed to air, may start burning and detonate. An ample supply of water and mud shall be immediately available if excavation reveals a WP UXO. Appropriate protective equipment (leather gloves, face shield, and flame-retardant clothing) and first aid shall also be immediately available.

H. WP UXO shall not be detonated into the ground. The UXO shall be counter-charged on the bottom-center-line.

I. Photoflash powder will react with moisture and generate hydrogen gas, and this reaction may generate sufficient heat or pressure to detonate the UXO. Do not look directly at photoflash UXO during detonation.

J. If loose pyrotechnic, tracer, flare, and similiar mixtures are to be transported, they shall be placed in #10 mineral motor oil or equivalent to minimize fire and explosion hazard.

K. Initiating explosives include lead azide, mercury fulminate, lead styphnate, and tetracene. They manifest extreme sensitivity to friction, heat, and impact. When involved in a fire, they can be expected to detonate without burning. In storage, initiating explosives shall be kept wet with water or water/alcohol mixture. Every effort shall be made to prevent the liquid from freezing; frozen explosives material will not be handled. Lead azide shall not be allowed contact with copper, zinc, or alloys containing any concentration of such metals because of the likely formation of othr azides that are more sensitive than the original lead azide. Likewise, mercury fulminate shall not be allowed contact with aluminum, magnesium, zinc, brass or bronze.

XIII. Assume a practice UXO contains a live charge until it can be determined otherwise.

A. Inert UXO will not be disposed of or sold for scrap until the internal fillers have been exposed and unconfined. Heat generated during a reclamation operation can cause the inert filler, moisture and air to expand and burst sealed casings. Venting or exposure may be accomplished in any way necessary to preclude rupture due to confined pressure.

... approach an unfired rocket motor from the side. Ignition will create a missile hazard and hot exhaust.

A. Do not expose electrically fired rocket motors within 25-feet of any exposed electronic transmitting equipment or exposed antenna leads.

B. If an unfired rocket motor must be transported, it shall be positioned in the direction which offers the least exposure to personnel in the event of an accident ignition.

XV. Consider an emplaced landmine armed until proven otherwise. It may not be possible to tell, or it may be intentionally rigged to deceive.

A. Many training mines contain firing indicator charges capable of inflicting serious injury.

B. Exercise care with wooden mines that have been buried for a long time. Because of soil conditions, the wood deteriorates and the slightest inadvertent pressure on top may initiate the fuze.

XVI. Do not pack a bomb fuze well with explosives unless it can be positively confirmed that the fuze well does not contain any fuze components.

A. Photoflash bombs must be handled with the same care as black powder, and with even greater care than explosive-loaded bombs.

B. Some practice bombs do not contain any positive safety features. Positively identify and review all safety precautions prior to handling practice bombs.

XVII. The usual method for uncovering buried UXO is to excavate by hand. Hand excavation is the most reliable method for uncovering UXO, but unless the UXO is very near the surface, hand excavation exposes more people to the hazard of detonation for a longer period of time than any other method.

A. Earth moving machinery (EMM) may be used to excavate for buried UXO, if the UXO is estimated to be deeper than 12 inches. EMM shall not be used to excavate within 12 inches of an UXO. When excavation gets within 12 inches of an UXO, hand excavation shall be used to uncover the UXO.

(1) If more than one EMM will be used on the same site, they will be separated by at least 100m during excavation,

(2) During excavation operations, only those personnel absolutely necessary for the operation shall be within the exclusion zone.

B. Excavation shall comply with the provisions of 29 CFR 1926 subpart P.

XVIII. The site shall be surveyed for electromagnetic radiation (EMR) radio frequency (RF) transmitters and appropriate action taken. Safe distances have been established for specific transmitter power and transmitters. These distances shall be made available to the contractor by CEHND-ED-SY, upon request.

XIX. Do not wear outer or undergarments made of wool, silk, or synthetic textiles such as rayon and nylon while working on UXO. These materials can generate sufficient static charge to ignite fuels or initiate explosives. Any person coming in contact with an UXO, shall ground himself prior to touching EEDs. This must be done to discharge any electrostatic charge accumulation from the body.

XX. If UXO must be transported off-site for disposal, the provisions of 4 CFR 100-199, TM 9-1300-206, and state and local laws shall be followed.

XXI. Personnel working with explosives and explosive ordnance shall comply with the following:

A. Do not carry fire or spark-producing devices on-site.

B. Do not smoke, except in authorized areas.

C. Do not have fires for heating or cooking, except in authorized areas.

D. Do not conduct operations without approved Standing Operating Procedures (SOP) and proper supervision.

E. Do not become careless by reason of familiarity with ammunition.

F. Do not conduct explosive operations during electrical, sand, dust or snow storms.

G. Do not conduct explosive operations between sunset and dawn.

XX. Civil War projectiles shall be treated as any other UXO, especially projectiles with uncut Bormann time fuses and projectiles with percussion fuses, brass in particular. These have generally provided a watertight seal, even if they have been in the ground over one-hundred years. No projectile should be exposed to excess heat, the ignition point of black powder, used as a bursting charge in all Civil War projectiles is 457 degrees F. Under no circumstances should an attempt be made to drill a hole in a projectile, either through the fuse or the body of the projectile.

XXI. If base-ejection type projectiles must be transported to a disposal area or collection point, the base shall be oriented to the rear of the vehicle and the projectile secured, in the event the ejection charge functions in route.

XXII. If an OEW, with exposed hazardous filler (HE, etc), has to be moved to a disposal area, the item shall be placed in a heavy duty plastic bag to prevent migration of the hazardous filler. Padding should also be added to protect the exposed filler from heat, shock, and friction.

XIII. Do not undertake the handling or disposal of liquid propellant fuels or oxidizers if not familiar with the characteristics of the material.

XXIV. 29 CFR 1926.100(a) requires personnel to wear protective helments in areas where there is a possible danger of head injury from impact, or from falling or flying objects, or from electrical shock or burns. During field activities on ordnance projects, hardhats need not be worn unless a head injury threat is present.

XXV. Soil samples, test pit excavation, and/or monitoring well installation are sometimes conducted in areas where subsurface UXO may be found. These intrusive activities must be preceded by a magnetometer survey to assure the safety of the sampling crews.

a. Prior to the drilling rig coming on site, a magnetometer and a hand-held auger shall be utilized to assure the drilling spot is clear of subsurface UXO.

(1) After finding an area the magnetometer indicates is clear of detectable UXO, the hand-held auger should be used to start the drill hole. At not more than 2-foot depth, the hand-held auger shall be withdrawn and the magnetometer probe shall be lowered into the auger hole. This procedure will ensure small UXO items(20mm projectiles and grenades), undetectable from the surface, are now detectable. This procedure shall be repeated until the maximum depth of the hand-held auger.

(2) Borehole monitoring shall continue at 2-foot intervals until virgin soil is encountered.

XXVI. The detection and identification of suspect explosive materials shall be accomplished IAW Chapter 13, TM 9-1300-214, "Military Explosives".

ELECTROMAGNETIC RADIATION (EMR) HAZARDS
UNEXPLODED EXPLOSIVE ORDNANCE (UXO)

The use of electroexplosive devices (EED) susceptible to EMR devices in the radio frequency (RF) range, that is, radio, radar, and television transmitters, has become almost universal. Radio frequency electromagnetic radiation consists of waves of electrical energy at radio transmission frequencies. These waves are radiated in a line-of-sight from the antennas of electronic devices that transmit radio, radar, television, or other communication or navigation radio frequency signals. The energy is usually equally radiated in all directions; however, certain types of antennas focus the energy, transmitting it in a single direction or sector only. EMR (RF) can also be reflected from large metallic surfaces or objects into areas not directly reached by the line-of-sight-radiated electric energy.

Under highly undesirable conditions, enough of the energy may be picked up by portions of the EED*, associated circuitry, or related objects acting as receiving antennas, to initiate the EED.

*[An EED is used to ignite a limited quantity of explosive, propellant, or [illegible] produced by the application of electrical energy from an outside source across an internal conductor or spark gap. An EED is generally a subassembly used to trigger a larger assembly.] (EED's have extensive military applications. They are used to activate certain control devices, to arm many various ordnance items, and to initiate explosive trains. Examples are artillery/mortar proximity (variable time (VT)) fuses, rocket motors, and electric blasting caps.)

Since the strength of the radiation decreases as the distance from the transmitter increases, the further away the ordnance item is, the less hazardous the situation. The energy can pass directly through materials that do not conduct electricity, such as wood or plastic. Therefore, using these materials as a barrier is of little value. The factors to be considered when evaluating the degree of hazard that the EMR (RF) energy represents are: 1) the strength of the field, that is, its power; 2) the nature of the frequencies transmitted; 3) the distance from the transmitter antenna to the ordnance, and; 4) the amount or type of protection available.

Hazards of Electromagnetic Radiation to Ordnance (HERO).

Some ordnance is particularly susceptible to EMR (RF) emission. This susceptibility is usually caused by the design of the ordnance item or the type of EED that is used. HERO categories have been established under which ordnance is classified as safe, susceptible, and unsafe. A knowledge of ordnance that is normally unsafe in the presence of EMR (RF) is important so that preventive steps can be taken if the ordnance is encountered in a suspected EMR (RF) field.

In general, all ordnance items, even those normally safe when intact, are hazardous when extensively damaged. The damage may expose components, trailing wires, or breaks in shielding integrity that permit the entrance of EMR (RF) energy into the ordnance item and then into the EED.

The presence of antennas, communication and radar devices should be a point of interest on initial site visits and preliminary assessments.

SECTION II

STANDING OPERATING PROCEDURES

APPENDIX A

STANDING OPERATING PROCEDURES

GEOPHYSICAL UXO SURVEY

OF

FUNCTIONAL TEST RANGES 1,2,3, AND CURRENT DEMO/BURN AREA

FORT WINGATE, NM

**STANDING OPERATING PROCEDURES (S0P) FOR
GEOPHYSICAL UXO SURVEYS
FORT WINGATE FUNCTIONAL TEST RANGES AND DEMO/BURNING GROUNDS**

STEP DESCRIPTION		SPECIFIC INSTRUCTIONS
1.	Daily Operations	a. All personnel report to the work site at time designated by the Senior UXO Specialist. b. The Senior UXO Specialist will give the daily safety briefing to all site workers and give specific instructions for the day's work. c. The project command post (CP) will be designated and all personnel not directly involved in down-range operations will remain at the CP. Visitors requesting to observe down-range operations will be escorted by the Senior UXO Specialist or his representative. d. Communications with down-range personnel are mandatory. Radios will be tested prior to beginning UXO operations. e. A minimum of two qualified UXO Technicians will be onsite during all UXO operations. f. The Senior UXO Specialist will maintain a log detailing all field operations in accordance with direction contained in the work plan.
2.	Geophysical Survey Procedures	a. The UXO Supervisor will verify and survey area. b. The UXB survey crew, consisting of a minimum of two UXO Technicians, will conduct a visual inspection of the survey area to locate any obvious surface UXO hazards. c. The survey area will be divided into six-foot-wide search lanes using wooden stakes and surveyor's line to clearly mark the lanes. d. The geophysical instruments to be used to conduct the survey will be assembled and operationally checked in the CP area, by testing the instrument response to known objects buried at known depths, prior beginning the geophysical survey. f. All subsurface metallic contracts will be marked with pin flags.
3.	UXO Disposal	a. All confirmed UXO will be identified, recorded, and the 41st Ordnance Detachment (EOD) notified of their location, condition, and quantity for disposal.

4.	Post-Operation Procedures	a. The Senior UXO Specialist will ensure all equipment is properly stored and secured. Important: Loosen swivel screws on Foerster Ferex before folding probe. b. The Senior UXO Specialist will conduct a daily debrief of the project and briefly outline the next day's objectives. c. Prior to departing the work site the Senior UXO Specialist will ensure that the project area is clean and free of UXO and industrial hazards.

APPENDIX B

STANDING OPERATING PROCEDURES

UXO SAFETY ESCORT

FORT WINGATE, NM

STANDING OPERATING PROCEDURES (S0P) FOR GEOPHYSICAL ESCORT FORT WINGATE, NEW MEXICO

STEP DESCRIPTION		SPECIFIC INSTRUCTIONS
1.	Daily Operations	a. All personnel report to the work site at time designated by the Senior UXO Specialist. b. The Senior UXO Specialist will give the daily safety briefing to all site workers and give specific instructions for the day's work. c. The project command post (CP) will be designated and all personnel not directly involved in down-range operations will remain at the CP. d. Communications with down-range personnel are mandatory. Radios will be tested prior to beginning UXO operations. e. A minimum of two qualified UXO Technicians will be on site during all UXO operations. f. The Senior UXO Specialist will maintain a log detailing all field operations in accordance with direction contained in the work plan.
2.	Geophysical Survey Procedures	a. One UXO Technician will survey the area to be traversed ahead of the samplers and mark ordnance items (both surface and subsurface with biodegradable spray paint or pin flags. These marked areas will be avoided during this and subsequent passage. b. Any UXO located is to be left in place and reported to the 41st Ordnance Detachment (EOD) for final disposal. c. Areas such as demolition ranges, disposal burn sites, or landfills containing ordnance, will require a UXO Technician to accompany non-ordnance personnel during each excursion within the site boundaries. d. Cleared areas will be re-inspected after excavations, heavy rains, or any other terrain-altering disturbances which m

have uncovered ordnance.

e. Any area deemed to be too heavily contaminated with ordnance or explosive waste by the Senior UXO Supervisor to allow non-ordnance personnel to enter for sampling or other activities may require the activities to be performed by a UXO Technician under the instruction of the sampler.

APPENDIX C

STANDING OPERATING PROCEDURES

DOWN-HOLE MONITORING

FORT WINGATE, NM

STANDING OPERATING PROCEDURES (SOP) FOR DOWNHOLE GEOPHYSICS FORT WINGATE, NM

STEP DESCRIPTION	SPECIFIC INSTRUCTIONS
1. Daily Operations	a. All personnel report to the work site at time designated by the Senior UXO Specialist.
	b. The Senior UXO Specialist will give the daily safety briefing to all site workers and give specific instructions for the day's work.
	c. The project command post (CP) will be designated and all personnel not involved in down-range operations will remain at the CP.
	d. Communications with down-range personnel are mandatory. Radios will be tested prior to beginning UXO operations.
	e. The Senior UXO Specialist will maintain a log detailing all field operations in accordance with direction contained in the work plan.
2. Downhole Geophysics Procedures	a. Proposed monitoring well sites will be reviewed with prime contractor for position, physical obstacles, and access paths.
	b. Selected drilling sites will be marked with stakes and flagging tape to identify the cleared radius. Radii will be based on size of drill rig as follows: Minimum............15 feet 1 ton rig..........30 feet 5 ton rig..........45 feet 10 ton rig.........60 feet
	c. The safety radii will be surveyed with the Foerster Ferex Ordnance Locator and the White's Eagle II detector to a depth of two feet. All metallic contacts will be marked for avoidance or excavated and identified (contract specific).

d. A 15 foot wide access path from the nearest road to the well site will be marked with stakes and flagging and clea[illegible] in the same manner as the safety radius. The stakes will be of sufficient height to be visible to the drill rig driver as he maneuvers from the road to the drill site.

e. A UXO located which is unsafe to move will be left in place and reported to the 41st Ordnance Detachment (EOD) for disposal.

f. A UXO Technician will hand auger down two feet at the proposed well site. With the Foerster configured in the underwater mode, the probe will be lowered to the bottom of the hole and monitored for metallic contacts. At this point, the well site will be cleared to a depth of four feet. Refer to paragraph 2.0, c. of the UXO Work Plan.

g. Position the drill rig upwind of well site. Observe drilling progress to a depth of four feet (Note: To facilitate sampling in undisturbed soil, the drill rig auger can offset to within one foot of the hand-augered hole and still be assured of a UXO-free path).

h. Instruct the drillers to cease drilling and remove the fi[illegible] four feet of hollow-stem auger from hole.

i. Insert 4" diameter PVC pipe in open hole to prevent cave-in (if required by soil conditions).

j. Lower Foerster Ferex probe into the PVC pipe to the bottom of the hole and recalibrate the instrument for full range investigation using each mode and scale. If instrument readings are negative, drilling may continue. If a ferrous contact is indicated, relocate the well a minimum of ten feet from original location.

k. Repeat step i. every two feet until cleared to a depth of 12 feet. Refer to paragraph 2.0, c. of the UXO Work Plan.

l. If drilling operations are to be performed at a later date, the borehole may be entirely cleared down to 20 feet (if soil conditions permit) by hand-auger and the Foerster Ferex. The drill rig MUST auger within one foot of the pre-cleared hole to be assured that no ferrous objects will be encountered.

12.0 SAMPLE HANDLING AND TRANSPORT

12.1 GENERAL PROCEDURES/PRACTICES

The following sample handling and transport procedures will be followed during the performance of the FWDA EI:

1. Samples will be packed with vermiculite in hard-sided plastic coolers to prevent breakage or sparks, during initial transport to the ERM field office;
2. Coolers will be sealed prior to loading into transport vehicles;
3. Loading and unloading will be performed with due care to prevent breakage or dropping of samples;
4. Vehicles transporting equipment and field reagents (acids, bases) will not transport samples which are considered hazardous;
5. Vehicles transporting samples will carry a fire extinguisher and be kept in good repair (i.e., free from excessive grease and oil, fuel leaks, and having an exhaust system in good repair);
6. Vehicles transporting samples will not be left unattended at any time; and
7. Samples requiring transport to the designated analytical laboratory for analyses will be transported from FWDA by Federal Express (or equivalent). Samples will be appropriately labeled and marked with warning signs and U.S. Department of Transportation (DOT) labels to comply with shipping regulations. Sample holding times will not be exceeded during transport.

12.2 SHIPPING PROCEDURES

Project/site personnel will comply with U.S. Department of Transportation (DOT) Rules for Hazardous Materials Transportation. Shipment of materials to and from the project site is the responsibility of designated individuals, who are provided with procedures to comply with the DOT rules as applicable to each particular substance they ship.

Compliance with U.S. DOT regulations begins with the proper classification of the substance, i.e., whether it meets the criteria for inclusion in any of the U.S. DOT hazard categories.

- Explosive (A, B, or C)
- Blasting Agent
- Flammable Gas
- Flammable Liquid
- Flammable Solid
- Organic Peroxide
- ORM-A (Irritant Leakage)
- ORM-B (Problem Character)
- Radioactive
- Poison Gas (Poison A)
- Poison B (Liquid or Solid)
- Combustible Liquid
- Irritating Material
- Nonflammable Compressed Gas
- Oxidizer
- ORM-B (Damaging Leakage)
- ORM-E (Hazardous Substance)
- Etiologic Agent

The U.S. DOT Hazardous Materials Table provided in 49 CFR 172.101 is used to determine the Proper Shipping Name and classification for chemical substances in commerce. If a listing cannot be found for the material, and the material appears to belong in one or more of the DOT classes, a determination will be made by comparing the characteristics of the material to be shipped with the definitions for the class in question. After the Proper Shipping Name is determined, the packaging, marking, labeling, placarding, and miscellaneous other requirements will be determined along with restrictions on quantities and modes of transportation. Shipping papers are always required, and the shipper will be required to certify to the carrier that the material is prepared in accordance with the regulations.

Materials for use on-site (such as acids, bases, and solvents) will be shipped to the site under the direction of technicians following established procedures. In the vast majority of cases, environmental samples of soil or water or air contaminants will not meet any of the criteria for a DOT class and will be classified "Not Hazardous" for shipping purposes. Where a particular sampling effort is expected to yield samples with unusual properties that may conceivably lead to their classification as hazardous under these rules, assistance should be sought from the Project Safety Supervisor in making a determination.

13.0 *WASTE DISPOSAL/DECONTAMINATION*

Investigation-Generated Wastes (IGW) generated during the FWDA EI will consist of borehole cuttings, drilling fluids, drilling equipment cleaning water, sampling and personnel protection gear decontamination water, and used PPE (disposable gloves, coveralls, etc).

Borehole cuttings will be staged adjacent to the boring location on plastic sheeting and covered to await the results of waste characterization and a hazardous waste determination. If non-hazardous, the drill cuttings will be returned to the borehole. If determined hazardous, the cuttings will be containerized and removed to a central staging area. The necessary manifests will then be prepared for signature by appropriate FWDA personnel and the wastes arranged for disposal in accordance with 40 CFR Part 262. All abandoned boreholes will be filled with a mixture of neat cement and bentonite.

The source of decontamination water is the FWDA water distribution system. Decontamination activities will be conducted at a central decontamination location to be designated during site mobilization activities. Used PPE will be placed in drums and will be disposed of appropriately. Appendix 13.1 provides procedures for the decontamination of the PPE anticipated for use during the EI.

Water generated during well development and sampling activities for each well will be scanned with a HNu or OVA. If the monitoring equipment registers less than 1 ppm above background, the water will be poured on the ground down-slope of the well. If the monitoring equipment registers greater than or equal to 1 ppm above background, the water will be containerized in separate DOT-approved drums, labeled with the site location and date, and sealed and transported to a central staging location. After analytical data are received for each monitor well, these drums will be segregated as follows. All drums containing water from sites showing contaminant levels acceptable as influent to the FWDA wastewater treatment plant will be placed in one group, and all drums from sites showing contaminant levels that are too high to be accepted by the FWDA treatment plant will be placed in another group. The first group will be disposed of in the FWDA treatment plant, with coordination by the Base Contact. The second group will be considered hazardous, and the necessary manifests will be prepared for signature by appropriate FWDA personnel and the wastes arranged for disposal in accordance with 40 CFR Part 262.

Water generated during equipment decontamination will be handled similarly, except that if it passes the monitoring equipment scan, it will be discharged to the FWDA wastewater treatment plant through the sanitary sewer system or discharged directly to the ground.

Appendix 13.1
Decontamination

APPENDIX 13.1 DECONTAMINATION

13.1-1 *GENERAL*

Personnel involved with hazardous material handling may be exposed to compounds in a number of ways, despite the most stringent protective procedures. Personnel may come in contact with vapors, gases, mists, or particulates in the air, or may come in contact with site media while performing work tasks. Use of monitoring instruments and equipment can also result in exposure to hazardous substances.

In general, decontamination involves scrubbing with a non-phosphate soap/water solution followed by clean water rinses. All disposable items will be disposed of in a dry container. Certain parts of contaminated respirators, such as harness assemblies and leather or cloth components, are difficult to decontaminate. If grossly contaminated, they may have to be discarded. Rubber components can be soaked in soap and water and scrubbed with a brush. In addition to being decontaminated, all respirators, non-disposable protective clothing, and other personal articles must be sanitized before they can be used again unless they are assigned to individuals. The manufacturer's instructions should be followed in sanitizing the respirator masks. The Site Safety Officer or his/her qualified designee will be responsible for supervising the proper decontamination of protective equipment.

13.1-2 *STANDARD PPE DECONTAMINATION*

The Site Safety Officer or his/her qualified designee will monitor decontamination procedures to ensure their effectiveness. Modifications of the decontamination procedure may be necessary as determined by the Site Safety Officer or his/her designee.

Level D Personal Protection Decontamination Procedure

Step 1 -- Boot Cover and Glove Wash (if applicable)

Scrub outer boot covers and gloves with decon solution or detergent and water.

Step 2 -- Boot Cover and Glove Rinse (if applicable)

Rinse off decon solution from station 1 using copious amounts of water.

Step 3 -- Boot Cover Removal (if applicable)

Remove boot covers and deposit in container with plastic liner.

Step 4 -- Glove Removal (if applicable)

Remove gloves and deposit in container with plastic liner.

Step 5 -- Field Wash

Wash hands and face with soap and water.

14.0 LABORATORY SAFETY PROGRAM

EA Laboratories of Sparks, MD is ERM's designated analytical laboratory for the FWDA EI. The EA Laboratory Chemical Analysis Supervisor is Sharon Albaugh and the EA Laboratory Analytical Safety Program is presented in its entirety in Appendix I.

Appendix A
Personnel Training

General site workers (such as equipment operators, general laborers and supervisory personnel) engaged in hazardous substance removal or other activities which expose or potentially expose workers to hazardous substances and health hazards shall receive a minimum of 40 hours of instruction off the site, and a minimum of three days actual field experience under the direct supervision of a trained, experienced supervisor. The training course must have included the following material at a minimum:

1. Safety and Health Officer and Site Management Responsibilities - personnel must understand Safety Officer and Site Management responsibilities and authority.
2. Site-Specific Health and Safety Hazards - personnel must be informed of specific hazards related to site and site operations.
3. Personal Protection Equipment (PPE) - personnel must be trained in proper use of personal protective equipment.
4. Safe Work Practices/Engineering Controls - personnel must be informed of appropriate work practices and engineering controls that will reduce the risk of exposure to site hazards.
5. Safety Equipment Use - personnel must understand the use of monitoring instruments and other safety equipment.
6. Medical Surveillance Program - personnel must be informed of requirements for medical surveillance of hazardous waste site employees.
7. Site Control Methods - personnel must understand site methods used to reduce exposure to on-site and off-site personnel.
8. Decontamination Procedures - personnel must be trained in proper decontamination operations and procedures.
9. Emergency Response - personnel must be trained in proper emergency response operations and procedures.
10. Confined Space Entry/Special Hazards - personnel involved in specific hazardous activities, such as confined space entry and drum handling, must receive training in appropriate techniques to employ during such operations.

Workers on site only occasionally for a specific limited task (such as, but not limited to, ground water monitoring, land surveying, or geo-physical surveying) and who are unlikely to be exposed over permissible exposure limits and published exposure limits shall receive a minimum of 24 hours of instruction off the site, and the minimum of one day actual field experience under the direct supervision of a trained, experienced supervisor.

Workers regularly on site who work in areas which have been monitored and fully characterized indicating that exposures are under permissible exposure limits where respirators are not necessary, and the characterization indicates that there are no health hazards or the possibility of an emergency developing, shall receive a minimum of 24 hours of instruction off the site and the minimum of one day actual field experience under the direct supervision of a trained, experienced supervisor.

Workers with 24 hours of training who meet the criteria for 24-hour training cited above, and who become general site workers or who are required to wear respirators, shall have the additional 16 hours and two days of training necessary to total the training specified for the 40-hour training criteria.

On-site management and supervisors directly responsible for, or who supervise employees engaged in, hazardous waste operations shall receive 40 hours initial training, and three days of supervised field experience [the training may be reduced to 24 hours and one day if the only area of their responsibility is employees covered by 29 CFR 1910.120 paragraphs (e)(3)(ii) and (e)(3)(iii)] and at least eight additional hours of specialized training at the time of job assignment on such topics as, but not limited to, the employer's safety and health program and the associated employee training program, personal protective equipment program, spill containment program, and health hazard monitoring procedure and techniques.

Annual refresher training consisting of eight hours of instruction is required of all employees, managers and supervisors who have completed the initial specified training requirements for working on-site as indicated in 29 CFR 1910.120 (e)(8).

Health and safety training programs shall comply with criteria set forth by ERM and OSHA as per final regulation 29 CFR 1910.120. This program will instruct employees on general health and safety principles and procedures, proper operation of monitoring instruments, and use of personal protective equipment.

In addition, site employees will undergo site-specfic training prior to the start-up of any given project or task. As activities change at a particular site, related training will address potential hazards and associated risks, site operating procedures, emergency response and site control methods to be employed.

Specialized training will be provided as dictated by the nature of site activities. Specialized training will be provided for activities such as confined space entry, excavations and handling of unidentified substances. Employees involved in these types of activities will be given off-site instruction regarding the potential hazards involved with safety activities and the appropriate health and safety procedures to be followed. Off-site instruction is meant to include any area where employees will not be exposed to site hazards.

This Health and Safety Plan must be distributed to all subcontractors prior to the start of field activities. A pre-operation meeting will be held to discuss the contents of the Plan. Specialty training will be provided as determined by task and responsibility. All training of personnel will be conducted under direct supervision of a trained Health and Safety Officer or his designee.

Exemptions from training may be approved by the Health & Safety Officer in conjunction with the Project Manager.

Appendix B
Medical Monitoring Program

The Occupational Safety and Health Administration (OSHA) has established requirements for a medical surveillance program designed to monitor and reduce health risks for employees potentially exposed to hazardous materials (29 CFR 1910.120). This program has been designed to provide baseline medical data for each employee involved in hazardous waste operations including field activities, and to determine his/her ability to wear personal protective equipment, such as chemical resistant clothing and respirators. Employees who wear or may wear respiratory protection must be provided respirators as regulated by 29 CFR 1910.134. This Standard requires that an individual's ability to wear respiratory protection be medically certified before he/she performs designated duties. Where medical requirements of 29 CFR 1910.120 overlap those of 29 CFR 1910.134, the more stringent of the two will be enforced.

The medical examinations must be administered on a pre-employment and annual basis and as warranted by symptoms of exposure or specialized activities. These examinations shall be provided by employers without cost or loss of pay to the employee. For the purposes of this Health and Safety Plan, all subcontractors shall assume the employer's responsibility in obtaining the necessary medical monitoring and training for their employees pursuant to this section of 29 CFR 1910.120.

The medical examinations shall include the following:

A. Medical History and Physical, Including:

- Medical questionnaire.
- Completion of medical history with occupational risk factor analysis.
- Examination by physician.
- Evaluation of test results.
- Brief report sent to employer covering specific requested areas as well as pertinent positive findings; report sent to family physician and employee by request.

B. Pulmonary Function Testing (FEV_1, FVC)

C. EKG (12-lead)

D. Lab tests, Including

- Urinalysis

J.T.BAKER INC., 222 RED SCHOOL LANE, PHILLIPSBURG, NJ 08865

SECTION I - PRODUCT IDENTIFICATION

PRODUCT NAME: NITRIC ACID
COMMON SYNONYMS: HYDROGEN NITRATE; AZOTIC ACID
CHEMICAL FAMILY: INORGANIC ACIDS
FORMULA: HNO_3
FORMULA WT.: 63.01
CAS NO.: 7697-37-2
NIOSH/RTECS NO.: QU5775000
PRODUCT USE: LABORATORY REAGENT
PRODUCT CODES: 5555,9597,6901,9602,5801,9616,9605,5113,5371,4801,9604,9601
9600,9606,9598

PRECAUTIONARY LABELING

BAKER SAF-T-DATA* SYSTEM

HEALTH	-	3	SEVERE (POISON)
FLAMMABILITY	-	0	NONE
REACTIVITY	-	3	SEVERE (OXIDIZER)
CONTACT	-	4	EXTREME (CORROSIVE)

LABORATORY PROTECTIVE EQUIPMENT

GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES

U.S. PRECAUTIONARY LABELING

POISON DANGER

SPILLAGE MAY CAUSE FIRE OR LIBERATE DANGEROUS GAS. HARMFUL IF INHALED AND MAY CAUSE DELAYED LUNG INJURY. STRONG OXIDIZER. CONTACT WITH COMBUSTIBLE MATERIALS, FLAMMABLE MATERIALS, OR POWDERED METALS CAN CAUSE FIRE OR EXPLOSION. LIQUID AND VAPOR CAUSE SEVERE BURNS. MAY BE FATAL IF SWALLOWED OR INHALED.

KEEP FROM CONTACT WITH CLOTHING AND OTHER COMBUSTIBLE MATERIALS. DO NOT STORE NEAR COMBUSTIBLE MATERIALS. DO NOT GET IN EYES, ON SKIN, ON CLOTHING. DO NOT BREATHE VAPOR. KEEP IN TIGHTLY CLOSED CONTAINER. USE WITH ADEQUATE VENTILATION. WASH THOROUGHLY AFTER HANDLING. IN CASE OF FIRE, USE WATER SPRAY. IN CASE OF SPILL, NEUTRALIZE WITH SODA ASH OR LIME.

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PRECAUTIONARY LABELING (CONTINUED)

INTERNATIONAL LABELING

CAUSES SEVERE BURNS.
KEEP OUT OF REACH OF CHILDREN. DO NOT BREATHE VAPOUR. IN CASE OF CONTACT WITH EYES, RINSE IMMEDIATELY WITH PLENTY OF WATER AND SEEK MEDICAL ADVICE. TAKE OFF IMMEDIATELY ALL CONTAMINATED CLOTHING.

SAF-T-DATA* STORAGE COLOR CODE: YELLOW (REACTIVE)

SECTION II - COMPONENTS

COMPONENT	CAS NO.	WEIGHT %	OSHA/PEL	ACGIH/TLV
NITRIC ACID	7697-37-2	65-71	2 PPM	2 PPM
WATER	7732-18-5	29-35	N/E	N/E

SECTION III - PHYSICAL DATA

BOILING POINT: 121 C (249 F) (AT 760 MM HG)

VAPOR PRESSURE (MMHG): 9 (20 C)

MELTING POINT: -42 C (-43 F) (AT 760 MM HG)

VAPOR DENSITY (AIR=1): N/A

SPECIFIC GRAVITY: 1.41 (H_2O=1)

EVAPORATION RATE: N/A

SOLUBILITY(H_2O): COMPLETE (100%)

% VOLATILES BY VOLUME: 100 (21 C)

PH: 1.0 (0.1M SOLUTION)

ODOR THRESHOLD (P.P.M.): N/A

PHYSICAL STATE: LIQUID

COEFFICIENT WATER/OIL DISTRIBUTION: N/A

APPEARANCE & ODOR: CLEAR, COLORLESS LIQUID. SUFFOCATING ODOR.

CONTINUED ON PAGE: 3

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (CLOSED CUP): N/A NFPA 704M RATING: 3-0-0 OXY

AUTOIGNITION TEMPERATURE: N/A

FLAMMABLE LIMITS: UPPER - N/A LOWER - N/A

FIRE EXTINGUISHING MEDIA
USE WATER SPRAY.

SPECIAL FIRE-FIGHTING PROCEDURES
FIREFIGHTERS SHOULD WEAR PROPER PROTECTIVE EQUIPMENT AND SELF-CONTAINED BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN POSITIVE PRESSURE MODE. MOVE EXPOSED CONTAINERS FROM FIRE AREA IF IT CAN BE DONE WITHOUT RISK. USE WATER TO KEEP FIRE-EXPOSED CONTAINERS COOL; DO NOT GET WATER INSIDE CONTAINERS.

UNUSUAL FIRE & EXPLOSION HAZARDS
STRONG OXIDIZER. CONTACT WITH COMBUSTIBLE MATERIALS, FLAMMABLE MATERIALS, OR POWDERED METALS CAN CAUSE FIRE OR EXPLOSION. REACTS WITH MOST METALS TO PRODUCE HYDROGEN GAS, WHICH CAN FORM AN EXPLOSIVE MIXTURE WITH AIR. A VIOLENT EXOTHERMIC REACTION OCCURS WITH WATER. SUFFICIENT HEAT MAY BE PRODUCED TO IGNITE COMBUSTIBLE MATERIALS.

TOXIC GASES PRODUCED
OXIDES OF NITROGEN, HYDROGEN

EXPLOSION DATA-SENSITIVITY TO MECHANICAL IMPACT
NONE IDENTIFIED.

EXPLOSION DATA-SENSITIVITY TO STATIC DISCHARGE
NONE IDENTIFIED.

SECTION V - HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE (TLV/TWA): 5 MG/M3 (2 PPM)

SHORT-TERM EXPOSURE LIMIT (STEL): 10 MG/M3 (4 PPM)

PERMISSIBLE EXPOSURE LIMIT (PEL): 5 MG/M3 (2 PPM)

CONTINUED ON PAGE: 4

SECTION V - HEALTH HAZARD DATA (CONTINUED)

TOXICITY OF COMPONENTS

INHALATION-1HR RAT LC50 FOR NITRIC ACID	2500 PPM
INTRAPERITONEAL MOUSE LD50 FOR WATER	190 G/KG
INTRAVENOUS MOUSE LD50 FOR WATER	25 G/KG

CARCINOGENICITY: NTP: NO IARC: NO Z LIST: NO OSHA REG: NO

CARCINOGENICITY

NONE IDENTIFIED.

REPRODUCTIVE EFFECTS

NONE IDENTIFIED.

EFFECTS OF OVEREXPOSURE

INHALATION: SEVERE IRRITATION OR BURNS OF RESPIRATORY SYSTEM, COUGHING, DIFFICULT BREATHING, CHEST PAINS, PULMONARY EDEMA, LUNG INFLAMMATION, UNCONSCIOUSNESS, AND MAY BE FATAL

SKIN CONTACT: SEVERE IRRITATION OR BURNS

EYE CONTACT: SEVERE IRRITATION OR BURNS

SKIN ABSORPTION: NONE IDENTIFIED

INGESTION: NAUSEA, VOMITING, SEVERE BURNS, ULCERATION - MOUTH, THROAT, STOMACH, AND MAY BE FATAL

CHRONIC EFFECTS: DAMAGE TO LUNGS, TEETH

TARGET ORGANS

EYES, SKIN, MUCOUS MEMBRANES, RESPIRATORY SYSTEM, LUNGS, TEETH, GI TRACT

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE

DAMAGED SKIN, EYE DISORDERS, CARDIOPULMONARY DISEASE, LUNG DISEASE

PRIMARY ROUTES OF ENTRY

INHALATION, INGESTION, EYE CONTACT, SKIN CONTACT

CONTINUED ON PAGE: 5

SECTION V - HEALTH HAZARD DATA (CONTINUED)

EMERGENCY AND FIRST AID PROCEDURES

INGESTION: CALL A PHYSICIAN. IF SWALLOWED, DO NOT INDUCE VOMITING. IF CONSCIOUS, GIVE WATER, MILK, OR MILK OF MAGNESIA.

INHALATION: IF INHALED, REMOVE TO FRESH AIR. IF NOT BREATHING, GIVE ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT, GIVE OXYGEN.

SKIN CONTACT: IN CASE OF CONTACT, IMMEDIATELY FLUSH SKIN WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES WHILE REMOVING CONTAMINATED CLOTHING AND SHOES. WASH CLOTHING BEFORE RE-USE.

EYE CONTACT: IN CASE OF EYE CONTACT, IMMEDIATELY FLUSH WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES.

SARA/TITLE III HAZARD CATEGORIES AND LISTS

ACUTE: YES CHRONIC: YES FLAMMABILITY: YES PRESSURE: NO REACTIVITY: NO

EXTREMELY HAZARDOUS SUBSTANCE:	YES	CONTAINS NITRIC ACID (RQ = 1,000 LBS, TPQ = 1,000 LBS)
CERCLA HAZARDOUS SUBSTANCE:	YES	CONTAINS NITRIC ACID (RQ = 1000 LBS)
SARA 313 TOXIC CHEMICALS:	YES	CONTAINS NITRIC ACID
GENERIC CLASS:		C16
TSCA INVENTORY:	YES	

SECTION VI - REACTIVITY DATA

STABILITY: STABLE HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

CONDITIONS TO AVOID: HEAT, LIGHT, MOISTURE

INCOMPATIBLES: STRONG BASES, CARBONATES, SULFIDES, CYANIDES, COMBUSTIBLE MATERIALS, ORGANIC MATERIALS, STRONG REDUCING AGENTS, MOST COMMON METALS, POWDERED METALS, CARBIDES, AMMONIUM HYDROXIDE, WATER, ALCOHOLS

DECOMPOSITION PRODUCTS: OXIDES OF NITROGEN, HYDROGEN

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SECTION VII - SPILL & DISPOSAL PROCEDURES

STEPS TO BE TAKEN IN THE EVENT OF A SPILL OR DISCHARGE

WEAR SELF-CONTAINED BREATHING APPARATUS AND FULL PROTECTIVE CLOTHING. STOP LEAK IF YOU CAN DO SO WITHOUT RISK. VENTILATE AREA. NEUTRALIZE SPILL WITH SODA ASH OR LIME. WITH CLEAN SHOVEL, CAREFULLY PLACE MATERIAL INTO CLEAN, DRY CONTAINER AND COVER; REMOVE FROM AREA. FLUSH SPILL AREA WITH WATER.

KEEP COMBUSTIBLES (WOOD, PAPER, OIL, ETC.) AWAY FROM SPILLED MATERIAL.

J. T. BAKER NEUTRASORB(R) OR TEAM(R) 'LOW NA+' ACID NEUTRALIZERS ARE FOR SPILLS OF THIS PRODUCT.

DISPOSAL PROCEDURE

DISPOSE IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL ENVIRONMENTAL REGULATIONS.

EPA HAZARDOUS WASTE NUMBER: D001, D002 (IGNITABLE, CORROSIVE WASTE)

SECTION VIII - INDUSTRIAL PROTECTIVE EQUIPMENT

VENTILATION:	USE GENERAL OR LOCAL EXHAUST VENTILATION TO MEET TLV REQUIREMENTS.
RESPIRATORY PROTECTION:	RESPIRATORY PROTECTION REQUIRED IF AIRBORNE CONCENTRATION EXCEEDS TLV. AT CONCENTRATIONS UP TO 100 PPM, A CHEMICAL CARTRIDGE RESPIRATOR WITH ACID CARTRIDGE IS RECOMMENDED. ABOVE THIS LEVEL, A SELF-CONTAINED BREATHING APPARATUS IS ADVISED.
EYE/SKIN PROTECTION:	SAFETY GOGGLES AND FACE SHIELD, UNIFORM, PROTECTIVE SUIT, NEOPRENE GLOVES ARE RECOMMENDED.

SECTION IX - STORAGE AND HANDLING PRECAUTIONS

SAF-T-DATA* STORAGE COLOR CODE: YELLOW (REACTIVE)

STORAGE REQUIREMENTS

KEEP CONTAINER TIGHTLY CLOSED. STORE SEPARATELY AND AWAY FROM FLAMMABLE AND COMBUSTIBLE MATERIALS. ISOLATE FROM INCOMPATIBLE MATERIALS. KEEP PRODUCT OUT OF LIGHT.

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SECTION X - TRANSPORTATION DATA AND ADDITIONAL INFORMATION

DOMESTIC (D.O.T.)

PROPER SHIPPING NAME: NITRIC ACID (OVER 40%)
HAZARD CLASS: OXIDIZER
UN/NA: UN2031 REPORTABLE QUANTITY: 1000 LBS.
LABELS: OXIDIZER, CORROSIVE
REGULATORY REFERENCES: 49CFR 172.101; 173.268

INTERNATIONAL (I.M.O.)

PROPER SHIPPING NAME: NITRIC ACID
HAZARD CLASS: 8 I.M.O. PAGE: 8185
UN: UN2031 MARINE POLLUTANTS: NO PACKAGING GROUP: II
LABELS: CORROSIVE
REGULATORY REFERENCES: 49CFR 172.102; PART 176; IMO

AIR (I.C.A.O.)

PROPER SHIPPING NAME: NITRIC ACID
HAZARD CLASS: 8
UN: UN2031 PACKAGING GROUP: II
LABELS: CORROSIVE
REGULATORY REFERENCES: 49CFR 172.101; 173.6; PART 175; ICAO/IATA

U.S. CUSTOMS HARMONIZATION NUMBER: 28080000000

N/A = NOT APPLICABLE OR NOT AVAILABLE
N/E = NOT ESTABLISHED

THE INFORMATION IN THIS MATERIAL SAFETY DATA SHEET MEETS THE REQUIREMENTS OF THE UNITED STATES OCCUPATIONAL SAFETY AND HEALTH ACT AND REGULATIONS PROMULGATED THEREUNDER (29 CFR 1910.1200 ET. SEQ.) AND THE CANADIAN WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM. THIS DOCUMENT IS INTENDED ONLY AS A GUIDE TO THE APPROPRIATE PRECAUTIONARY HANDLING OF THE MATERIAL BY A PERSON TRAINED IN, OR SUPERVISED BY A PERSON TRAINED IN, CHEMICAL HANDLING. THE USER IS RESPONSIBLE FOR DETERMINING THE PRECAUTIONS AND DANGERS OF THIS CHEMICAL FOR HIS OR HER PARTICULAR APPLICATION. DEPENDING ON USAGE, PROTECTIVE CLOTHING INCLUDING EYE AND FACE GUARDS AND RESPIRATORS MUST BE USED TO AVOID CONTACT WITH MATERIAL OR BREATHING CHEMICAL VAPORS/FUMES.
EXPOSURE TO THIS PRODUCT MAY HAVE SERIOUS ADVERSE HEALTH EFFECTS. THIS CHEMICAL MAY INTERACT WITH OTHER SUBSTANCES. SINCE THE POTENTIAL USES

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ARE SO VARIED, BAKER CANNOT WARN OF ALL OF THE POTENTIAL DANGERS OF USE OR INTERACTION WITH OTHER CHEMICALS OR MATERIALS. BAKER WARRANTS THAT THE CHEMICAL MEETS THE SPECIFICATIONS SET FORTH ON THE LABEL.
BAKER DISCLAIMS ANY OTHER WARRANTIES, EXPRESSED OR IMPLIED WITH REGARD TO THE PRODUCT SUPPLIED HEREUNDER, ITS MERCHANTABILITY OR ITS FITNESS FOR A PARTICULAR PURPOSE.
THE USER SHOULD RECOGNIZE THAT THIS PRODUCT CAN CAUSE SEVERE INJURY AND EVEN DEATH, ESPECIALLY IF IMPROPERLY HANDLED OR THE KNOWN DANGERS OF USE ARE NOT HEEDED. READ ALL PRECAUTIONARY INFORMATION. AS NEW DOCUMENTED GENERAL SAFETY INFORMATION BECOMES AVAILABLE, BAKER WILL PERIODICALLY REVISE THIS MATERIAL SAFETY DATA SHEET.
NOTE: CHEMTREC, CANUTEC, AND NATIONAL RESPONSE CENTER EMERGENCY TELEPHONE NUMBERS ARE TO BE USED ONLY IN THE EVENT OF CHEMICAL EMERGENCIES INVOLVING A SPILL, LEAK, FIRE, EXPOSURE, OR ACCIDENT INVOLVING CHEMICALS. ALL NON-EMERGENCY QUESTIONS SHOULD BE DIRECTED TO CUSTOMER SERVICE (1-800-JTBAKER) FOR ASSISTANCE.

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APPROVED BY QUALITY ASSURANCE DEPARTMENT.

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J.T.BAKER INC., 222 RED SCHOOL LANE, PHILLIPSBURG, NJ 08865

SECTION I - PRODUCT IDENTIFICATION

PRODUCT NAME:	HYDROCHLORIC ACID
COMMON SYNONYMS:	MURIATIC ACID; CHLOROHYDRIC ACID; HYDROGEN CHLORIDE, AQUEOUS
CHEMICAL FAMILY:	INORGANIC ACIDS
FORMULA:	HCL
FORMULA WT.:	36.46
CAS NO.:	7647-01-0
NIOSH/RTECS NO.:	MW4025000
PRODUCT USE:	LABORATORY REAGENT
PRODUCT CODES:	9538,9537,9535,4800,9542,9534,5537,9549,9529,9547,9546,6900 9536,9540,9539,9548,5367,9544,5800,5214,5575,9543,9530

PRECAUTIONARY LABELING

BAKER SAF-T-DATA* SYSTEM

HEALTH	-	3	SEVERE (POISON)
FLAMMABILITY	-	0	NONE
REACTIVITY	-	2	MODERATE
CONTACT	-	3	SEVERE (CORROSIVE)

LABORATORY PROTECTIVE EQUIPMENT

GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES

U.S. PRECAUTIONARY LABELING

POISON DANGER

CAUSES SEVERE BURNS. MAY BE FATAL IF SWALLOWED OR INHALED.
DO NOT GET IN EYES, ON SKIN, ON CLOTHING. DO NOT BREATHE VAPOR. CAUSES DAMAGE TO RESPIRATORY SYSTEM (LUNGS), EYES AND SKIN. KEEP IN TIGHTLY CLOSED CONTAINER. LOOSEN CLOSURE CAUTIOUSLY. USE WITH ADEQUATE VENTILATION. WASH THOROUGHLY AFTER HANDLING. IN CASE OF SPILL NEUTRALIZE WITH SODA ASH OR LIME AND PLACE IN DRY CONTAINER.

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PRECAUTIONARY LABELING (CONTINUED)

INTERNATIONAL LABELING

IRRITATING TO EYES AND SKIN.
KEEP OUT OF REACH OF CHILDREN. IN CASE OF CONTACT WITH EYES, RINSE IMMEDIATELY WITH PLENTY OF WATER AND SEEK MEDICAL ADVICE.

SAF-T-DATA* STORAGE COLOR CODE: WHITE (CORROSIVE)

SECTION II - COMPONENTS

COMPONENT	CAS NO.	WEIGHT %	OSHA/PEL	ACGIH/TLV
HYDROCHLORIC ACID	7647-01-0	33-40	5 PPM	5 PPM
WATER	7732-18-5	60-67	N/E	N/E

SECTION III - PHYSICAL DATA

BOILING POINT: 110 C (230 F)
(AT 760 MM HG)

VAPOR PRESSURE (MMHG): N/A

MELTING POINT: -25 C (-13 F)
(AT 760 MM HG)

VAPOR DENSITY (AIR=1): 1.3

SPECIFIC GRAVITY: 1.19
(H2O=1)

EVAPORATION RATE: N/A

SOLUBILITY(H2O): COMPLETE (100%)

% VOLATILES BY VOLUME: 100
(21 C)

PH: 1.0 (0.1M SOLUTION)

ODOR THRESHOLD (P.P.M.): N/A

PHYSICAL STATE: LIQUID

COEFFICIENT WATER/OIL DISTRIBUTION: N/A

APPEARANCE & ODOR: CLEAR, COLORLESS FUMING LIQUID. PUNGENT ODOR.

CONTINUED ON PAGE: 3

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (CLOSED CUP): N/A NFPA 704M RATING: 3-0-0

AUTOIGNITION TEMPERATURE: N/A

FLAMMABLE LIMITS: UPPER - N/A LOWER - N/A

FIRE EXTINGUISHING MEDIA
USE EXTINGUISHING MEDIA APPROPRIATE FOR SURROUNDING FIRE.

SPECIAL FIRE-FIGHTING PROCEDURES
FIREFIGHTERS SHOULD WEAR PROPER PROTECTIVE EQUIPMENT AND SELF-CONTAINED BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN POSITIVE PRESSURE MODE. MOVE CONTAINERS FROM FIRE AREA IF IT CAN BE DONE WITHOUT RISK. USE WATER TO KEEP FIRE-EXPOSED CONTAINERS COOL. DO NOT GET WATER INSIDE CONTAINERS.

UNUSUAL FIRE & EXPLOSION HAZARDS
MAY EMIT HYDROGEN GAS UPON CONTACT WITH METAL.

TOXIC GASES PRODUCED
HYDROGEN CHLORIDE, HYDROGEN

EXPLOSION DATA-SENSITIVITY TO MECHANICAL IMPACT
NONE IDENTIFIED.

EXPLOSION DATA-SENSITIVITY TO STATIC DISCHARGE
NONE IDENTIFIED.

SECTION V - HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE (TLV/TWA): 7 MG/M3 (5 PPM)

TLV (CEILING) IS FOR HYDROGEN CHLORIDE.

SHORT-TERM EXPOSURE LIMIT (STEL): NOT ESTABLISHED

PERMISSIBLE EXPOSURE LIMIT (PEL): 7 MG/M3 (5 PPM)

PEL (CEILING) IS FOR HYDROGEN CHLORIDE.

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SECTION V - HEALTH HAZARD DATA (CONTINUED)

TOXICITY OF COMPONENTS

INTRAPERITONEAL MOUSE LD50 FOR HYDROCHLORIC ACID	40	MG/KG
ORAL RABBIT LD50 FOR HYDROCHLORIC ACID	900	MG/KG
INHALATION-1HR RAT LC50 FOR HYDROCHLORIC ACID	3124	PPM
INTRAPERITONEAL MOUSE LD50 FOR WATER	190	G/KG
INTRAVENOUS MOUSE LD50 FOR WATER	25	G/KG

CARCINOGENICITY: NTP: NO IARC: NO Z LIST: NO OSHA REG: NO

CARCINOGENICITY
NONE IDENTIFIED.

REPRODUCTIVE EFFECTS
NONE IDENTIFIED.

EFFECTS OF OVEREXPOSURE

INHALATION: PULMONARY EDEMA, CIRCULATORY FAILURE, RESPIRATORY SYSTEM DAMAGE, COLLAPSE, COUGHING, DIFFICULT BREATHING

SKIN CONTACT: SEVERE BURNS

EYE CONTACT: SEVERE BURNS

SKIN ABSORPTION: NONE IDENTIFIED

INGESTION: IS HARMFUL AND MAY BE FATAL, SEVERE BURNS TO MOUTH, THROAT, AND STOMACH, NAUSEA, VOMITING

CHRONIC EFFECTS: NONE IDENTIFIED

TARGET ORGANS
RESPIRATORY SYSTEM, EYES, SKIN

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE
NONE IDENTIFIED

PRIMARY ROUTES OF ENTRY
INGESTION, INHALATION, SKIN CONTACT, EYE CONTACT

CONTINUED ON PAGE: 5

SECTION V - HEALTH HAZARD DATA (CONTINUED)

EMERGENCY AND FIRST AID PROCEDURES

INGESTION: CALL A PHYSICIAN. IF SWALLOWED, DO NOT INDUCE VOMITING. IF CONSCIOUS, GIVE WATER, MILK, OR MILK OF MAGNESIA.

INHALATION: IF INHALED, REMOVE TO FRESH AIR. IF NOT BREATHING, GIVE ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT, GIVE OXYGEN.

SKIN CONTACT: IN CASE OF CONTACT, IMMEDIATELY FLUSH SKIN WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES WHILE REMOVING CONTAMINATED CLOTHING AND SHOES. WASH CLOTHING BEFORE RE-USE.

EYE CONTACT: IN CASE OF EYE CONTACT, IMMEDIATELY FLUSH WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES.

SARA/TITLE III HAZARD CATEGORIES AND LISTS

ACUTE: YES CHRONIC: YES FLAMMABILITY: NO PRESSURE: NO REACTIVITY: NO

EXTREMELY HAZARDOUS SUBSTANCE:	YES	CONTAINS HYDROGEN CHLORIDE (RQ = 1 LB, TPQ = 500 LBS)
CERCLA HAZARDOUS SUBSTANCE:	YES	CONTAINS HYDROCHLORIC ACID (RQ = 5000 LBS)
SARA 313 TOXIC CHEMICALS:	YES	CONTAINS HYDROCHLORIC ACID
GENERIC CLASS:		C16
TSCA INVENTORY:	YES	

SECTION VI - REACTIVITY DATA

STABILITY: STABLE HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

CONDITIONS TO AVOID: HEAT, MOISTURE

INCOMPATIBLES: MOST COMMON METALS, WATER, AMINES, METAL OXIDES, ACETIC ANHYDRIDE, PROPIOLACTONE, VINYL ACETATE, MERCURIC SULFATE, CALCIUM PHOSPHIDE, FORMALDEHYDE, ALKALIES, CARBONATES, STRONG BASES, SULFURIC ACID, CHLOROSULFONIC ACID

DECOMPOSITION PRODUCTS: HYDROGEN CHLORIDE, HYDROGEN, CHLORINE

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SECTION VII - SPILL & DISPOSAL PROCEDURES

STEPS TO BE TAKEN IN THE EVENT OF A SPILL OR DISCHARGE

WEAR SELF-CONTAINED BREATHING APPARATUS AND FULL PROTECTIVE CLOTHING. STOP LEAK IF YOU CAN DO SO WITHOUT RISK. VENTILATE AREA. NEUTRALIZE SPILL WITH SODA ASH OR LIME. WITH CLEAN SHOVEL, CAREFULLY PLACE MATERIAL INTO CLEAN, DRY CONTAINER AND COVER; REMOVE FROM AREA. FLUSH SPILL AREA WITH WATER.

J. T. BAKER NEUTRASORB(R) OR TEAM(R) 'LOW NA+' ACID NEUTRALIZERS ARE FOR SPILLS OF THIS PRODUCT.

DISPOSAL PROCEDURE

DISPOSE IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL ENVIRONMENTAL REGULATIONS.

EPA HAZARDOUS WASTE NUMBER: D002 (CORROSIVE WASTE)

SECTION VIII - INDUSTRIAL PROTECTIVE EQUIPMENT

VENTILATION: USE GENERAL OR LOCAL EXHAUST VENTILATION TO MEET TLV REQUIREMENTS.

RESPIRATORY PROTECTION: RESPIRATORY PROTECTION REQUIRED IF AIRBORNE CONCENTRATION EXCEEDS TLV. AT CONCENTRATIONS UP TO 100 PPM, A CHEMICAL CARTRIDGE RESPIRATOR WITH ACID CARTRIDGE IS RECOMMENDED. ABOVE THIS LEVEL, A SELF-CONTAINED BREATHING APPARATUS IS ADVISED.

EYE/SKIN PROTECTION: SAFETY GOGGLES AND FACE SHIELD, UNIFORM, PROTECTIVE SUIT, NEOPRENE GLOVES ARE RECOMMENDED.

SECTION IX - STORAGE AND HANDLING PRECAUTIONS

SAF-T-DATA* STORAGE COLOR CODE: WHITE (CORROSIVE)

STORAGE REQUIREMENTS

KEEP CONTAINER TIGHTLY CLOSED. STORE IN CORROSION-PROOF AREA. ISOLATE FROM INCOMPATIBLE MATERIALS. DO NOT STORE NEAR OXIDIZING MATERIALS.

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SECTION X - TRANSPORTATION DATA AND ADDITIONAL INFORMATION

DOMESTIC (D.O.T.)

PROPER SHIPPING NAME: HYDROCHLORIC ACID
HAZARD CLASS: CORROSIVE MATERIAL (LIQUID)
UN/NA: UN1789 REPORTABLE QUANTITY: 5000 LBS.
LABELS: CORROSIVE
REGULATORY REFERENCES: 49CFR 172.101; 173.263

INTERNATIONAL (I.M.O.)

PROPER SHIPPING NAME: HYDROCHLORIC ACID, SOLUTION
HAZARD CLASS: 8 I.M.O. PAGE: 8183
UN: UN1789 MARINE POLLUTANTS: NO PACKAGING GROUP: II
LABELS: CORROSIVE
REGULATORY REFERENCES: 49CFR 172.102; PART 176; IMO

AIR (I.C.A.O.)

PROPER SHIPPING NAME: HYDROCHLORIC ACID, SOLUTION
HAZARD CLASS: 8
UN: UN1789 PACKAGING GROUP: II
LABELS: CORROSIVE
REGULATORY REFERENCES: 49CFR 172.101; 173.6; PART 175; ICAO/IATA

U.S. CUSTOMS HARMONIZATION NUMBER: 28061000000

N/A = NOT APPLICABLE OR NOT AVAILABLE
N/E = NOT ESTABLISHED

THE INFORMATION IN THIS MATERIAL SAFETY DATA SHEET MEETS THE REQUIREMENTS OF THE UNITED STATES OCCUPATIONAL SAFETY AND HEALTH ACT AND REGULATIONS PROMULGATED THEREUNDER (29 CFR 1910.1200 ET. SEQ.) AND THE CANADIAN WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM. THIS DOCUMENT IS INTENDED ONLY AS A GUIDE TO THE APPROPRIATE PRECAUTIONARY HANDLING OF THE MATERIAL BY A PERSON TRAINED IN, OR SUPERVISED BY A PERSON TRAINED IN, CHEMICAL HANDLING. THE USER IS RESPONSIBLE FOR DETERMINING THE PRECAUTIONS AND DANGERS OF THIS CHEMICAL FOR HIS OR HER PARTICULAR APPLICATION. DEPENDING ON USAGE, PROTECTIVE CLOTHING INCLUDING EYE AND FACE GUARDS AND RESPIRATORS MUST BE USED TO AVOID CONTACT WITH MATERIAL OR BREATHING CHEMICAL VAPORS/FUMES.
EXPOSURE TO THIS PRODUCT MAY HAVE SERIOUS ADVERSE HEALTH EFFECTS. THIS CHEMICAL MAY INTERACT WITH OTHER SUBSTANCES. SINCE THE POTENTIAL USES

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ARE SO VARIED, BAKER CANNOT WARN OF ALL OF THE POTENTIAL DANGERS OF USE OR INTERACTION WITH OTHER CHEMICALS OR MATERIALS. BAKER WARRANTS THAT THE CHEMICAL MEETS THE SPECIFICATIONS SET FORTH ON THE LABEL.
BAKER DISCLAIMS ANY OTHER WARRANTIES, EXPRESSED OR IMPLIED WITH REGARD TO THE PRODUCT SUPPLIED HEREUNDER, ITS MERCHANTABILITY OR ITS FITNESS FOR A PARTICULAR PURPOSE.
THE USER SHOULD RECOGNIZE THAT THIS PRODUCT CAN CAUSE SEVERE INJURY AND EVEN DEATH, ESPECIALLY IF IMPROPERLY HANDLED OR THE KNOWN DANGERS OF USE ARE NOT HEEDED. READ ALL PRECAUTIONARY INFORMATION. AS NEW DOCUMENTED GENERAL SAFETY INFORMATION BECOMES AVAILABLE, BAKER WILL PERIODICALLY REVISE THIS MATERIAL SAFETY DATA SHEET.
NOTE: CHEMTREC, CANUTEC, AND NATIONAL RESPONSE CENTER EMERGENCY TELEPHONE NUMBERS ARE TO BE USED ONLY IN THE EVENT OF CHEMICAL EMERGENCIES INVOLVING A SPILL, LEAK, FIRE, EXPOSURE, OR ACCIDENT INVOLVING CHEMICALS. ALL NON-EMERGENCY QUESTIONS SHOULD BE DIRECTED TO CUSTOMER SERVICE (1-800-JTBAKER) FOR ASSISTANCE.

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APPROVED BY QUALITY ASSURANCE DEPARTMENT.

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SECTION I - PRODUCT IDENTIFICATION

PRODUCT NAME:	SODIUM HYDROXIDE
COMMON SYNONYMS:	CAUSTIC SODA; SODIUM HYDRATE; LYE
CHEMICAL FAMILY:	INORGANIC SODIUM COMPOUNDS
FORMULA:	NAOH
FORMULA WT.:	40.00
CAS NO.:	1310-73-2
NIOSH/RTECS NO.:	WB4900000
PRODUCT USE:	LABORATORY REAGENT
PRODUCT CODES:	3728,3734,3726,5312,5022,3729,5104,3722,5565,5045,3736,3730 3723

PRECAUTIONARY LABELING

BAKER SAF-T-DATA* SYSTEM

HEALTH	-	3	SEVERE (POISON)
FLAMMABILITY	-	0	NONE
REACTIVITY	-	2	MODERATE
CONTACT	-	4	EXTREME (CORROSIVE)

LABORATORY PROTECTIVE EQUIPMENT

GOGGLES; LAB COAT; VENT HOOD; PROPER GLOVES

U.S. PRECAUTIONARY LABELING

POISON DANGER

HARMFUL IF INHALED. CAUSES SEVERE BURNS. MAY BE FATAL IF SWALLOWED. REACTS VIOLENTLY WITH WATER AND ACIDS.
DO NOT GET IN EYES, ON SKIN, ON CLOTHING. AVOID SPATTERING BY SLOWLY ADDING TO SOLUTION. AVOID BREATHING DUST. KEEP IN TIGHTLY CLOSED CONTAINER. USE WITH ADEQUATE VENTILATION. WASH THOROUGHLY AFTER HANDLING.

INTERNATIONAL LABELING

CAUSES SEVERE BURNS.
KEEP OUT OF REACH OF CHILDREN. IN CASE OF CONTACT WITH EYES, RINSE IMMEDIATELY WITH PLENTY OF WATER AND SEEK MEDICAL ADVICE. WEAR SUITABLE GLOVES AND EYE/FACE PROTECTION.

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PRECAUTIONARY LABELING (CONTINUED)

SAF-T-DATA* STORAGE COLOR CODE: WHITE STRIPE (STORE SEPARATELY)

SECTION II - COMPONENTS

COMPONENT	CAS NO.	WEIGHT %	OSHA/PEL	ACGIH/TLV
SODIUM HYDROXIDE	1310-73-2	98-100	2 MG/M3	2 MG/M3

THE TLV AND PEL LISTED DENOTE CEILING LIMITS.

SECTION III - PHYSICAL DATA

BOILING POINT: 1390 C (2534 F) (AT 760 MM HG)

VAPOR PRESSURE (MMHG): <1 (20 C)

MELTING POINT: 318 C (604 F) (AT 760 MM HG)

VAPOR DENSITY (AIR=1): N/A

SPECIFIC GRAVITY: 2.13 ($H2O$=1)

EVAPORATION RATE: N/A

SOLUBILITY($H2O$): APPRECIABLE (>10%)

% VOLATILES BY VOLUME: 0 (21 C)

PH: 14.0 (1.0M SOLUTION)

ODOR THRESHOLD (P.P.M.): N/A

PHYSICAL STATE: SOLID

COEFFICIENT WATER/OIL DISTRIBUTION: N/A

APPEARANCE & ODOR: WHITE PELLETS OR FLAKES. ODORLESS.

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (CLOSED CUP): N/A

NFPA 704M RATING: 3-0-1

AUTOIGNITION TEMPERATURE: N/A

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SECTION IV - FIRE AND EXPLOSION HAZARD DATA (CONTINUED)

FLAMMABLE LIMITS: UPPER - N/A LOWER - N/A

FIRE EXTINGUISHING MEDIA
USE EXTINGUISHING MEDIA APPROPRIATE FOR SURROUNDING FIRE.

SPECIAL FIRE-FIGHTING PROCEDURES
FIREFIGHTERS SHOULD WEAR PROPER PROTECTIVE EQUIPMENT AND SELF-CONTAINED BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN POSITIVE PRESSURE MODE. FLOOD WITH WATER SPRAY TO PREVENT SPLASHING OF MATERIAL.

UNUSUAL FIRE & EXPLOSION HAZARDS
CONTACT WITH MOISTURE OR WATER MAY GENERATE SUFFICIENT HEAT TO IGNITE COMBUSTIBLE MATERIALS. REACTS WITH MOST METALS TO PRODUCE HYDROGEN GAS, WHICH CAN FORM AN EXPLOSIVE MIXTURE WITH AIR.

TOXIC GASES PRODUCED
NONE IDENTIFIED

EXPLOSION DATA-SENSITIVITY TO MECHANICAL IMPACT
NONE IDENTIFIED.

EXPLOSION DATA-SENSITIVITY TO STATIC DISCHARGE
NONE IDENTIFIED.

SECTION V - HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE (TLV/TWA): 2 MG/M3

TLV LISTED DENOTES CEILING LIMIT.

SHORT-TERM EXPOSURE LIMIT (STEL): NOT ESTABLISHED

PERMISSIBLE EXPOSURE LIMIT (PEL): 2 MG/M3

PEL LISTED DENOTES CEILING LIMIT.

TOXICITY OF COMPONENTS

INTRAPERITONEAL MOUSE LD50 FOR SODIUM HYDROXIDE 40 MG/KG

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SECTION V - HEALTH HAZARD DATA (CONTINUED)

CARCINOGENICITY: NTP: NO IARC: NO Z LIST: NO OSHA REG: NO

CARCINOGENICITY
NONE IDENTIFIED.

REPRODUCTIVE EFFECTS
NONE IDENTIFIED.

EFFECTS OF OVEREXPOSURE
INHALATION: SEVERE IRRITATION OR BURNS OF RESPIRATORY SYSTEM, PULMONARY EDEMA, LUNG INFLAMMATION, MAY CAUSE RESPIRATORY SYSTEM DAMAGE

SKIN CONTACT: SEVERE IRRITATION OR BURNS

EYE CONTACT: SEVERE IRRITATION OR BURNS, PERMANENT EYE DAMAGE

SKIN ABSORPTION: NONE IDENTIFIED

INGESTION: IS HARMFUL AND MAY BE FATAL, SEVERE BURNS TO MOUTH, THROAT, AND STOMACH, NAUSEA, VOMITING

CHRONIC EFFECTS: NONE IDENTIFIED

TARGET ORGANS
EYES, SKIN, RESPIRATORY SYSTEM, LUNGS

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE
DAMAGED SKIN

PRIMARY ROUTES OF ENTRY
INHALATION, INGESTION, EYE CONTACT, SKIN CONTACT

EMERGENCY AND FIRST AID PROCEDURES
INGESTION: CALL A PHYSICIAN. IF SWALLOWED, DO NOT INDUCE VOMITING. IF CONSCIOUS, GIVE LARGE AMOUNTS OF WATER. FOLLOW WITH DILUTED VINEGAR, FRUIT JUICE OR WHITES OF EGGS BEATEN WITH WATER.

INHALATION: IF INHALED, REMOVE TO FRESH AIR. IF NOT BREATHING, GIVE ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT, GIVE OXYGEN.

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SECTION V - HEALTH HAZARD DATA (CONTINUED)

SKIN CONTACT: IN CASE OF CONTACT, IMMEDIATELY FLUSH SKIN WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES WHILE REMOVING CONTAMINATED CLOTHING AND SHOES. WASH CLOTHING BEFORE RE-USE.

EYE CONTACT: IN CASE OF EYE CONTACT, IMMEDIATELY FLUSH WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES.

NOTES TO PHYSICIAN

IN CASES OF SEVERE ESOPHAGEAL CORROSION, THE USE OF THERAPEUTIC DOSES OF STEROIDS SHOULD BE CONSIDERED. GENERAL SUPPORTIVE MEASURES WITH CONTINUAL MONITORING OF GAS EXCHANGE, ACID-BASE BALANCE, ELECTROLYTES, AND FLUID INTAKE ARE ALSO REQUIRED.

SARA/TITLE III HAZARD CATEGORIES AND LISTS

ACUTE: YES CHRONIC: YES FLAMMABILITY: NO PRESSURE: NO REACTIVITY: NO

EXTREMELY HAZARDOUS SUBSTANCE:	NO	
CERCLA HAZARDOUS SUBSTANCE:	YES	CONTAINS SODIUM HYDROXIDE (RQ = 1000 LBS)
SARA 313 TOXIC CHEMICALS:	YES	CONTAINS SODIUM HYDROXIDE
GENERIC CLASS:		C16
TSCA INVENTORY:	YES	

SECTION VI - REACTIVITY DATA

STABILITY: STABLE HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

CONDITIONS TO AVOID: MOISTURE

INCOMPATIBLES: WATER, STRONG ACIDS, MOST COMMON METALS, COMBUSTIBLE MATERIALS, ORGANIC MATERIALS, ZINC, ALUMINUM, PEROXIDES, HALOGENATED HYDROCARBONS

DECOMPOSITION PRODUCTS: NONE IDENTIFIED

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SECTION VII - SPILL & DISPOSAL PROCEDURES

STEPS TO BE TAKEN IN THE EVENT OF A SPILL OR DISCHARGE

WEAR SELF-CONTAINED BREATHING APPARATUS AND FULL PROTECTIVE CLOTHING. WITH CLEAN SHOVEL, CAREFULLY PLACE MATERIAL INTO CLEAN, DRY CONTAINER AND COVER; REMOVE FROM AREA. FLUSH SPILL AREA WITH WATER.

J. T. BAKER NEUTRACIT(R)-2 OR BUCAIM(R) CAUSTIC NEUTRALIZERS ARE RECOMMENDED SPILLS OF THIS PRODUCT.

DISPOSAL PROCEDURE

DISPOSE IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL ENVIRONMENTAL REGULATIONS.

EPA HAZARDOUS WASTE NUMBER: D002, D003 (CORROSIVE, REACTIVE WASTE)

SECTION VIII - INDUSTRIAL PROTECTIVE EQUIPMENT

VENTILATION: USE GENERAL OR LOCAL EXHAUST VENTILATION TO MEET TLV REQUIREMENTS.

RESPIRATORY PROTECTION: RESPIRATORY PROTECTION REQUIRED IF AIRBORNE CONCENTRATION EXCEEDS TLV. AT CONCENTRATIONS UP TO 100 PPM, A HIGH-EFFICIENCY PARTICULATE RESPIRATOR IS RECOMMENDED. ABOVE THIS LEVEL, A SELF-CONTAINED BREATHING APPARATUS IS ADVISED.

EYE/SKIN PROTECTION: SAFETY GOGGLES, UNIFORM, APRON, NEOPRENE GLOVES ARE RECOMMENDED.

SECTION IX - STORAGE AND HANDLING PRECAUTIONS

SAF-T-DATA* STORAGE COLOR CODE: WHITE STRIPE (STORE SEPARATELY)

STORAGE REQUIREMENTS

KEEP CONTAINER TIGHTLY CLOSED. STORE IN CORROSION-PROOF AREA. STORE IN A DRY AREA. ISOLATE FROM INCOMPATIBLE MATERIALS.

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SECTION X - TRANSPORTATION DATA AND ADDITIONAL INFORMATION

DOMESTIC (D.O.T.)

PROPER SHIPPING NAME: SODIUM HYDROXIDE, DRY SOLID
HAZARD CLASS: CORROSIVE MATERIAL (SOLID)
UN/NA: UN1823 REPORTABLE QUANTITY: 1000 LBS.
LABELS: CORROSIVE
REGULATORY REFERENCES: 49CFR 172.101; 173.245; 173.245B

INTERNATIONAL (I.M.O.)

PROPER SHIPPING NAME: SODIUM HYDROXIDE, SOLID
HAZARD CLASS: 8 I.M.O. PAGE: 8215
UN: UN1823 MARINE POLLUTANTS: NO PACKAGING GROUP: II
LABELS: CORROSIVE
REGULATORY REFERENCES: 49CFR 172.102; PART 176; IMO

AIR (I.C.A.O.)

PROPER SHIPPING NAME: SODIUM HYDROXIDE, SOLID
HAZARD CLASS: 8
UN: UN1823 PACKAGING GROUP: II
LABELS: CORROSIVE
REGULATORY REFERENCES: 49CFR 172.101; 173.6; PART 175; ICAO/IATA

U.S. CUSTOMS HARMONIZATION NUMBER: 28151100008

N/A = NOT APPLICABLE OR NOT AVAILABLE
N/E = NOT ESTABLISHED

THE INFORMATION IN THIS MATERIAL SAFETY DATA SHEET MEETS THE REQUIREMENTS OF THE UNITED STATES OCCUPATIONAL SAFETY AND HEALTH ACT AND REGULATIONS PROMULGATED THEREUNDER (29 CFR 1910.1200 ET. SEQ.) AND THE CANADIAN WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM. THIS DOCUMENT IS INTENDED ONLY AS A GUIDE TO THE APPROPRIATE PRECAUTIONARY HANDLING OF THE MATERIAL BY A PERSON TRAINED IN, OR SUPERVISED BY A PERSON TRAINED IN, CHEMICAL HANDLING. THE USER IS RESPONSIBLE FOR DETERMINING THE PRECAUTIONS AND DANGERS OF THIS CHEMICAL FOR HIS OR HER PARTICULAR APPLICATION. DEPENDING ON USAGE, PROTECTIVE CLOTHING INCLUDING EYE AND FACE GUARDS AND RESPIRATORS MUST BE USED TO AVOID CONTACT WITH MATERIAL OR BREATHING CHEMICAL VAPORS/FUMES.
EXPOSURE TO THIS PRODUCT MAY HAVE SERIOUS ADVERSE HEALTH EFFECTS. THIS CHEMICAL MAY INTERACT WITH OTHER SUBSTANCES. SINCE THE POTENTIAL USES

CONTINUED ON PAGE: 8

ARE SO VARIED, BAKER CANNOT WARN OF ALL OF THE POTENTIAL DANGERS OF USE OR INTERACTION WITH OTHER CHEMICALS OR MATERIALS. BAKER WARRANTS THAT THE CHEMICAL MEETS THE SPECIFICATIONS SET FORTH ON THE LABEL.
BAKER DISCLAIMS ANY OTHER WARRANTIES, EXPRESSED OR IMPLIED WITH REGARD TO THE PRODUCT SUPPLIED HEREUNDER, ITS MERCHANTABILITY OR ITS FITNESS FOR A PARTICULAR PURPOSE.
THE USER SHOULD RECOGNIZE THAT THIS PRODUCT CAN CAUSE SEVERE INJURY AND EVEN DEATH, ESPECIALLY IF IMPROPERLY HANDLED OR THE KNOWN DANGERS OF USE ARE NOT HEEDED. READ ALL PRECAUTIONARY INFORMATION. AS NEW DOCUMENTED GENERAL SAFETY INFORMATION BECOMES AVAILABLE, BAKER WILL PERIODICALLY REVISE THIS MATERIAL SAFETY DATA SHEET.
NOTE: CHEMTREC, CANUTEC, AND NATIONAL RESPONSE CENTER EMERGENCY TELEPHONE NUMBERS ARE TO BE USED ONLY IN THE EVENT OF CHEMICAL EMERGENCIES INVOLVING A SPILL, LEAK, FIRE, EXPOSURE, OR ACCIDENT INVOLVING CHEMICALS. ALL NON-EMERGENCY QUESTIONS SHOULD BE DIRECTED TO CUSTOMER SERVICE (1-800-JTBAKER) FOR ASSISTANCE.

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APPROVED BY QUALITY ASSURANCE DEPARTMENT.

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Appendix D
Temperature Extreme Guidelines

HEAT STRESS

The following should be used as guidelines in controlling heat stress. The Site Safety Officer has the responsibility to monitor heat stress throughout each day and to make work/rest recommendations as appropriate. All workers are expected to follow the work/rest cycles.

Heat stress decisions will be based mostly on physiological measurements (pulse rate, skin temperature) and environmental measurements by the WBGT monitors. All equipment necessary to monitor WBGT will be maintained on site in the event it is required. Additional environmental data will also be recorded daily and considered in heat stress evaluations.

Initially, work/rest cycles will be established using pulse rates and the following guidelines. This work/rest schedule may be modified at the discretion of the Site Safety Officer. The work/rest schedule is based upon guidance set by the ACGIH along with the professional judgment of the responsible ERM Industrial Hygienist. The WBGT readings in this table are actual readings - no additional factors should be added:

WORK/REST SCHEDULE

WBGT (°C)			
LEVEL C&B	MOD C	LEVEL D	WORK/REST
<22.5	<24	<25.8	NORMAL
22.5-24.4	24-25.9	25.8-27.5	60-15
24.5-26.4	26-27.9	27.6-29.6	45-15
26.5-29.4	28-30.9	29.7-32.5	30-30
29.5-30.4	31-31.9	32.6-33.5	15-45
30.5-32	32-33.5	33.6-35.2	15-60
>32	>33.5	>35.2	CEASE WORK

DAILY PROTOCOL

- WBGT Readings will be taken:
  - at the beginning of the work day
  - mid-morning
  - noon
  - mid-afternoon
  - at the end of the work day
- WBGT readings will be taken at least at each drilling rig, other major work areas and at outside rest stations.
- Employee body weights (semi-nude) will be taken immediately before work and at the end of the work day. If the weight loss exceeds 1.5%, the worker should be told to drink more liquids during that evening and the following work days. The worker will also be monitored during the next few work days to insure the weight loss does not continue at an unacceptable rate.
- Pulse rates will be monitored routinely throughout the workday, frequency depending upon WBGT readings. At minimum, the most active member of each work crew will be monitored during the first two breaks in the morning and the first break after lunch.
- Pulse rates will be taken as follows:
  - at the end of a cycle of work, the worker goes to a nearby location and sits on a stool or straight chair. At the moment he is seated the observer starts a stopwatch. At 30 seconds the observer begins a pulse count, having previously palpate the radial pulse. This count is continued until one minute. The 30-second count is multiplied by 2 and recorded as "P_1"
  - if P_1 exceeds 120, an additional pulse will be taken starting at 2 minutes, 30 seconds to 3 minutes; multiplied by 2 and recorded as P_3.
- Pulse rates readings:
  - 120 and below (P_1) - Worker will be allowed to continue the scheduled work/rest cycle.
  - Exceeding 120 (P_1) - Worker will remain in the rest area until pulse rate returns to 90, or below; additional monitoring will depend upon the pulse rate recovery.
- Pulse rate recovery - for individual with P_1 greater than 120. \

Patterns	P_3	P_1-P_3
Satisfactory (S)	<90	-
High (H)	≥90	≥10
No recovery (N)	≥90	<10

- Satisfactory patterns need no further comment.
  - High recovery patterns indicate work at a high metabolic level with little or no accumulated body heat. Individuals showing this condition should be monitored during the next breaks while work periods are reduced until P1 is 120 or below.
  - No recovery patterns indicate too much personal stress. Individuals showing "no recovery" heart rate patterns return to the decon trailers and rest for a period no less than one hour. Site Health and Safety Officer must monitor the workers and determine if additional medical assistance is needed.
- Fluid intake should be encouraged for workers throughout the day. Workers should frequently drink small amounts; the equivalent of one cup every 15-20 minutes. Workers should also be encouraged to salt their food abundantly.
- Acclimatization to heat involves a series of physiological and psychological adjustments that occur in an individual during the first week of exposure to hot environments. For this reason, the following work schedule applies for workers new to the site when conditions are such that controlled work/rest cycles are being used:

		Suggested Maximum Work
Day 1	-	2 hours
Day 2	-	3 hours
Day 3	-	4 hours
Day 4	-	6 hours
Day 5	-	8 hours

Deviations form this schedule may be done based on evaluations by the Site Safety Officer.

HEAT STRESS

Effects of heat stress can occur as either heat exhaustion, or the more dangerous condition of heat stroke. Signs of heat exhaustion include pale, clammy skin, profuse perspiration, and extreme fatigue. There may be headache or vomitting. The body temperature will appear normal. Effects of heat stroke include hot, flushed or red, dry skin with extremely high body temperature, up to 41°C (106°F). The victim may experience dizziness, nausea, headache, rapid pulse or unconsciousness.

COLD EXPOSURE

Personnel working outdoors in low temperatures are subject to cold exposure. Toes, fingers, ears, cheeks, and the nose are especially vulnerable to cold exposure.

Factors influencing the development of a cold injury include ambient temperature, wind velocity, humidity, type of exposure, and duration of exposure. Frostbite and hypothermia are two cold injuries which may occur.

Frostbite is a local injury resulting from cold exposure. It is characterized by a white or pale coloring of the skin. Its symptoms are exhibited in the following stages:

- Just before frostbite occurs, the affected skin may be slightly flushed;
- The skin changes to white or grayish-white in appearance;
- Pain is sometimes felt early but subsides later (often there is no pain).
- Blisters may appear later;
- The affected part feels intensely cold and numb;
- The victim frequently is not aware of frostbite.

The objectives of first aid are to protect the frozen area from further injury, to warm the affected area rapidly, and to maintain respiration.

Hypothermia is an overall cooling of the body. Its symptoms are usually exhibited in five stages:

- Shivering;
- Apathy, listlessness, sleepiness;

- Unconsciousness, glassy stare, slow pulse, and slow respiratory rate;
- Freezing of the extremities; and
- Death.

To avoid cold exposure injuries, personnel should dress in layers, removing clothing as they generate heat from working. The buddy system must be instituted to ensure signs of frost bite or hypothermia will be noted as soon as possible. Generally, it is easier for someone else to see these signs before the person who is exhibiting them will notice. A work rest regimen, designated by the Site Safety Officer should be implemented early to avoid personnel casualties. If any cold exposure injuries are detected, the Site Safety Officer must be notified immediately.

Appendix E
Special Precautions and Procedures

APPENDIX E SPECIAL PRECAUTIONS AND PROCEDURES

The site poses potential exposure risks from both chemical and physical hazards. The chemical risks have been explained in detail in the HASP. The potential for chemical exposure to hazardous substances is significantly reduced through the use of personal protective clothing, engineering controls, and implementation of safe work practices.

Other potential hazards that are associated with the site activities include working around heavy equipment, heat stress or cold exposure (depending on time of year), and site debris. Precautionary measures have been established to reduce these risks to a minimum during site activities.

E.1 HEAT STRESS/COLD EXPOSURE

It is not anticipated that heat stress will be a significant factor in the health and safety of the workers. However, if heat stress does become a significant factor, Work/Rest regimens will be employed as necessary so that personnel do not suffer adverse effects from heat stress. Special clothing and an appropriate diet and fluid intake will be recommended to all site personnel to further reduce these temperature-related hazards. The work/rest regimens will be developed following the guidelines in the ACGIH, Threshold Limit Values and Biological Exposure Indices for 1990-1991 and other practices developed and used by experienced industrial hygienists.

Effects of heat stress can occur as either heat exhaustion, or the more dangerous condition of heat stroke. Signs of heat exhaustion include pale, clammy skin, profuse perspiration, and extreme fatigue. There may be headache or vomitting. The body temperature will appear normal. Effects of heat stroke include hot, flushed or red, dry skin with extremely high body temperature, up to 41°C (106°F). The victim may experience dizziness, nausea, headache, rapid pulse or unconsciousness.

The effects of cold exposure can be less apparent to the victim. It is extremely important that partners within the buddy system visually inspect their fellow workers often. Redness of the skin indicates the onset of cold exposure. A white or pale skin color, especially on extremities such as the nose, cheeks, chin, ears, fingers, and toes are indications that frostbite is setting in. Individuals should dress in layers, peeling off each layer as they get warmer from exertion. The Site Safety Officer should keep informed of the wind-chill factor and be inspecting workers during cold exposure conditions.

E.2 *HEAVY MACHINERY/EQUIPMENT*

All site employees must remain aware of those site activities that involve the use of heavy equipment and machinery. Respiratory protection and protective eyewear may be worn during site activities. This protective equipment significantly reduces peripheral vision of the wearer. Therefore, it is essential that all employees at the site exercise extreme caution during operation of equipment and machinery to avoid physical injury to themselves or others.

E.3 *CONSTRUCTION MATERIALS AND SITE REFUSE*

All construction materials and site refuse (spoil material) should be contained in appropriate areas or facilities. All trash and waste materials will be immediately and properly disposed of. It is important to maintain clear areas of egress in case of an emergency.

E.4 *ADDITIONAL SAFETY PRACTICES*

The following are important safety precautions which will be enforced during the remedial activities when contact with waste materials is possible.

1. Eating, drinking, chewing gum or tobacco, smoking, or any practice that increases the probability of hand-to-mouth transfer and ingestion of material is prohibited in any area designated as contaminated, specifically, within the fenced area.
2. Hands and face must be thoroughly washed upon leaving the work area and before eating, drinking, or any other activity.
3. Whenever decontamination procedures for outer garments are in effect, the entire body should be thoroughly washed as soon as possible after departing the site. At a minimum, personnel will be required to wash face and hands thoroughly prior to departing the site.
4. No excessive facial hair which interferes with the effectiveness of a respirator will be permitted on personnel required to wear respiratory protection equipment. The respirator must seal against the face so that the wearer receives air only through the air purifying cartridges

attached to the respirator. Fit testing shall be performed prior to respirator use to ensure a proper seal is obtained by the wearer.

5. Contact with potentially contaminated surfaces should be avoided whenever possible. One should not walk through puddles, mud, or other discolored surfaces; kneel on ground; lean, sit or place equipment on drums, containers, vehicles, or the ground.

6. Medicine and alcohol can potentiate the effect from exposure to certain compounds. On-site Personnel should consult with their physician regarding the use of prescribed drugs during the remedial operations.

7. Personnel and equipment in the work areas should be minimized, consistent with effective site operations.

8. Work areas for various operational activities should be established.

9. Procedures for leaving the work area must be planned and implemented prior to going to the site. Work areas and decontamination procedures must be established on the basis of prevailing site conditions.

10. Respirators will be issued for the exclusive use of one worker and will be cleaned and disinfected after each use by the worker.

11. Safety gloves and boots shall be taped to the disposable, chemical protective suits as necessary.

12. All unsafe equipment left unattended will be identified by a "DANGER DO NOT OPERATE" tag.

13. The Department of the Army requires hearing protection any time noise levels exceed 85 decibels (dBA). Disposable, form-fitting plugs are preferred.

14. Cartridges for air-purifying respirators in use will be changed as directed by the Site Safety Officer. Cartridges will be replaced whenever the wearer experiences breathing resistance or breakthrough.

15. Self-contained breathing apparatus (SCBA) and air-purifying respirators will be inspected by the Site Safety Officer, as necessary dependent upon use.

16. All activities in the exclusion zone will be conducted using the "Buddy System". The Buddy is another worker fully dressed in the appropriate PPE, who can perform the following activities:
    - Provide his/her partner with assistance;
    - Observe his/her partner for signs of chemical or heat exposure;
    - Periodically check the integrity of his/her partner's PPE; and
    - Notify others if emergency help is needed.

[illegible] of the program. For example, [illegible]

5. Contact with local utility companies [illegible]. Whenever possible [illegible] [illegible] underground [illegible].

6. [illegible] power lines [illegible] [illegible]

7. [illegible] and equipment [illegible] should [illegible]

8. Vehicles [illegible]

9. [illegible] and [illegible] [illegible]

10. [illegible]

11. [illegible]

12. All [illegible] will be [illegible]

13. The [illegible] of the Army [illegible]

14. [illegible]

15. [illegible]

16. All [illegible] buddy system [illegible] who can perform the following duties:
   - [illegible]
   - [illegible]

Appendix F
Accident Investigation Report (ENG Form 3394)

For Safety Staff only)	REPORT NO	EROC CODE	UNITED STATES ARMY CORPS OF ENGINEERS ACCIDENT INVESTIGATION REPORT (For Use of this Form See Attached Instructions and USACE Suppl to AR 385-40)	REQUIREMENT CONTROL SYMBOL: CEEC-S-8(R2)

1 ACCIDENT CLASSIFICATION

PERSONNEL CLASSIFICATION	INJURY/ILLNESS/FATAL	PROPERTY DAMAGE	MOTOR VEHICLE INVOLVED	DIVING
GOVERNMENT ☐ CIVILIAN ☐ MILITARY	☐	☐ FIRE INVOLVED ☐ OTHER	☐	☐
☐ CONTRACTOR	☐	☐ FIRE INVOLVED ☐ OTHER	☐	☐
☐ PUBLIC	☐ FATAL ☐ OTHER		☐	

2 PERSONAL DATA

a. NAME (Last,First,MI)	b. AGE	c. SEX ☐ MALE ☐ FEMALE	d. SOCIAL SECURITY NUMBER ___ ___ ___ / ___ ___ / ___ ___ ___ ___	e. GRADE

f. JOB SERIES/TITLE	g. DUTY STATUS AT TIME OF ACCIDENT	h. EMPLOYMENT STATUS AT TIME OF ACCIDENT
	☐ ON DUTY ☐ TDY ☐ OFF DUTY	☐ ARMY ACTIVE ☐ ARMY RESERVE ☐ VOLUNTEER ☐ PERMANENT ☐ FOREIGN NATIONAL ☐ SEASONAL ☐ TEMPORARY ☐ STUDENT ☐ OTHER (Specify) ________

3 GENERAL INFORMATION

a. DATE OF ACCIDENT (month/day/year) / /	b. TIME OF ACCIDENT (Military time)	c. EXACT LOCATION OF ACCIDENT	d. CONTRACTOR'S NAME (1) PRIME: (2) SUBCONTRACTOR:
e. CONTRACT NUMBER ________ ☐ CIVIL WORKS ☐ MILITARY ☐ OTHER (Specify) ________	f. TYPE OF CONTRACT ☐ CONSTRUCTION ☐ SERVICE ☐ A/E ☐ DREDGE ☐ OTHER (Specify) ________	g. HAZARDOUS/TOXIC WASTE ACTIVITY ☐ SUPERFUND ☐ DERP ☐ IRP ☐ OTHER (Specify) ________	

4 CONSTRUCTION ACTIVITIES ONLY *(Fill in line and corresponding code number in box from list - see instructions)*

a. CONSTRUCTION ACTIVITY ________ (CODE) #	b. TYPE OF CONSTRUCTION EQUIPMENT ________ (CODE) #

5 INJURY / ILLNESS INFORMATION *(Include name on line and corresponding code number in box for items e, f & g - see instructions)*

a. SEVERITY OF ILLNESS / INJURY ________ (CODE) #	b. ESTIMATED DAYS LOST	c. ESTIMATED DAYS HOSPITALIZED	d. ESTIMATED DAYS RESTRICTED DUTY

e. BODY PART AFFECTED	g. TYPE AND SOURCE OF INJURY/ILLNESS
PRIMARY ________ (CODE) #	TYPE ________ (CODE) #
SECONDARY ________ (CODE) #	SOURCE ________ (CODE) #
f. NATURE OF ILLNESS / INJURY ________ (CODE) #	

6 PUBLIC FATALITY *(Fill in line and corresponding code number in box - see instructions)*

a. ACTIVITY AT TIME OF ACCIDENT ________ (CODE) #	b. PERSONAL FLOATATION DEVICE USED? ☐ YES ☐ NO ☐ N/A

7 MOTOR VEHICLE ACCIDENT

a. TYPE OF VEHICLE	b. TYPE OF COLLISION	c. SEAT BELTS	USED	NOT USED	NOT AVAILABLE
☐☐ PICKUP/VAN ☐☐ AUTOMOBILE	☐ SIDE SWIPE ☐ HEAD ON ☐ REAR END	(1) FRONT SEAT			
☐☐ TRUCK ☐☐ OTHER (Specify) ________	☐ BROADSIDE ☐ ROLL OVER ☐ BACKING ☐ OTHER (Specify) ________	(2) REAR SEAT			

8 PROPERTY/MATERIAL INVOLVED

a. NAME OF ITEM	b. OWNERSHIP	c. $ AMOUNT OF DAMAGE
(1)		
(2)		
(3)		

9 VESSEL / FLOATING PLANT ACCIDENT *(Fill in line and corresponding code number in box from list - see instructions)*

a. TYPE OF VESSEL/FLOATING PLANT ________ (CODE) #	b. TYPE OF COLLISION/MISHAP ________ (CODE) #

10 ACCIDENT DESCRIPTION *(Use additional paper, if necessary)*

11 CAUSAL FACTOR(S) *(Read instruction Before Completing)*					
a. *(Explain YES answers in item 13)*	YES	NO	a. *(CONTINUED)*	YES	NO
DESIGN: Was design of facility, workplace or equipment a factor?	☐	☐	CHEMICAL AND PHYSICAL AGENT FACTORS: Did exposure to chemical agents, such as dust, fumes, mists, vapors or physical agents, such as, noise, radiation, etc., contribute to accident?	☐	☐
INSPECTION/MAINTENANCE: Were inspection & maintenance procedures a factor?	☐	☐	OFFICE FACTORS: Did office setting such as, lifting office furniture, carrying, stooping, etc., contribute to the accident?	☐	☐
PERSON'S PHYSICAL CONDITION: In your opinion, was the physical condition of the person a factor?	☐	☐	SUPPORT FACTORS: Were inappropriate tools/resources provided to properly perform the activity/task?	☐	☐
OPERATING PROCEDURES: Were operating procedures a factor?	☐	☐	PERSONAL PROTECTIVE EQUIPMENT: Did the improper selection, use or maintenance of personal protective equipment contribute to the accident?	☐	☐
JOB PRACTICES: Were any job safety/health practices not followed when the accident occurred?	☐	☐	DRUGS/ALCOHOL: In your opinion, was drugs or alcohol a factor to the accident?	☐	☐
HUMAN FACTORS: Did any human factors such as, size or strength of person, etc., contribute to accident?	☐	☐	b. WAS A WRITTEN JOB/ACTIVITY HAZARD ANALYSIS COMPLETED FOR TASK BEING PERFORMED AT TIME OF ACCIDENT?		
ENVIRONMENTAL FACTORS: Did heat, cold, dust, sun, glare, etc., contribute to the accident?	☐	☐	☐ YES *(If yes, attach a copy.)* ☐ NO		

12 TRAINING		
a. WAS PERSON TRAINED TO PERFORM ACTIVITY/TASK?	b. TYPE OF TRAINING.	c. DATE OF MOST RECENT FORMAL TRAINING.
☐ YES ☐ NO	☐ CLASSROOM ☐ ON JOB	/ / *(Month) (Day) (Year)*

13. FULLY EXPLAIN WHAT ALLOWED OR CAUSED THE ACCIDENT; INCLUDE DIRECT AND INDIRECT CAUSES *(See instruction for definition of direct and indirect causes.) (Use additional paper, if necessary)*

a. DIRECT CAUSE

b. INDIRECT CAUSE(S)

14 ACTION(S) TAKEN, ANTICIPATED OR RECOMMENDED TO ELIMINATE CAUSE(S).

DESCRIBE FULLY:

15 DATES FOR ACTIONS IDENTIFIED IN BLOCK 14.			
a. BEGINNING *(Month/Day/Year)* / /		b. ANTICIPATED COMPLETION *(Month/Day/Year)* / /	
c. SIGNATURE AND TITLE OF SUPERVISOR COMPLETING REPORT CORPS ____ CONTRACTOR ____	d. DATE *(Mo/Da/Yr)* ___ / ___ / ___ ___ / ___ / ___	e. ORGANIZATION IDENTIFIER *(Div, Br, Sect)*	f. OFFICE SYMBOL

16. MANAGEMENT REVIEW *(1st)*.

a. ☐ CONCUR b. ☐ NON CONCUR c. COMMENTS

SIGNATURE	TITLE	DATE

17 MANAGEMENT REVIEW *(2nd - Chief Operations, Construction, Engineering, etc.)*

a. ☐ CONCUR b. ☐ NON CONCUR c. COMMENTS

SIGNATURE	TITLE	DATE

18 SAFETY AND OCCUPATIONAL HEALTH OFFICE REVIEW

a. ☐ CONCUR b. ☐ NON CONCUR c. ADDITIONAL ACTIONS/COMMENTS.

SIGNATURE	TITLE	DATE

19 COMMAND APPROVAL

COMMENTS

COMMANDER SIGNATURE	DATE

☆ USGPO 1989- 626-113

GENERAL. Complete a separate report for each person who was *injured, caused,* or *contributed* to the accident (excluding uninjured personnel and witnesses). Use of this form for reporting USACE employee first-aid type injuries *NOT* to be submitted to the Department of Labor (DOL), Office of Workers' Compensation Programs (OWCP) shall be at the discretion of the FOA Commander. Please type or print legibly. Appropriate items shall be marked with an "X" in the box(es). If additional space is needed, provide the information on a separate sheet and attach to the completed form. Ensure that these instructions are forwarded with the completed report to the designated management reviewers indicated in sections 16. and 17.

INSTRUCTIONS FOR SECTION 1 — ACCIDENT CLASSIFICATION. *(Mark All Boxes That Are Applicable.)*

a. GOVERNMENT. Mark "CIVILIAN" box if accident involved government civilian employee; mark "MILITARY" box if accident involved U.S. military personnel.

(1) INJURY/ILLNESS/FATALITY — Mark if accident resulted in any government civilian employee injury, illness, or fatality that requires the submission of Office of Workers Compensation Programs (OWCP) Forms CA-1 (injury), CA-2 (illness), or CA-6 (fatality), to the Department of Labor OWCP, or military personnel lost-time or fatal injury.

(2) PROPERTY DAMAGE — Mark the appropriate box if accident resulted in any damage of $1000 or more to government property (including motor vehicles).

(3) VEHICLE INVOLVED — Mark if accident involved a motor vehicle, *regardless* of whether "INJURY/ILLNESS" or "PROPERTY DAMAGE" are marked.

(4) DIVING ACTIVITY — Mark if the accident involved an in-house USACE diving activity.

b. CONTRACTOR.

(1) INJURY/ILLNESS/FATALITY — Mark if accident resulted in any contractor lost-time injury/illness or fatality.

(2) PROPERTY DAMAGE — Mark the appropriate box if accident resulted in any damage of $1000 or more to contractor property (including motor vehicles).

(3) VEHICLE INVOLVED — Mark if accident involved a motor vehicle, regardless of whether "INJURY/ILLNESS" or "PROPERTY DAMAGE" are marked.

(4) DIVING ACTIVITY — Mark if the accident involved a USACE Contractor diving activity.

c. PUBLIC.

(1) INJURY/ILLNESS/FATALITY — Mark if accident resulted in public fatality. (The "OTHER" box will be marked when requested by the FOA to report an unusual non-fatal public accident that could result in claims against the government or as otherwise directed by the FOA Commander).

(2) VOID SPACE — Make no entry.

(3) VEHICLE INVOLVED — Mark if accident resulted in a fatality to a member of the public and involved a motor vehicle, *regardless* of whether "INJURY/ILLNESS" is marked.

(4) VOID SPACE — Make no entry.

INSTRUCTIONS FOR SECTION 2 — PERSONAL DATA

a. NAME — (MANDATORY FOR GOVERNMENT ACCIDENTS. OPTIONAL AT THE DISCRETION OF THE FOA COMMANDER FOR CONTRACTOR AND PUBLIC ACCIDENTS). Enter last name, first name, middle initial of person involved.

b. AGE — Enter age.

c. SEX — Mark appropriate box.

d. SOCIAL SECURITY NUMBER — (FOR GOVERNMENT PERSONNEL ONLY) Enter the social security number (or other personal identification number if no social security number issued).

e. GRADE — (FOR GOVERNMENT PERSONNEL ONLY) Enter pay grade. Example: O-6, E-7; WG-8, WS-12; GS-11; etc.

f. JOB SERIES/TITLE — For *government civilian employees* enter the pay plan, full series number, and job title, e.g. GS-0810/Civil Engineer. For *military personnel* enter the primary military occupational specialty (PMOS), e.g., 15A30 or 11G50. For *contractor employees* enter the job title assigned to the injured person, e.g. carpenter, laborer, surveyor, etc..

g. DUTY STATUS — Mark the appropriate box.

(1) ON DUTY — Person was at duty station during duty hours or person was away from duty station during duty hours but on official business at time of the accident.

(2) TDY — person was on official business, away from the duty station and with travel orders, at time of accident.

(3) OFF DUTY — person was not on official business at time of accident.

h. EMPLOYMENT STATUS — (FOR GOVERNMENT PERSONNEL ONLY) Mark the most appropriate box. If "OTHER" is marked, specify the employment status of the person.

INSTRUCTION FOR SECTION 3 — GENERAL INFORMATION

a. DATE OF ACCIDENT — Enter the month, day, and year of accident.

b. TIME OF ACCIDENT — Enter the local time of accident in military time. Example: 1430 hrs (not 2:30 p.m.).

c. EXACT LOCATION OF ACCIDENT — Enter facts needed to locate the accident scene. (installation/project name, building number, street, direction and distance from closest landmark, etc.,).

d. CONTRACTOR NAME

(1) PRIME — Enter the exact name (title of firm) of the prime contractor.

(2) SUBCONTRACTOR — Enter the name of any subcontractor involved in the accident.

e. CONTRACT NUMBER — Mark the appropriate box to identify if contract is civil works, military, or other: if "OTHER" is marked, specify contract appropriation on line provided. Enter complete contract number of prime contract, e.g., DACW 09-85-C-0100.

f. TYPE OF CONTRACT — Mark appropriate box. A/E means architect/engineer. If "OTHER" is marked, specify type of contract on line provided.

g. HAZARDOUS/TOXIC WASTE ACTIVITY (HTW) — Mark the box to identify the HTW activity being performed at the time of the accident. For Superfund, DERP, and Installation Restoration Program (IRP) HTW activities include accidents that occurred during inventory, predesign, design, and construction. For the purpose of accident reporting, DERP Formerly Used DoD Site (FUDS) activities and IRP activities will be treated separately. For Civil Works O&M HTW activities mark the "OTHER" box.

INSTRUCTIONS FOR SECTION 4 — CONSTRUCTION ACTIVITIES

a. CONSTRUCTION ACTIVITY — Select the *most appropriate* construction activity being performed at time of accident from the *list below*. Enter the activity name and place the corresponding code number identified in the box.

CONSTRUCTION ACTIVITY LIST

1. MOBILIZATION
2. SITE PREPARATION
3. EXCAVATION/TRENCHING
4. GRADING (EARTHWORK)
5. PIPING/UTILITIES
6. FOUNDATION
7. FORMING
8. CONCRETE PLACEMENT
9. STEEL ERECTION
10. ROOFING
11. FRAMING
12. MASONRY
13. CARPENTRY
14. ELECTRICAL
15. SCAFFOLDING/ACCESS
16. MECHANICAL
17. PAINTING
18. EQUIPMENT/MAINTENANCE
19. TUNNELING
20. WAREHOUSING/STORAGE
21. PAVING
22. FENCING
23. SIGNING
24. LANDSCAPING/IRRIGATION
25. INSULATION
26. DEMOLITION

g. TYPE OF CONSTRUCTION EQUIPMENT – Select the equipment involved in the accident from the list below. Enter the name and place the corresponding code number identified in the box. If equipment is not included below, use code 24, "OTHER", and write in specific type of equipment.

CONSTRUCTION EQUIPMENT

1. GRADER	13. DUMP TRUCK (OFF HIGHWAY)
2. DRAGLINE	14. TRUCK (OTHER)
3. CRANE (ON VESSEL BARGE)	15. FORKLIFT
4. CRANE (TRACKED)	16. BACKHOE
5. CRANE (RUBBER TIRE)	17. FRONT-END LOADER
6. CRANE (VEHICLE MOUNTED)	18. PILE DRIVER
7. CRANE (TOWER)	19. TRACTOR (UTILITY)
8. SHOVEL	20. MANLIFT
9. SCRAPER	21. DOZER
10. PUMP TRUCK (CONCRETE)	22. DRILL RIG
11. TRUCK (CONCRETE TRANSIT MIXER)	23. COMPACTOR/VIBRATORY ROLLER
12. DUMP TRUCK (HIGHWAY)	24. OTHER

INSTRUCTIONS FOR SECTION 5 – INJURY/ILLNESS INFORMATION

a. SEVERITY OF INJURY – Mark the appropriate box

(1) FATAL – injured person died or is missing and presumed dead.

(2) LOST TIME – a non-fatal injury that causes any loss of time from work beyond the day or shift in which it occurred or a non-fatal illness/disease that causes disability at any time.

(3) NO LOST TIME – a non-fatal, traumatic injury that does not cause loss of time from work beyond the day or shift in which it occurred.

(4) FIRST AID – One time treatment (and/or one follow visit for observation) for minor scratches, cuts and similar injuries that do not ordinarily require medical attention.

b. ESTIMATED DAYS LOST – Enter the estimated number of workdays the person will lose from work.

c. ESTIMATED DAYS HOSPITALIZED – Enter the estimated number of workdays the person will be hospitalized.

d. ESTIMATED DAYS RESTRICTED DUTY – Enter the estimated number of workdays the person, as a result of the accident, will not be able to perform all of their regular duties.

e. BODY PART AFFECTED – Select the most appropriate primary and when applicable, secondary body part affected from the list below. Enter body part name on line and place the corresponding code letters identifying that body part in the box.

GENERAL BODY AREA	CODE	BODY PART NAME
ARM/WRIST	AB	ARM AND WRIST
	AS	ARM OR WRIST
TRUNK, EXTERNAL MUSCULATURE	B1	SINGLE BREAST
	B2	BOTH BREASTS
	B3	SINGLE TESTICLE
	B4	BOTH TESTICLES
	BA	ABDOMEN
	BC	CHEST
	BL	LOWER BACK
	BP	PENIS
	BS	SIDE
	BU	UPPER BACK
	BW	WAIST
	BZ	TRUNK OTHER
HEAD, INTERNAL	C1	SINGLE EAR INTERNAL
	C2	BOTH EARS INTERNAL
	C3	SINGLE EYE INTERNAL
	C4	BOTH EYES INTERNAL
	CB	BRAIN
	CC	CRANIAL BONES
	CD	TEETH
	CJ	JAW
	CL	THROAT, LARYNX
	CM	MOUTH
	CN	NOSE
	CR	THROAT, OTHER
	CT	TONGUE
	CZ	HEAD OTHER INTERNAL
ELBOW	EB	BOTH ELBOWS
	ES	SINGLE ELBOW
FINGER	F1	FIRST FINGER
	F2	BOTH FIRST FINGERS
	F3	SECOND FINGER
	F4	BOTH SECOND FINGERS
	F5	THIRD FINGER
	F6	BOTH THIRD FINGERS
	F7	FOURTH FINGER
	F8	BOTH FOURTH FINGERS
TOE	G1	GREAT TOE
	G2	BOTH GREAT TOES
	G3	TOE OTHER
	G4	TOES OTHER
HEAD, EXTERNAL	H1	EYE EXTERNAL
	H2	BOTH EYES EXTERNAL
	H3	EAR EXTERNAL
	H4	BOTH EARS EXTERNAL
	HC	CHIN
	HF	FACE
	HK	NECK/THROAT
	HM	MOUTH/LIPS
	HN	NOSE
	HS	SCALP
KNEE	KB	BOTH KNEES
	KS	KNEE
LEG, HIP, ANKLE, BUTTOCK	LB	BOTH LEGS/HIPS/ ANKLES/BUTTOCKS
	LS	SINGLE LEG/HIP ANKLE/BUTTOCK
HAND	MB	BOTH HANDS
	MS	SINGLE HAND
FOOT	PB	BOTH FEET
	PS	SINGLE FOOT
TRUNK, BONES	R1	SINGLE COLLAR BONE
	R2	BOTH COLLAR BONES
	R3	SHOULDER BLADE
	R4	BOTH SHOULDER BLADES
	RB	RIB
	RS	STERNUM (BREAST BONE)
	RV	VERTEBRAE (SPINE; DISC)
	RZ	TRUNK BONES OTHER
SHOULDER	SB	BOTH SHOULDERS
	SS	SINGLE SHOULDER
THUMB	TB	BOTH THUMBS
	TS	SINGLE THUMB
TRUNK, INTERNAL ORGANS	V1	LUNG, SINGLE
	V2	LUNGS, BOTH
	V3	KIDNEY, SINGLE
	V4	KIDNEYS, BOTH
	VH	HEART
	VL	LIVER
	VR	REPRODUCTIVE ORGANS
	VS	STOMACH
	VV	INTESTINES
	VZ	TRUNK, INTERNAL; OTHER

f. NATURE OF INJURY – Select the most appropriate nature of injury from the list below. This nature of injury shall correspond to the *primary body part* selected in 5.e. above. Enter the nature of injury name on the line and place the corresponding CODE letters identifying the nature of injury in the box provided.

INSTRUCTIONS FOR SECTION 9 — VESSEL FLOATING PLANT ACCIDENT

a. TYPE OF VESSEL/FLOATING PLANT — Select the most appropriate vessel/floating plant from list below. Enter name and place corresponding number in box. If item is not listed below, enter item number for "OTHER" and write in specific type of vessel/floating plant.

VESSEL/FLOATING PLANTS

1. ROW BOAT	7. DREDGE/DIPPER
2. SAIL BOAT	8. DREDGE/CLAMSHELL, BUCKET
3. MOTOR BOAT	9. DREDGE/PIPE LINE
4. BARGE	10. DREDGE/DUST PAN
5. DREDGE HOPPER	11. TUG BOAT
6. DREDGE SIDE CASTING	12. OTHER

b. COLLISION MISHAP — Select from the list below the object(s) that contributed to the accident or were damaged in the accident.

COLLISION/MISHAP

1. COLLISION W/OTHER VESSEL	7. HAULAGE UNIT
2. UPPER GUIDE WALL	8. BREAKING TOW
3. UPPER LOCK GATES	9. TOW BREAKING UP
4. LOCK WALL	10. SWEPT DOWN ON DAM
5. LOWER LOCK GATES	11. BUOY/DOLPHIN/CELL
6. LOWER GUIDE WALL	12. WHARF OR DOCK
	13. OTHER

INSTRUCTIONS FOR SECTION 10 — ACCIDENT DESCRIPTION

DESCRIBE ACCIDENT — Fully describe the accident. Give the sequence of events that describe what happened leading up to and including the accident. Fully identify personnel and equipment involved and their role(s) in the accident. Ensure that relationships between personnel and equipment are clearly specified. Continue on blank sheets if necessary and attach to this report.

INSTRUCTIONS FOR SECTION 11 — CAUSAL FACTORS

a. Review thoroughly. Answer each question by marking the appropriate block. If any answer is yes, explain in item 13 below. Consider, as a minimum, the following:

(1) DESIGN — Did inadequacies associated with the building or work site play a role? Would an improved design or layout of the equipment or facilities reduce the likelihood of similar accidents? Were the tools or other equipment designed and intended for the task at hand?

(2) INSPECTION/MAINTENANCE — Did inadequately or improperly maintained equipment, tools, workplace, etc. create or worsen any hazards that contributed to the accident? Would better equipment, facility, work site or work activity inspections have helped avoid the accident?

(3) PERSON'S PHYSICAL CONDITION — Do you feel that the accident would probably not have occurred if the employee was in "good" physical condition? If the person involved in the accident had been in better physical condition, would the accident have been less severe or avoided altogether? Was over exertion a factor?

(4) OPERATING PROCEDURES — Did a lack of or inadequacy within established operating procedures contribute to the accident? Did any aspect of the procedures introduce any hazard to, or increase the risk associated with the work process? Would establishment or improvement of operating procedures reduce the likelihood of similar accidents?

(5) JOB PRACTICES — Were any of the provisions of the Safety and Health Requirements Manual (EM 385-1-1) violated? Was the task being accomplished in a manner which was not in compliance with an established job hazard analysis or activity hazard analysis? Did any established job practice (including EM 385-1-1) fail to adequately address the task or work process? Would better job practices improve the safety of the task?

(6) HUMAN FACTORS — Was the person under undue stress (either internal or external to the job)? Did the task tend toward overloading the capabilities of the person, i.e., did the job require tracking and reacting to many external inputs such as displays, alarms, or signals? Did the arrangement of the workplace tend to interfere with efficient task performance? Did the task require reach, strength, endurance, agility, etc., at or beyond the capabilities of the employee? Was the work environment ill-adapted to the person? Did the person need more training, experience, or practice in doing the task? Was the person inadequately rested to perform safely?

(7) ENVIRONMENTAL FACTORS — Did any factors such as moisture, humidity, rain, snow, sleet, hail, ice, fog, cold, heat, sun, temperature changes, wind, tides, floods, currents, dust, mud, glare, pressure changes, lightning, etc., play a part in the accident?

(8) CHEMICAL AND PHYSICAL AGENT FACTORS — Did exposure to chemical agents (either single shift exposure or long-term exposure) such as dusts, fibers (asbestos, etc.), silica, gases (carbon monoxide, chlorine, etc.,), mists, steam, vapors, fumes, smoke, other particulates, liquid or dry chemicals that are corrosive, toxic, explosive or flammable, by-products of combustion or physical agents such as noise, ionizing radiation, non-ionizing radiation (UV radiation created during welding, etc.) contribute to the accident/incident?

(9) OFFICE FACTORS — Did the fact that the accident occurred in an office setting or to an office worker have a bearing on its cause? For example, office workers tend to have less experience and training in performing tasks such as lifting office furniture. Did physical hazards within the office environment contribute to the hazard?

(10) SUPPORT FACTORS — Was the person using an improper tool for the job? Was inadequate time available or utilized to safely accomplish the task? Were less than adequate personnel resources (in terms of employee skills, number of workers, and adequate supervision) available to get the job done properly? Was funding available, utilized, and adequate to provide proper tools, equipment, personnel, site preparation, etc?

(11) PERSONAL PROTECTIVE EQUIPMENT — Did the person fail to use appropriate personal protective equipment (gloves, eye protection, hard-toed shoes, respirator, etc.) for the task or environment? Did protective equipment provided or worn fail to provide adequate protection from the hazard(s)? Did lack of or inadequate maintenance of protective gear contribute to the accident?

(12) DRUGS/ALCOHOL — Is there any reason to believe the person's mental or physical capabilities, judgement, etc., were impaired or altered by the use of drugs or alcohol? Consider the effects of prescription medicine and over the counter medications as well as illicit drug use. Consider the effect of drug or alcohol induced "hangovers".

b. WRITTEN JOB/ACTIVITY HAZARD ANALYSIS — Was a written Job/Activity Hazard Analysis completed for the task being performed at the time of the accident? Mark the appropriate box. *If one was performed, attach a copy of the analysis to the report.*

INSTRUCTIONS FOR SECTION 12 — TRAINING

a. WAS PERSON TRAINED TO PERFORM ACTIVITY/TASK? — For the purpose of this section "trained" means the person has been provided the necessary information (either formal and/or on-the-job (OJT) training) to competently perform the activity/task in a safe and healthful manner.

b. TYPE OF TRAINING — Mark the appropriate box that best indicates the type of training; (classroom or on-the-job) that the injured person received before the accident happened.

c. DATE OF MOST RECENT TRAINING — Enter the month, day, and year of the last *formal* training completed that covered the activity/task being performed at the time of the accident.

* The injury or condition selected below must be caused by a specific incident or event which occurred during a single work day or shift.

GENERAL NATURE CATEGORY	CODE	NATURE OF INJURY NAME
*TRAUMATIC INJURY OR DISABILITY	TA	AMPUTATION
	TB	BACK STRAIN
	TC	CONTUSION; BRUISE, ABRASION
	TD	DISLOCATION
	TF	FRACTURE
	TH	HERNIA
	TK	CONCUSSION
	TL	LACERATION, CUT
	TP	PUNCTURE
	TS	STRAIN, MULTIPLE
	TU	BURN, SCALD, SUNBURN
	TI	TRAUMATIC SKIN DISEASES/ CONDITIONS INCLUDING DERMATITIS
	TR	TRAUMATIC RESPIRATORY DISEASE
	TQ	TRAUMATIC FOOD POISONING
	TW	TRAUMATIC TUBERCULOSIS
	TX	TRAUMATIC VIROLOGICAL/ INFECTIVE/PARASITIC DISEASE
	T1	TRAUMATIC CEREBRAL VASCULAR CONDITION/STROKE
	T2	TRAUMATIC HEARING LOSS
	T3	TRAUMATIC HEART CONDITION
	T4	TRAUMATIC MENTAL DISORDER; STRESS, NERVOUS CONDITION
	T8	TRAUMATIC INJURY – OTHER (EXCEPT DISEASE, ILLNESS)

**A nontraumatic physiological harm or loss of capacity produced by systemic infection; continued or repeated stress or strain; exposure to toxins, poisons, fumes, etc.; or other continued and repeated exposures to conditions of the work environment over a long period of time. *For practical purposes*, an occupational illness/disease or disability is any reported condition which doses not meet the definition of traumatic injury or disability as described above.

GENERAL NATURE CATEGORY	CODE	NATURE OF INJURY NAME
**NON-TRAUMATIC ILLNESS DISEASE OR DISABILITY		
RESPIRATORY DISEASE	RA	ASBESTOSIS
	RB	BRONCHITIS
	RE	EMPHYSEMA
	RP	PNEUMOCONIOSIS
	RS	SILICOSIS
	R9	RESPIRATORY DISEASE, OTHER
VIROLOGICAL, INFECTIVE & PARASITIC DISEASES	VB	BRUCELLOSIS
	VC	COCCIDIOMYCOSIS
	VF	FOOD POISONING
	VH	HEPATITIS
	VM	MALARIA
	VS	STAPHYLOCOCCUS
	VT	TUBERCULOSIS
	V9	VIROLOGICAL/INFECTIVE/ PARASITIC—OTHER
DISABILITY, OCCUPATIONAL	DA	ARTHRITIS, BURSITIS
	DB	BACK STRAIN, BACK SPRAIN
	DC	CEREBRAL VASCULAR CONDITION; STROKE
	DD	ENDEMIC DISEASE (OTHER THAN CODE TYPES R&S)
	DE	EFFECT OF ENVIRONMENTAL CONDITION
	DH	HEARING LOSS
	DK	HEART CONDITION
	DM	MENTAL DISORDER, EMOTIONAL STRESS NERVOUS CONDITION
	DR	RADIATION
	DS	STRAIN, MULTIPLE
	DU	ULCER
	DV	OTHER VASCULAR CONDITIONS
	D9	DISABILITY, OTHER

GENERAL NATURE CATEGORY	CODE	NATURE OF INJURY NAME
SKIN DISEASE OR CONDITION	SB	BIOLOGICAL
	SC	CHEMICAL
	S9	DERMATITIS, UNCLASSIFIED

g. TYPE AND SOURCE OF INJURY (CAUSE) – Type and Source Codes are used to describe what caused the incident. The Type Code stands for an ACTION and the Source Code for an OBJECT or SUBSTANCE. Together, they form a brief description of how the incident occurred. Where there are two different sources, code the *initiating* source of the incident (see example 1, below). Examples:

(1) An employee tripped on carpet and struck his head on a desk.
TYPE: 210 (Fell on Same Level) SOURCE. 0110 (walking/ working surface)

NOTE. This example would NOT be coded 120 (struck against) and 0140 (furniture).

(2) A Park Ranger contracted dermatitis from contact with poison ivy/ oak.
TYPE: 510 (contact) SOURCE. 0920 (plant)

(3) A lock and dam mechanic punctured his finger with a metal sliver while grinding a turbine blade.
TYPE: 410 (punctured by) SOURCE: 0830 (metal)

(4) An employee was driving a government vehicle when it was struck by another vehicle.
TYPE: 800 (traveling in) SOURCE. 0421 (government owned vehicle, as driver)

NOTE: The Type Code 800, "Traveling In" is different from the other type codes in that its function is not to identify factors contributing to the injury or fatality, but rather to collect data on the type of vehicle the employee was operating or traveling in at the time of the incident.

Select the most appropriate TYPE and SOURCE identifier from the list below and enter the name on the line and the corresponding code in the appropriate box.

CODE	TYPE OF INJURY NAME
	STRUCK
0110	STRUCK BY
0111	STRUCK BY FALLING OBJECT
0120	STRUCK AGAINST
	FELL, SLIPPED, TRIPPED
0210	FELL ON SAME LEVEL
0220	FELL ON DIFFERENT LEVEL
0230	SLIPPED, TRIPPED (NO FALL)
	CAUGHT
0310	CAUGHT ON
0320	CAUGHT IN
0330	CAUGHT BETWEEN
	PUNCTURED, LACERATED
0410	PUNCTURED BY
0420	CUT BY
0430	STUNG BY
0440	BITTEN BY
	CONTACTED
0510	CONTACTED WITH (INJURED PERSON MOVING)
0520	CONTACTED BY (OBJECT WAS MOVING)
	EXERTED
0610	LIFTED, STRAINED BY (SINGLE ACTION)
0620	STRESSED BY (REPEATED ACTION)
	EXPOSED
0710	INHALED
0720	INGESTED
0730	ABSORBED
0740	EXPOSED TO
0800	TRAVELING IN

CODE	SOURCE OF INJURY NAME
0100	BUILDING OR WORKING AREA
0110	WALKING/WORKING SURFACE (FLOOR, STREET, SIDEWALKS, ETC)
0120	STAIRS, STEPS
0130	LADDER
0140	FURNITURE, FURNISHINGS, OFFICE EQUIPMENT
0150	BOILER, PRESSURE VESSEL
0160	EQUIPMENT LAYOUT (ERGONOMIC)
0170	WINDOWS, DOORS
0180	ELECTRICITY

CODE	SOURCE OF INJURY NAME
0200	ENVIRONMENTAL CONDITION
0210	TEMPERATURE EXTREME (INDOOR)
0220	WEATHER (ICE, RAIN, HEAT, ETC.)
0230	FIRE, FLAME, SMOKE (NOT TOBACCO)
0240	NOISE
0250	RADIATION
0260	LIGHT
0270	VENTILATION
0271	TOBACCO SMOKE
0280	STRESS (EMOTIONAL)
0290	CONFINED SPACE
0300	MACHINE OR TOOL
0310	HAND TOOL (POWERED: SAW, GRINDER, ETC.)
0320	HAND TOOL (NONPOWERED)
0330	MECHANICAL POWER TRANSMISSION APPARATUS
0340	GUARD, SHIELD (FIXED, MOVEABLE, INTERLOCK)
0350	VIDEO DISPLAY TERMINAL
0360	PUMP, COMPRESSOR, AIR PRESSURE TOOL
0370	HEATING EQUIPMENT
0380	WELDING EQUIPMENT
0400	VEHICLE
0411	AS DRIVER OF PRIVATELY OWNED/RENTAL VEHICLE
0412	AS PASSENGER OF PRIVATELY OWNED/RENTAL VEHICLE
0421	DRIVER OF GOVERNMENT VEHICLE
0422	PASSENGER OF GOVERNMENT VEHICLE
0430	COMMON CARRIER (AIRLINE, BUS, ETC.)
0440	AIRCRAFT (NOT COMMERCIAL)
0450	BOAT, SHIP, BARGE
0500	MATERIAL HANDLING EQUIPMENT
0510	EARTHMOVER (TRACTOR, BACKHOE, ETC.)
0520	CONVEYOR (FOR MATERIAL AND EQUIPMENT)
0530	ELEVATOR, ESCALATOR, PERSONNEL HOIST
0540	HOIST, SLING CHAIN, JACK
0550	CRANE
0551	FORKLIFT
0560	HANDTRUCK, DOLLY
0600	DUST, VAPOR, ETC.
0610	DUST (SILICA, COAL, ETC.)
0620	FIBERS
0621	ASBESTOS
0630	GASES
0631	CARBON MONOXIDE
0640	MIST, STEAM, VAPOR, FUME
0641	WELDING FUMES
0650	PARTICLES (UNIDENTIFIED)
0700	CHEMICAL, PLASTIC, ETC.
0711	DRY CHEMICAL—CORROSIVE
0712	DRY CHEMICAL—TOXIC
0713	DRY CHEMICAL—EXPLOSIVE
0714	DRY CHEMICAL—FLAMMABLE
0721	LIQUID CHEMICAL—CORROSIVE
0722	LIQUID CHEMICAL—TOXIC
0723	LIQUID CHEMICAL—EXPLOSIVE
0724	LIQUID CHEMICAL—FLAMMABLE
0730	PLASTIC
0740	WATER
0750	MEDICINE
0800	INANIMATE OBJECT
0810	BOX, BARREL, ETC.
0820	PAPER
0830	METAL ITEM, MINERAL
0831	NEEDLE
0840	GLASS
0850	SCRAP, TRASH
0860	WOOD
0870	FOOD
0880	CLOTHING, APPAREL, SHOES
0900	ANIMATE OBJECT
0911	DOG
0912	OTHER ANIMAL
0920	PLANT
0930	INSECT
0940	HUMAN (VIOLENCE)
0950	HUMAN (COMMUNICABLE DISEASE)
0960	BACTERIA, VIRUS (NOT HUMAN CONTACT)

CODE	SOURCE OF INJURY NAME
1000	PERSONAL PROTECTIVE EQUIPMENT
1010	PROTECTIVE CLOTHING, SHOES, GLASSES, GOGGLES
1020	RESPIRATOR, MASK
1021	DIVING EQUIPMENT
1030	SAFETY BELT, HARNESS
1040	PARACHUTE

INSTRUCTIONS FOR SECTION 6 — PUBLIC FATALITY

a. ACTIVITY AT TIME OF ACCIDENT—Select the activity being performed at the time of the accident from the list below. Enter the activity name on the line and the corresponding number in the box. If the activity performed is not identified on the list, select from the *most* appropriate primary activity area (water related, non-water related or other activity), the code number for "Other", and write in the activity being performed at the time of the accident.

WATER RELATED RECREATION

1. Sailing
2. Boating—powered
3. Boating—unpowered
4. Water skiing
5. Fishing from boat
6. Fishing from bank dock or pier
7. Fishing while wading
8. Swimming/supervised area
9. Swimming/designated area
10. Swimming/other area
11. Underwater activities (skin diving, scuba, etc.)
12. Wading
13. Attempted rescue
14. Hunting from boat
15. Other

NON-WATER RELATED RECREATION

16. Hiking and walking
17. Climbing (general)
18. Camping/picnicking authorized area
19. Camping/picnicking unauthorized area
20. Guided tours
21. Hunting
22. Playground equipment
23. Sports/summer (baseball, football, etc.)
24. Sports/winter (skiing, sledding, snowmobiling etc.)
25. Cycling (bicycle, motorcycle, scooter)
26. Gliding
27. Parachuting
28. Other non-water related

OTHER ACTIVITIES

29. Unlawful acts (fights, riots, vandalism, etc.)
30. Food preparation/serving
31. Food consumption
32. Housekeeping
33. Sleeping
34. Pedestrian struck by vehicle
35. Pedestrian other acts
36. Suicide
37. "Other" activities

b. PERSONAL FLOTATION DEVICE USED—If fatality was water-related was the victim wearing a person flotation device? Mark the appropriate box.

INSTRUCTIONS FOR SECTION 7—MOTOR VEHICLE ACCIDENT

a. TYPE OF VEHICLE—Mark appropriate box for each vehicle involved. If more than one vehicle of the same type is involved, mark both halves of the appropriate box. USACE vehicle(s) involved shall be marked in left half of appropriate box.

b. TYPE OF COLLISION—Mark appropriate box.

c. SEAT BELT—Mark appropriate box.

INSTRUCTIONS FOR SECTION 8—PROPERTY/MATERIAL INVOLVED

a. NAME OF ITEM—Describe all property involved in accident. Property/material involved means material which is damaged or whose use or misuse contributed to the accident. Include the name, type, model; also include the National Stock Number (NSN) whenever applicable.

b. OWNERSHIP—Enter ownership for each item listed. Enter one of the following: *USACE; OTHER GOVERNMENT; CONTRACTOR PRIVATE)*

c. $ AMOUNT OF DAMAGE—Enter the total estimated dollar amount of damage (parts and labor), if any.

INSTRUCTIONS FOR SECTION 13—CAUSES

a. DIRECT CAUSES—The direct cause is that single factor which most directly lead to the accident. See examples below.

b. INDIRECT CAUSES—Indirect causes are those factors which contributed to but did not directly initiate the occurrence of the accident.

Examples for section 13

a. Employee was dismantling scaffold and fell 12 feet from unguarded opening.
Direct cause: failure to provide fall protection at elevation.
Indirect causes: failure to enforce USACE safety requirements; improper training/motivation of employee (possibility that employee was not knowledgeable of USACE fall protection requirements or was lax in his attitude towards safety); failure to ensure provision of positive fall protection whenever elevated; failure to address fall protection during scaffold dismantling in phase hazard analysis.

b. Private citizen had stopped his vehicle at intersection for red light when vehicle was struck in rear by USACE vehicle. (note USACE vehicle was in proper/safe working condition).
Direct cause: failure of USACE driver to maintain control of and stop USACE vehicle within safe distance.
Indirect cause: Failure of employee to pay attention to driving (defensive driving).

INSTRUCTIONS FOR SECTION 14—ACTION TO ELIMINATE CAUSE(S)

DESCRIPTION—Fully describe all the actions taken, anticipated, and recommended to eliminate the cause(s) and prevent reoccurrence of similar accidents/illnesses. Continue on blank sheets of paper if necessary to fully explain and attach to the completed report form.

INSTRUCTIONS FOR SECTION 15—DATES FOR ACTION

a. BEGIN DATE—Enter the date when the corrective action(s) identified in Section 14 will begin.

b. COMPLETE DATE—Enter the date when the corrective action(s) identified in Section 14 will be completed.

c. TITLE AND SIGNATURE—Enter the title and signature of supervisor completing the accident report. For a GOVERNMENT employee accident/illness the immediate supervisor will complete and sign the report. For PUBLIC accidents the USACE Project Manager/Area Engineer responsible for the USACE property where the accident happened shall complete and sign the report. For CONTRACTOR accidents the Contractor's project manager shall complete and sign the report and provide to the USACE supervisor responsible for oversight of that contractor activity. This USACE Supervisor shall also sign the report. Upon entering the information required in 15.d, 15.e and 15.f below, the responsible USACE supervisor shall forward the report for management review as indicated in Section 16.

d. DATE SIGNED—Enter the month, day, and year that the report was signed by the responsible supervisor.

e. ORGANIZATION NAME—For GOVERNMENT employee accidents enter the USACE organization name (Division, Branch, Section, etc.) of the injured employee. For PUBLIC accidents enter the USACE organization name for the person identified in block 15.c. For CONTRACTOR accidents enter the USACE organization name for the USACE office responsible for providing contract administration oversight.

f. OFFICE SYMBOL—Enter the latest complete USACE Office Symbol for the USACE organization identified in block 15.e.

INSTRUCTIONS FOR SECTION 16—MANAGEMENT REVIEW (1st)

1ST REVIEW—Each USACE FOA shall determine who will provide 1st management review. The responsible USACE supervisor in section 15.c shall forward the completed report to the USACE office designated as the 1st Reviewer by the FOA. Upon receipt, the Chief of the Office shall review the completed report, mark the appropriate box, provide substantive comments, sign, date, and forward to the FOA Staff Chief (2nd review) for review and comment.

INSTRUCTIONS FOR SECTION 17—MANAGEMENT REVIEW (2nd)

2ND REVIEW—The FOA Staff Chief (i.e., FOA Chief of Construction, Operations, Engineering, Planning, etc.) shall mark the appropriate box, review the completed report, provide substantive comments, sign, date, and return to the FOA Safety and Occupational Health Office.

INSTRUCTIONS FOR SECTION 18—SAFETY AND OCCUPATIONAL HEALTH REVIEW

3RD REVIEW—The FOA Safety and Occupational Health Office shall review the completed report, mark the appropriate box, ensure that any inadequacies, discrepancies, etc, are rectified by the responsible supervisor and management reviewers, provide substantive comments, sign, date and forward to the FOA Commander for review, comment, and signature.

INSTRUCTION FOR SECTION 19—COMMAND APPROVAL

4TH REVIEW—The FOA Commander shall (to include the person designated Acting Commander in his absence) review the completed report, comment if required, sign, date, and forward the report to the FOA Safety and Occupational Health Office. Signature authority shall not be delegated.

Appendix G
Chemical Hygiene Plan - EA Laboratories

CHEMICAL HYGIENE PLAN

EA Laboratories
EA Engineering, Science & Technology, Inc.
19 Loveton Circle
Sparks, MD 21152

Prepared By:

Robert S. Runkle
VP EA Laboratories

Robert D. Lentz, Jr.
Safety & Health Coordinator
EA Laboratories

Approved By:

Stephen J. Hammalian
Executive Vice President & COO
EA Engineering, Science, & Technology, Inc.

DATE: January 30, 1991

CONTENTS (Continued)

I. PURPOSE OF LABORATORY SAFETY MANUAL

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This manual has been prepared in accordance with the Occupational Safety and Health Administration's (OSHA) Standard, Exposure to Toxic Substances in Laboratories (29-CFR-1910.1450) to summarize proper procedures to protect the safety and health of all employees and visitors of EA Laboratories. Proper protective equipment, accident procedures, handling of chemicals, reactions of compounds, and ignition sources are discussed. Supervisory responsibility for training, education and motivation is described, as is general information concerning facility layout, emergency equipment location, etc. The importance of each employee's "Right to Know" under Federal and State regulations is described and the location and use of Material Safety Data Sheets (MSDS) are described.

It is the policy of EA Laboratories that all employees be provided a safe working environment, proper protective equipment consistent with risk involved, and adequate training and education in proper safe procedures. Employee safety awareness and training is the primary responsibility of supervisors and managers. Additionally, EA Laboratories has appointed a SAFETY AND HEALTH COORDINATOR to serve as a focal point within EA Laboratories for information, communication, safety training/coordination, and accident analysis. EA will periodically evaluate the effectiveness of the safety program by thorough recordkeeping of accidents, employee training, and medical records.

II. RESPONSIBILITIES & POLICIES

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The policy of EA Laboratories is to protect the safety and health of our employees and to comply with all Federal, State, and local regulations. Since industrial injuries and property loss through accidents are needless, costly, and preventable, the company has established a safety and health program which is adapted from proven fundamental safety concepts. The overall organizational structure of EA Laboratories and its relationship to EA Engineering, Science and Technology, Inc. is presented in Appendix A.

A. CHAIN-OF-COMMAND

Management's basic responsibility is the prevention of accidents through full support of the development, maintenance, and implemention of all safety procedures, training, and hazard elimination practices as indicated in the rules and regulations prescribed within this manual. Management will be kept fully informed on all health and safety items throughout the facilities of EA Laboratories in order to review the effectiveness of the current safety and health programs.

Supervisory/managerial personnel are directly responsible for the instruction of all employees under their jurisdiction with regard to the proper procedures and safety methods to be utilized in performing work duties, for taking immediate corrective actions to eliminate hazardous conditions and/or practices, and for the prevention of accidents, whether personal injury or property damage. Supervisors/managers must enforce the established safety program. Supervisors will not permit safety to be sacrificed for any reason, be it completion of analytical reports, client needs, time limitations, or unexpected problems.

<u>Vice President</u>

- Ensure implementation of policies and procedures set forth in this Chemical Hygiene Plan and in EA's Corporate Safety and Health Program (Manual SHP-001).

- Ensure compliance with Federal, State, and Local safety, health, and fire regulations.

- Ensure that adequate resources are made available to provide for the safety and health of lab employees.

- In conjunction with Safety and Health Coordinator (SHC), EA Laboratories and the Corporate Safety and Health Officer (CSHO), approve laboratory operations.

- Designate a Safety and Health Coordinator for the Lab.

- Initiate periodic inspections to evaluate effectiveness of this Manual and ensure compliance.

- Request, review, and approve Job Hazard Analyses for specific work operations.

Chief Chemist

- Implement measures, including periodic inspections, to ensure that all lab employees maintain safe working conditions in their work areas, receive training in appropriate safety and health procedures and work practices, and wear the required protective equipment.

- Ensure that Purchasing Specialist accurately and completely maintains Chemical Inventory List and MSDS file.

- Provide new employees or employees transferring to new areas of lab with safety and health orientation relating to their specific job assignment.

Department Managers and Supervisors

- Implement all EA-specific and client-specific safety and health requirements for work in their areas of the Lab.

- Provide personnel in their lab areas with required safety and health training, including training in compliance with federal and state Hazard Communication regulations.

- Ensure that all accidents by employees under their responsibility are promptly reported in compliance with EA's Corporate Safety and Health Program.

- Ensure that safety and health measures have been reviewed/established by the Safety and Health Coordinator and/or the CSHO prior to the beginning of new procedures.

- Ensure that corrective actions specified by the SHC, CSHO, and/or Vice-President, subsequent to walk-through inspections and safety audits, are implemented within the specified time frame.

- Monitor laboratory operations in their work area on a daily basis to ensure that all safety and health requirements are being effectively implemented.

- Advise the SHC of all new operations/procedures or substantive changes in established procedures that potentially involve employee exposure to hazardous chemicals.

- Ensure that all subcontractors or visitors in their work areas are apprised of safety and health concerns and protective equipment requirements for work in the area. Ensure these individuals know the location of this Manual and MSDS for chemicals to which they may be exposed.

- Ensure that all new chemicals introduced into their work area are added to the Chemical Inventory List and that MSDSs are obtained.

- Provide all new employees with safety and health briefing pertinent to their specific job in the work area.

- Administer and coordinate EA's Corporate Safety and Health Program.

- In conjunction with the Safety and Health Coordinator, evaluate new laboratory operations and procedures to identify safety and health issues and determine appropriate protective measures.

- Develop and distribute Job Hazard Analyses of specific work operations as requested by the Vice President or as deemed appropriate.

- Provide technical support for safety and health concerns/procedures to the Lab.

<u>Safety and Health Coordinator (SHC)</u>

- In conjunction with the CSHO, coordinate Lab Safety and Health Program, including training certification, medical examinations, and personal protective equipment.

- Perform preliminary evaluation of new lab procedures/projects and/or substantive changes in these procedures to make an initial assessment of safety and health requirements.

- Ensure that personal protective equipment and clothing are issued, maintained, and replaced when needed.

- Ensure that personnel are trained and medically monitored as required by this manual.

- Ensure that all training certificates, medical examination reports, and other pertinent safety and health documentation are maintained in a central Lab Safety and Health file.

<u>Purchasing Specialist</u>

- Maintenance of up-to-date file of MSDS and Chemical Inventory List for each chemical used in Lab. Request MSDS for all new chemicals added to the Chemical Inventory List.

III. BASIC RULES AND STANDARD OPERATING PROCEDURES FOR LABORATORY TASKS INVOLVING CHEMICALS

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A. GENERAL RULES APPLICABLE TO ALL EA LABORATORIES

The following sections describe general operating conditions within the laboratory, including use of laboratory accessories and equipment and basic rules for laboratory tasks involving hazardous chemicals.

1.0 Rules for Handling Glassware

1.1 Discard broken, chipped or badly scratched glassware. Use gloves when sweeping up broken glass. Do not use bare hands. Pick up fine glass particles with wet paper towelling. Dispose of debris properly.

1.2 Fire polish tubing and rods to remove any sharp edges.

1.3 Protect hands with gloves or a towel when inserting tubing into stoppers. Lubricate the tubing with water or glycerine. Keep hand on tubing close to the stopper and out of line with the end of the tube.

1.4 Use ceramic/wire gauze when heating glass vessels over a hot plate. Heat only "Pyrex" glassware. Use towels, tongs or gloves to pick up hot glassware.

1.5 Do not attempt to catch falling glassware.

1.6 Large glass bottles filled with liquid break readily when dropped even a half inch to a hard surface. Large bottles filled with a dense liquid may break quite readily while carrying. If where is such a likelihood, provide a cork or rope mat to cushion the landing. Carts are recommended for handling large filled bottles. Bottles must be placed in a metal pan with sides when transported on a cart--never transport them by hand. Carts should be equipped with brakes.

1.7 Pressure or Vacuum: All glassware for use under vacuum or pressure or for heating must be carefully inspected for flaws and fracture lines, such as the star-shaped flaws produced by dropping a stirrer against a bottom of the container. These flaws are sometimes difficult to detect.

1.8 Positive pressure of more than a few pounds within glass vessels is more hazardous than a vacuum. Never apply a positive pressure of more than 5 psi to any glassware.

1.9 Guards or shields must be provided for any glass apparatus subjected to either pressure or vacuum.

1.10 Use only heavy-wall Pyrex glassware for vacuum or pressure work. Round-bottom containers are stronger than those with flat bottoms.

2.0 General Guidelines

2.1 Maintain benches in a clear and uncluttered condition for maximum efficiency and safety during operations. Limit laboratory traffic through the work area.

2.2 Periodically inspect and clean out freezers, dry ice chests, lab benches, trays, cabinets, and refrigerators to remove any broken or out-of-date ampules, tubes, etc. Use rubber gloves during cleaning and decontaminate before disposal. Any hazardous waste must be placed in the temporary waste disposal facility.

3.0 Compressed Gasses/Compressed Gas Cylinders

3.1 Compressed gases present unique problems in that they have the potential for creating a simultaneous exposure to both physical and chemical hazards. Additional hazards can arise from transporting the cylinders from one location to another. If a cylinder should fall the valve may shear off. In that case, the cylinder will become a dangerous projectile due to release of pressure. This can cause severe personal and property damage.

3.2 Bulk storage of Argon and Nitrogen is maintained in a fenced outside storage area. Gas cylinders, which are also maintained in a separate fenced area, must be transported only on hand trucks designed for that purpose and the cylinders must be secured during transportation. Any defective cylinders must be removed from laboratory area promptly and the supplying vendor notified immediately.

3.3 All cylinders used in the lab must be secured from falling over and protected from excessive heat. Compressed gas cylinders may be used only when equipped with a reduction valve. Cylinders containing liquefied gas may be used only when equipped with a regulation valve (needle valve). With strongly oxidizing gases (e.g., oxygen), fittings and gaskets must be kept free of oil, grease, or glycerine. Similarly, oily cloths or rags must not be used for cleaning (explosion hazard). Precautions must be taken to prevent blowing back or sucking back of liquid or chemical into the cylinder, e.g., use safety-wash bottles or non-return valves. Flexible tubing connections must be secured with hose clamps against displacement. Gas cylinders must never be heated with an open flame, and may in any case not be heated above 40 C. The shutoff valves of cylinders which are empty or not in use must be kept closed, and the valve covers must be secured.

B. BASIC RULES FOR LABORATORY TASKS INVOLVING HAZARDOUS CHEMICALS

There is rarely any knowledge concerning the hazardous properties of the samples received in the laboratory. It is therefore mandatory to ASSUME ALL SAMPLES ARE HAZARDOUS IN SOME WAY. This includes the possibility of physical, biological, and chemical hazards.

2.0 Floors: Floors must be stripped clean, free of stains, and composed of material that is able to withstand the demands of the area in which it is placed. Broken floor tiles must be removed and replaced. Spills must be cleaned up immediately. The area under benches, tables, and chairs must be swept routinely. Floors must be clear of miscellaneous material such as stoppers, vials, etc., and routinely cleaned of such debris while work is in progress.

3.0 Hallways: Hallways must be clear of obstructions and products. Extraneous debris such as papers, stoppers, vials, etc., must be removed immediately. The hallways are not to be used as storage areas.

4.0 Fume Hoods: Fume hoods must have an adequate flow rate satisfying the requirements of the area. In areas where solutions are volatilized, filters must be present in the air vents and these filters routinely maintained.

5.0 Doors: Doors must be functional and closed where required.

6.0 Laboratory Furniture: Benches, stools, and chairs should give a neat appearance and should be free of excessively chipped paint. Bench tops must be clean and spills immediately wiped up.

7.0 Storage Areas: Boxes must be closed and neatly stacked. There shall be no storage on carts, rollers, or work benches. All items must be stored in a neat and well organized manner in an area designated as a storage area.

8.0 Trash: Trash shall only be collected in a designated area where it can be removed from this area without being transported through the main work area. All trash receptacles must be covered. Trash carts must be routinely cleaned (for example, weekly).

9.0 Light Fixtures: Inoperable light bulbs must be replaced. All areas must have adequate lighting. Cracked covers on light fixtures must be replaced. Light fixtures should not detract from the area's appearance.

10.0 Miscellaneous Equipment: Furniture must be compatible with the area in which its use is intended. Equipment requiring certification must have updated labels indicating the current status: (for example, fume hoods). Items such as trays, bottle racks, etc., should be clean and give a neat and orderly appearance. Refrigerators, freezers, and other equipment must be clean internally and externally. The exterior and tops of cabinets must be clear of dirt and debris. Equipment such as rollers and work carts must not have excessively chipped paint and be free of dirt and debris. The surface of each instrument must be cleaned and polished routinely; particular attention must be paid to the stainless steel portion of the instruments.

11.0 Large Equipment: For example, autoclaves, analytical instruments, etc., must give a neat and orderly appearance. Preventative and corrective maintenance must be performed and indicated in a log book attached to the apparatus.

12.0 Signs: Where it is necessary to post signs, they must be of a permanent nature and not paper which easily deteriorates with time and use.

13.0 Windows: Windows must be cleaned routinely, properly sealed, and not cracked or broken.

14.0 Plumbing: Must be functional, the exterior clean, and located where it will not interfere with the workflow.

D. VENTILATION

1.0 General Practices: Exhaust hoods will be used for all operations which may result in the release of toxic gases, vapors, fumes, or mists.

Materials stored in hoods will be kept to a minimum; these items must not block vents or air flow.

The hood will be left on when it is not in use if toxic substances are stored in it or if laboratory general ventilation is not adequate otherwise.

2.0 System Design: Following are features of the HVAC systems designed to ensure the safety of occupants and the prevention of sample contamination:

2.1 All fume hood exhaust fans are monitored by differential pressure switches such that, upon fan failure, an alarm condition is annunciated both audibly and visually at the hood location. Operating policy provides for the proper actions of occupants upon the occurrence of an alarm condition at any hood. Upon alarm condition at a fume hood:

- If either sash is above 3 in. open, close the sash fully and reset the alarm. (If the alarm is now cleared but re-alarms when the sash is raised above 3 in. it is not safe to operate the hood in the fully opened position.)

- If neither sash is above 3 in. open, or if alarm does not clear as described above, stop operations in the fume hood and close the sash(es).

2.2 All exhaust fans are supplied with emergency power.

2.3 All supply and return fans associated with the air handlers that serve laboratories are supplied with emergency power.

2.4 The air systems for laboratories were designed and balanced to provide proper pressurization for each room.

2.5 The Organics VOA laboratory is supplied with 100 percent outdoor air to prevent contamination of samples or analytical procedures by means of return air from other laboratories.

2.6 Air from the Extractions laboratory is completely exhausted to prevent contamination of samples in other laboratories.

2.7 To further protect samples, the lay-out of return air paths to various air handlers was designed to prevent the possible cross-contamination of supply air by different laboratories.

2.8 All fume hoods have the maximum amount of air exhausted from them whenever any sash is higher than 3 in. above the fully closed position, ensuring the safety of operating personnel.

2.9 Exhaust air from fume hoods cannot be turned off, unless they are specifically designated as hoods that are not normally used; EA policy provides that such hoods should only be turned off when they are not in use.

Records will be kept by the Safety and Health Coordinator, EA Laboratories to document that EA's facilities and precautions are compatible with current standards and regulations.

VIII. PERSONAL PROTECTIVE EQUIPMENT

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Safety glasses are required to be worn by employees and visitors in the entire work area of EA Laboratories. In addition, all employees are provided with laboratory coats and are required to follow and conform to the specified laboratory dress policy. Specific procedures are identified by each supervisor which require use of specific types of gloves, and other protective measures, depending upon the nature of the work activities.

Employees involved in Preparation Analysis and Processing of Raw Sewage Samples in the Laboratory have been furnished a specific "Job Hazard Analysis" which describes potential hazards and protective measures (including medical inoculations) that are required for this work (Appendix D). Employees involved in disposal of hazardous waste must follow the specific SOP (See SOP-EAL-075-2 and 074-0) and utilize required personal protective equipment as indicated, including respirators. All personal protective equipment practices are handled by EA Laboratories Safety and Health Coordinator in conjunction with EA Corporate Safety and Health Officer.

All new employees are provided with one (1) pair of eyeglasses at no charge. If the glasses are lost or damaged, the employee must pay the cost of replacement. All visitors to the laboratory (either EA employee, client, maintenance contractor, or regulatory official) must wear visitors glasses.

IX. MEDICAL CONSULTATION AND EXAMINATIONS

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A. CONDITIONS UNDER WHICH MEDICAL EXAMS ARE PROVIDED

1.0 EA shall provide all employees who work with hazardous chemicals an opportunity to receive medical attention, including any follow-up examinations which the examining physician determines to be necessary, under the following circumstances:

- Whenever an employee develops signs or symptoms associated with a chemical to which the employee may have been exposed in the laboratory.
- Where exposure monitoring reveals an exposure level routinely above the action level (or in the absence of an action level, the PEL) for an OSHA regulated substance for which there are exposure monitoring and medical surveillance requirements.
- Whenever an event takes place in the work area such as a spill, leak, explosion or other occurrence resulting in the likelihood of a hazardous exposure. In this case, medical consultation is offered to the employee to determine the need for a medical examination.

2.0 All medical examinations and consultations shall be performed by or under the direct supervision of a licensed physician and shall be provided without cost to the employee, without loss of pay, and at a reasonable time and place. Medical records will be retained by EA in accordance with the requirements of State and Federal regulations.

3.0 Currently, Employees who are involved in the processing of raw sewage samples are provided routine inoculations as a preventive measure.

4.0 Employees assigned to work in the Hazardous Work Storage Shed received a baseline physical examination, which includes assessment of their ability to wear respiratory protection.

B. INFORMATION PROVIDED TO THE PHYSICIAN

EA shall provide the following information to the physician:

- The identity of the hazardous chemical(s) to which the employee may have been exposed.
- A description of the conditions under which the exposure occurred including quantitative exposure data if available.
- A description of the signs and symptoms of the exposure that the employee is experiencing, if any.

C. PHYSICIAN'S WRITTEN OPINION

Upon completion of each medical exam or consultation, EA shall obtain a written opinion from the examining physician which shall include the following:

- Any recommendation for further medical follow-up.
- The results of the medical examination and any associated data.
- Any medical condition which may be revealed in the course of the examination which may place the employee at increased risk as the result of exposure to a hazardous chemical found in the workplace.
- A statement that the employee has been informed by the physician of the results of the consultation or medical examination and any medical condition that may require further examination or treatment. The physician's written opinion shall not reveal specific findings of diagnoses unrelated to occupational exposure. Any further tests or medical follow-up recommended by the physician must be approved by the CSHO and the EA Labs Vice President <u>prior</u> to being conducted.

X. EMERGENCY ACTION PLAN

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A. ACCIDENTS

1.0 Minor Injuries

Minor injuries may be treated by personnel trained in first aid (certification from an approved course).

2.0 Chemical Burns

For eye contact: Promptly flush eyes with water for a prolonged period (15 minutes) and seek medical attention.

For ingestion: Encourage the victim to drink large amounts of water.

For skin contact: Promptly flush the affected area with water and remove any contaminated clothing. If symptoms persist, seek medical attention.

3.0 Injuries Requiring Medical Attention

In case of injuries requiring a doctor's treatment, the employee will be transported in the company of an employee trained in first aid to the local hospital emergency room. In the case of serious injuries, an ambulance will be summoned.

4.0 Accident Reporting

The supervisor shall report all industrial accidents or health problems to the Safety and Health Coordinator using the Supervisor's Accident Investigation Report which is obtained from the Administrative Assistant. Supervisor and the Safety and Health Coordinator, together with members of management as required, shall investigate reported accidents, taking corrective action as necessary to prevent recurrence.

5.0 Workers' Compensation

Employees who sustain an occupational injury or illness may be compensated in accordance with the State Workers' Compensation Act. In order to apply for such benefits, the appropriate notification and medical reports must be provided by the employee. See the Administrative Assistant for copy of necessary forms.

B FIRE PROCEDURES

1.0 FIRE PREVENTION

1.1 Authority and Responsibility

The EA Laboratories Safety and Health Coordinator (SHC) will be responsible for organizing, directing, and monitoring this plan and ensuring adherence to the plan.

1.2 Specific Responsibilities of the SHC include:

1.2.1 Act as liaison with the insurance carrier to make sure that requirements and recommendation of the carrier are implemented.

1.2.2 Maintain contact with the local Fire Department on a regular basis to insure that they are familiar with the lab operations and lay-out, and can provide fire prevention and suppression services as needed.

1.2.3 Identify any fire hazards as they enter the laboratory, particularly the use of new materials.

1.2.4 Ensure that all employees involved in the use, storage, and disposal of flammables are properly trained, and have the proper equipment at their disposal.

1.2.5 Work with the local Fire Department, insurance company and contractors to maintain fire suppression systems such as fire alarms and fire extinguishers.

1.2.6 Periodically inspect the facility to insure that this plan is carried out. Of particular interest are the following items:

- Housekeeping
- No smoking policy
- Proper materials handling for fire prevention
- Facility access

1.2.7 Train employees and/or their supervisors about the fire prevention plan and evacuation drills.

1.2.8 Identify any and all possible ignition sources.

1.2.9 Keep records of all inspections.

2.0 General Precautions

2.1 Good housekeeping, proper storage and handling of combustibles, observance of smoking regulations, and fire inspections are essential for effective fire prevention.

2.2 Every individual shares a like responsibility to constantly guard against conditions that could become fire hazards.

2.3 In situations not covered by this handbook or other specific regulations, the National Fire Code will be used as a guide.

3.0 Cleanliness and Housekeeping for Reduction of Fire Hazards

3.1 Dispose of all waste and rubbish at the end of the work day.

3.2 Dispose of solvent-soaked cloth, spill control products and other combustible waste in approved self-closing fire-resistant containers.

3.3 Temporarily store large quantities of combustible wastes that cannot be removed immediately from the building, in isolated, fireproof storage cabinets.

3.4 Do not store combustible material near the building. Keep areas around buildings free from debris and rubbish.

3.5 Keep work areas neat; do not let materials and waste accumulate.

3.6 Aisles should be semi-permanently designated. Debris and all trash will be removed from aisles on a daily basis to keep the aisles free.

3.7 Materials and equipment will be stored in an orderly manner so evacuation routes are not blocked.

3.8 Aisles to all fire protection equipment and means of egress will be kept open and free from tripping hazards. Access to fire extinguishers will be unobstructed at all times.

4.0 No Smoking Policy

. EA Laboratories has been designated as a non-smoking building.

5.0 Identified Potential Fire Hazards

5.1 Flammable Liquids - Fire and Explosion Dangers

5.1.1 OSHA considers any chemical with a flash point below 100 F a flammable substance. A liquid heated to its flash point will produce flammable vapor which can then be ignited by ignition sources such as electrical static and friction sparks, or flames. OSHA established 100 F as the upper limit of flammability for the clasification of flammable liquids because outdoor air temperatures can be expected to reach 100 F on occasion. The following list represents the most obvious potential for hazards at EA Laboratories.

- Acetone
- Hexane
- Acetylene
- Acolein
- Acrylonitrile
- Benzene
- Benezoyl Peroxide
- Calcium Carbide
- Ethyl Ether
- Lithium Aluminum Hydride
- Methanol
- Potassium
- Pyridine

5.1.2 Flammable liquids of themselves do not burn; however, their vapors mixed with air are highly combustible. These vapors, when ignited, burn so rapidly that an explosion may result.

5.1.3 Vapors of volatile liquids collect above the liquid; the higher the temperature above the flash point, the greater will be the accumulation of vapors. If the container is open, the vapors will rise (if lighter than air) and mix with the air near the ceiling. Vapors heavier than air will spill over the edge of the container and sink to the ground. In both cases, the vapors are continuously mixing with air. These vapors-air mixtures are not necessarily restricted to the area of the container. Gasoline vapors, for instance, have been carried considerable distances from their containers and ignited by a spark or a cigarette. Therefore, when such vapors exist, there is always a fire and explosion hazard. Even relatively small amounts of flammable liquids, vaporized and mixed with proper quantities of air, can inflict considerable damage. For example, a gallon of gasoline when vaporized into a 1.4 to 7.6 percent mixture in air can wreck a sizable building.

5.1.4 The following precautions shall be taken by users of flammable liquids:

- Always use the least amount of flammable liquid for cleaning that will serve the purpose; never use gasoline for cleaning.
- Store all flammable liquids in proper flammable storage cabinets or safety cans.
- As required by OSHA 1910.106(d) (2) (iii) (a) in areas of their use all class IA & IB flammable liquids (flash point below 73°F) will be stored in approved, labeled metal safety cans with the following exceptions.
  - Class IA flammable liquids, (flash point below 73°F and boiling point below 100°F) may be stored in appropriately labeled glass or plastic containers no larger than 1 pint in size.

- Class IB flammable liquids (a flash point below 73°F and a boiling point above 100°F) may be stored in appropriately labeled glass or plastic containers no larger than one quart in size.

- All flammable liquids stored in areas of use will be stored in flammable storage cabinets meeting the requirements of NFPA-251-1969.
- Bond and ground all equipment that might produce a spark (electrically, by friction, etc.) in areas where flammable chemicals are used.
- Conspicuously post open-flame regulations in areas of flammable liquids. Since EA is a totally "smoke free" company, "No Smoking" signs are not required.
- Equip internal combustion engines with spark arresters when used in areas subject to flammable vapors.
- Tanks, containers, and pumping equipment (portable or stationery) used to store or transfer flammable liquids must meet the requirements of the National Fire Protection Association.
- Rubbish, grass and other combustible material will not accumulate where flammable liquids are stored, handled, or processed.
- All flammable liquids will be shipped in containers approved for such materials and in accordance with Department of Transportation regulations.
- Provide metallic contact for grounding between tanks, hoses, and containers while flammable liquids are being transferred.

Proper Spill Clean-up and Waste Disposal

5.1.5 Spill Control Products will be available in all locations where flammable liquids are used or stored in case of a spill. Small spills will be cleaned up immediately using adsorbent materials. Solvent-soaked spill control products will be placed in covered drums that will be placed in an approved self-closing fire resistant container that will be collected at the end of the day, and placed in a specified container in the hazardous waste storage area.

5.2 Electricity as a Fire Hazard

5.2.1 Defective electrical wiring, sparks from electrical apparatus that is not explosion-proof, and fires in lab safety hoods are some leading causes of laboratory fires.

- Overloading electrical circuits--particularly multiple-socket installations--causes overheating which can develop into a mushrooming fire.
- Electrical outlets for lab hoods should be placed outside the hood, where feasible, so they will not corrode and become a hazard.

5.2.2 Sparks from electrical apparatus that have not been explosion-proofed and heat from lamps not equipped with explosion-proof enclosures often ignite volatile vapors. Resultant fires generally develop so fast, they may cause explosions. The safest technique is to use small volumes of material and to shut off all electrical equipment that is not explosion-proof before working with ethers or hydrocarbons in general, and other inflammable liquids solids or gases.

5.3.0 Procedure in the Event of Fire or Evacuation

5.3.1 Notify the supervisor, or department manager, and Operator (O) immediately.
5.3.2 The Operator will call the Fire Department and notify the SHC.
5.3.3 Locate and pull the manual fire alarm boxes.
5.3.4 Evacuate the area according to the route displayed on the floor plan in your area.
5.3.5 If it can be done safely and without personal risk:

- Shut off power machines and fans and stop all other spark-generating activities.
- Turn off all natural gas services and any compressed gas cylinder tanks.

5.3.6 Personnel trained in the use of fire extinguishers may fight small localized fires.
5.3.7 Walk, do not run, to the designated emergency exit.
5.3.8 Meet you supervisor/department manager at the designated location. Attendance will be taken to account for all personnel.

6.0 Classes of Fire

6.1 The use of the proper type of extinguisher for each class of fire will give the best control of the situation and avoid compounding the problem.
6.2 The classification of fires given here is based on the type of material being consumed.

- Class A Fires (for wood, paper, textiles, and similar materials): Use foam, water pumps, dry chemical or almost any kind of extinguisher on fires of this class.

- Class B Fires (for grease, oil, paint, and related materials): Use foam, dry chemical or Halon liquid extinguishers.
- Class C Fire (all fires in electrical equipment and in areas where lie electricity is present should be treated as Class C fires): Use carbon dioxide, dry chemical or Halon extinguishers only. Avoid becoming a part of the circuit.
- Class D Fires: Fires involving magnesium, aluminum, zinc, zirconium, lithium, sodium, potassium or metal hydrides should be smothered with fine dry soda ashes, sodium chloride, sand or graphite.

6.3. Fire Extinguisher Ratings

Underwriters Laboratories, Inc., has established ratings for portable fire extinguishers. A letter (letters) on the label refers to the class (or classes) of fire on which the extinguisher is most effective. A numeral indicates the relative fire extinguishing potential of the extinguisher, as well as the approximate square foot areas of a fire which an average operator can extinguish.

7.0 Fire Suppression System

7.1 Fire Walls - The building has been constructed with one (1) hour rated fire walls which divide the building into several smaller areas. This isolates the Laboratory areas from the general office areas and certain Laboratories such as extractions from each other. Critical areas such as the electrical system, warehouse and penthouse are also isolated with one hour fire walls.

7.2 A system of fire extinguishers (ABC and Halon) have been placed throughout the facility. The fire extinguishers will be checked annually by a Contractor. Proper extinguishers have been supplied to appropriately suppress the type of fire likely to occur. Fire alarms will be tested on a regular basis and a record of the test will be kept. This procedure will also be performed by an outside Contractor. The SHC will coordinate annual instruction in the proper use of the supplied fire extinguishers. This training will be provided for designated company employees.

7.3 Fire extinguishers are to be used only by personnel trained in their use to control small, localized fires.

7.4 Recharge the fire extinguisher after any use. A partially used one might as well be empty. Notify the Safety and Health Coordinator if any fire extinguisher are used or accidently discharged.

7.5 Extinguishers should be installed away from potential fire hazards near exits and escape routes.

8.0 Training And Evacuation Drills

8.1 Training

- All employees will be trained regarding all aspects of this policy. Of particular importance for this training program are the proper housekeeping requirements and routes of evacuation. A fire emergency action plan will be available for review by all employees and will be posted by fire exits.
- It is the responsibility of the SHC or alternate to implement this training program. Each employee will be trained prior to placement on the job and annually thereafter. This process will be supervised by the SHC.
- Designated employees will be trained in use of fire extinguishers once per year. This process will be supervised by the SHC.

8.2 Evacuation Drills

An evacuation drill, which will include a written evaluation to be completed by the SHC and each alternate will be carried out annually at an unannounced time.

C. EMERGENCY RESPONSE

1.0 Authority and Responsibility

There will be, at all times, at least one employee on the premises or on call with the responsibility for coordinating an emergency response. This person will thoroughly familiar with all aspects of the contingency plan, the facility, the locations and characteristics of chemicals and waste handled, the location of all records within the facility and the facility layout. This person will have the authority to commit resources as necessary.

The primary Emergency Coordinator will be:

Robert D. Lentz
7 South Main Street
Railroad, PA 17355
Phone Numbers
Office: (301) 771-4920 X315
Home: (717) 235-0695

Alternate Emergency Coordinators will be (in order in which they assume responsibility):

1) Gary R. Smith
   P.O. Box 836
   Sparks, MD 21152
   Phone Numbers
   Office: (301) 771-4920 X317
   Home: (301) 527-8840

2) Robert S. Runkle
   448 Five Farms Lane
   Timonium, MD 21093
   Phone Numbers
   Office: (301) 771-4920 X310
   Home: (301) 561-5204

Arrangements will be made to familiarize police and fire departments and emergency response teams with:

1) the layout of the facility,
2) the properties of the hazardous materials/waste handled at the facility,
3) places where personnel will normally be working,
4) entrances to roads,
5) evacuation routes.

2.0 Initial Response

The initial response to any emergency will be to protect human health and safety and then the environment. Identification, containment, treatment, and disposal assessment will be the secondary response.

In the event of a major emergency (ventilation failure, chemical spill, etc.) the person(s) discovering the problem is/are responsible for providing initial defensive actions <u>without undue risk of personal injury</u>.

2.1 The following actions will be implemented as necessary. The order of actions will depend on existing conditions.

- Initiate evacuation, if necessary.
- Notify Fire Department, if necessary.
- Notify Emergency Coordinator.
- Make spill scene OFF LIMITS to unauthorized personnel.
- Restrict all sources of ignition when flammable substances are involved.

- Report to Emergency Coordinator upon arrival.

Small spills of routine laboratory chemicals of low toxicity in the laboratory or in the Hazardous Waste storage area may be contained and/or cleaned up by trained personnel provided with the appropriate spill control and personal protective equipment. Larger spills or spills of toxic, reactive, explosive or carcinogenic materials will require outside assistance. In this case, the facility will be evacuated immediately.

2.2 When notifying the Fire Department of a spill occurrence, the following information should be provided if known or can reasonably be determined.

- Name of individual reporting spill
- Location of individual reporting spill
- Number of injured personnel and nature of injuries (if applicable)
- Substance spilled
- Amount of spill (estimated)
- Rate material currently spilling (estimated)
- Time spill occurred (estimated)
- Extent which spill has traveled
- Any additional pertinent information (i.e., other potential hazards)

2.3 Personnel other than Fire Department receiving reports of spills shall aid in channeling the report to the Fire Department who will respond as outlined.

2.4 The Emergency Coordinator will report to scene of spill immediately upon notification and in conjunction with Fire Department personnel, evaluate the severity of the situation and determine the necessary response.

2.5 The Emergency Coordinator will immediately identify the character, source, amount, and the extent of any released materials. This identification will be made by observation or review of facility records or manifests and, if necessary by chemical analysis. Generally, the contents of a hazardous waste container can be determined through a check of the operating record. Laboratory personnel will be able to identify spilled materials in the lab.

3.0 Implementation of the Contingency Plan

3.1 The decision to implement the contingency plan depends upon whether or not an imminent or actual incident could threaten human health or the environment. The purpose of this section is to provide guidance to the Emergency Coordinator in making this decision by providing decision-making criteria.

The contingency plan will be implemented in the following situations:

a) Fire and/or Explosion

1) A fire causes the release of toxic vapors.

2) The fire spreads and could possible ignite materials at other locations onsite or could cause heat-induced explosions.

3) The fire could possible spread to offsite areas.

4) Use of water or water and chemical fire suppressant could result in contaminated runoff.

5) An imminent danger exists that an explosion could occur, causing a safety hazard because of flying fragments or shock waves.

6) An imminent danger exists that an explosion could ignite other hazardous waste at the facility.

7) An imminent danger exists that an explosion could result in the release of toxic material.

8) An explosion has occurred.

b) Spills or Material Release

1) The spill could result in the release of flammable liquids or vapors, thus causing a fire or gas explosion hazard.

2) The spill could cause the release of toxic liquid or vapors.

3) The spill can be contained onsite, but the potential exists for ground-water contamination.

4) The spill cannot be contained onsite, resulting in offsite soil contamination and/or ground or surface water pollution.

c) Floods or Other Natural Disasters

The potential exists for surface water contamination.

3.2 Should one of these situations occur, the Emergency Coordinator will 1) activate the internal alarm or communication system to notify all facility personnel (if this was not previously done), and 2) notify appropriate State or local agencies with designated response roles. (see Table I.)

The Emergency Coordinator will, with assistance from other response personnel, assess the possible hazards to human health or the environment that may result from the incident. This assessment will address both direct and indirect effects, such as the effects of toxic, irritating or asphyxiating gases; or the effects of any hazardous surface water runoffs from water or chemical agents used to control fire and heat-induced explosions.

3.3 If it is determined that human health or the environment outside the facility is threatened, the Emergency Coordinator will notify appropriate local authorities that the hazard assessment indicates that evacuation of local areas may be advisable. The Emergency Coordinator will be available to assist in this decision.

The Emergency Coordinator will immediately notify either the government official designated as on-scene coordinator for the geographical area or the National Response Center (using their 24-hour toll free number, and the State's number). This report will include:

- (i) Name and telephone number of reporter
- (ii) Name and address of facility
- (iii) Time and type of incident
- (iv) Name and quantity of materials involved to the extent known
- (v) The extent of injuries, if any, and
- (vi) The possible hazards to human health or the environment outside the facility.

3.4 The Emergency Coordinator will ensure that all reasonable measures necessary to ensure that fires, explosions and releases do not occur, recur, or spread to other hazardous wastes or materials at the facility are taken. This will include collecting and containing released material and removing or isolating containers.

3.5 After an emergency, the Emergency Coordinator will provide for treating, storing, or disposing of recovered wastes, contaminated soil, or any other material that results from an incident at the facility.

3.6 The Emergency Coordinator will ensure that:

- No incompatible waste is treated, stored or disposed of until cleanup is complete.

- Emergency equipment is clean and fit for use before operations are resumed.

- Required notifications of the incident and clean-up operations are made to local, State, or Federal authorities.

4.0 Evacuation Plan

An evacuation plan with designated exit routes has been established for the facility. This map is posted in each work area and at each exit. A copy of the Emergency Evacuation Plan is included in Appendix F.

5.0 Copies of Contingency Plan

A copy of the Contingency Plan will be maintained at the facility, and will be reviewed annually. It will be amended as needed.

TABLE I

EMERGENCY RESPONSE CONTACTS

Fire Department:		Dial 911 and identify to operator type of problem and location. Operator will dispatch nearest unit, depending upon availability.
Police Department:		
Local Emergency Response:		
Hospital:	GBMC	828-2000
	St. Joseph's	337-1000
State Emergency Response:		(301) 974-3551 (Note that although this telephone number is answered 24 hours/day, after 5:00 pm until 8:00 am weekdays or on weekends, there may be 5-10 rings before someone answers phone.)
National Response Center:		800-424-8802 (24-hour toll free number)
ChemTrec: (Chemical Transportation Emergency Center)		800-424-9300 (24-hour hot line)

XI. WASTE DISPOSAL

XI. WASTE DISPOSAL

A. General Instructions

1.0 At all times, the EA Laboratories approved chemical waste disposal service shall be used. Some chemicals can be safely disposed of in the laboratory under the direction of a supervisor. All disposals must have the prior approval of the EA Laboratories Safety and Health Coordinator.

2.0 All quantities of organic solvents (flammable or non-flammable) must be placed in approved safety containers within the Laboratory prior to transfer to the Hazardous Waste Storage Shed. THESE MUST NOT BE DISPOSED DOWN THE DRAIN AT ANY TIME. (See EAL-SOP-075-2, 018-1, 066-0, 068-0, etc.)

B. Corrosive Liquids

In all cases, EA Laboratories approved disposal service will be used for corrosive liquids containing hazardous substances. Other non-contaminated acids and alkalies may be carefully neutralized and flushed down the drain with an abundance of water. Great care should be taken in disposing of fuming or concentrated sulfuric acid to prevent water from splashing into the bottle and causing a violent reaction. Disposal services are arranged and managed by EA Laboratories Safety and Health Coordinator.

C. Sample Disposal

Environmental samples received by the laboratory are disposed of according to the procedures outline in EAL-SOP-018-1. Samples which prove to be of a hazardous nature are disposed of by EA Laboratories approved disposal service.

D. Carcinogen Disposal

Carcinogenic material such as certain Laboratory standards or samples shown to contain carcinogens will be handled in the same manner as all hazardous materials. These will be disposed of by the EA Laboratories approved disposal service.

XII. EVALUATION OF CHEMICAL HYGIENE PLAN EFFECTIVENESS

XII. EVALUATION OF CHEMICAL HYGIENE PLAN EFFECTIVENESS

The policies of EA Laboratories require a variety of record keeping concerning accidents, maintenance/breakdown of equipment, safety and quality audits and external inspection by a variety of federal and state regulatory agencies. In addition, the EA Laboratories Safety and Health Coordinator, the Corporate Safety and Health Officer and the Corporate Hazardous Waste Coordinator make periodic unannounced audits of EA Laboratories and perform an annual/review/update of the Chemical Hygiene Plan and make recommendations to the Vice President of EA Laboratories for necessary changes. The function and responsibility of the EA Laboratories Safety and Health Coordinator includes submission of semi-annual reports to the Vice President of EA Laboratories identifying general state of safety practices, including accident trends, training activities conducted, and any specific recommendations to improve effectiveness of EA Laboratories overall safety and hygiene program.

XIII. RECORDKEEPING REQUIREMENTS

XIII. RECORDKEEPING REQUIREMENTS

A. Accidents:

All injuries and accidents are reported immediately to the supervisor of the injured employee. The supervisor completes an Accident Investigation Report in accordance with instructions contained in the EA Safety and Health Program Manual, EA Manual SHP-001. These reports are forwarded to the Corporate Safety and Health Officer within 24 hours of the incident's occurrence. Employees also must complete the Standard Form for Employer's First Report of Injury or Illness with EA Personnel Department within 3 days of the incident. The Administrative Assistant for EA Laboratories insures that the Bureau of Labor Statistics Log and Summary of Occupational Injuries and Illnesses, OSHA form 200 is maintained as required.

B. Hazard Communication

The written Hazard Communication Program, Material Safety Data Sheets, and the Chemical Inventory List will be maintained and updated in accordance with Federal and State of Maryland requirements by Purchasing Specialist, EA Laboratories, Chief Chemist and the Vice President of EA Laboratories.

C. Exposure Monitoring

Monitoring conducted of any employee's exposure to toxic substances will be documented. These records will be maintained by the Corporate Safety And Health Officer in accordance with Federal Standards (29 CFR 1910.20).

D. Medical Consultation and Examinations

Records will be maintained of any medical consultation and examinations, including tests and written opinions. These records shall also contain the results of exposure evaluations, including an estimate of the possible extent of overexposure. These records will be kept by the Corporate Safety and Health Officer in accordance with 29 CFR 1910.1450 and 29 CFR 1910.20.

E. Employee Access to Records

Employees and/or their designated representatives will be allowed access to exposure and medical records in compliance with 29 CFR 1910.20.

F. Hazardous Waste Disposal

Hazardous waste disposal records (storage facility inspection reports, manifests, etc.) will be maintained in accordance with Federal and State of Maryland regulations. These records will be the responsibility of the Safety and Health Coordinator, EA Laboratories.

. Facility Inspections

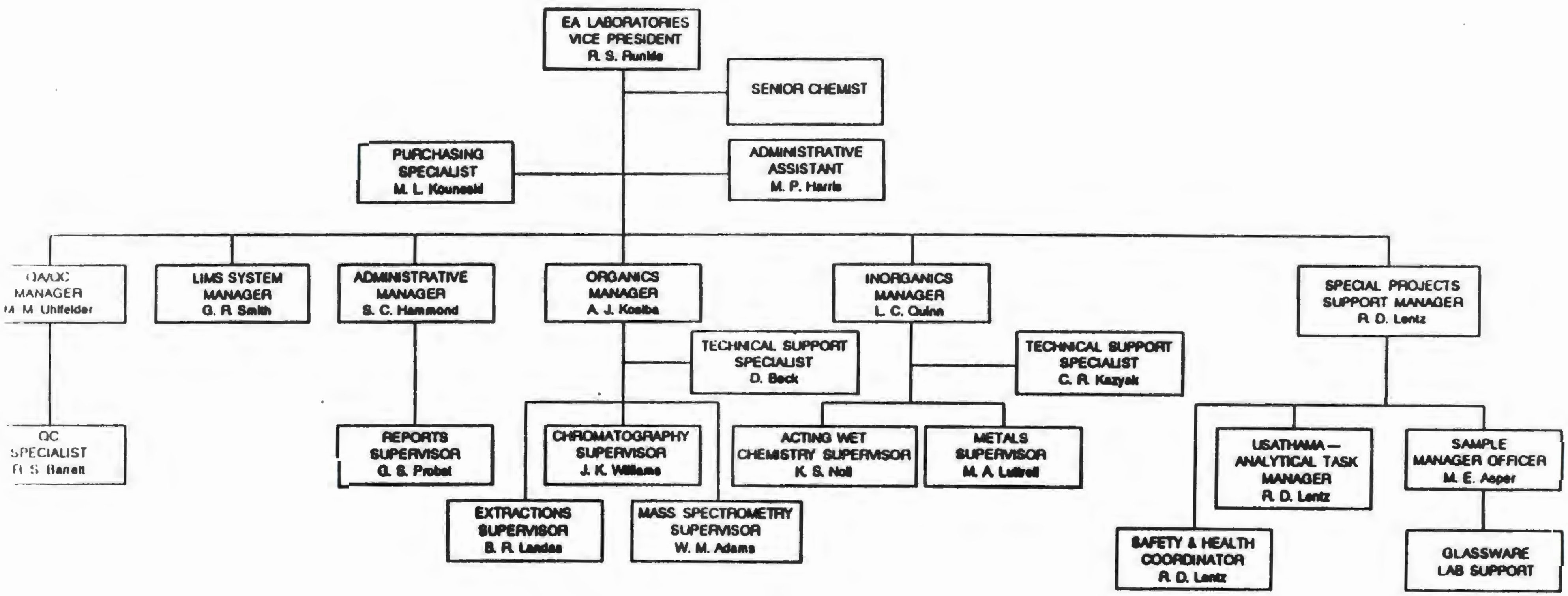
Maintenance of records of any facility inspections, including inspections of fire prevention equipment, safety equipment, or personal protective equipment will be the responsibility of the Safety and Health Coordinator, EA Laboratories.

H. Training Records

Records of all employee training will be maintained by the Administrative Assistant who reports to the Vice President EA Laboratories. Documentation will also be placed in employee personnel files.

APPENDIX A

ORGANIZATIONAL CHART

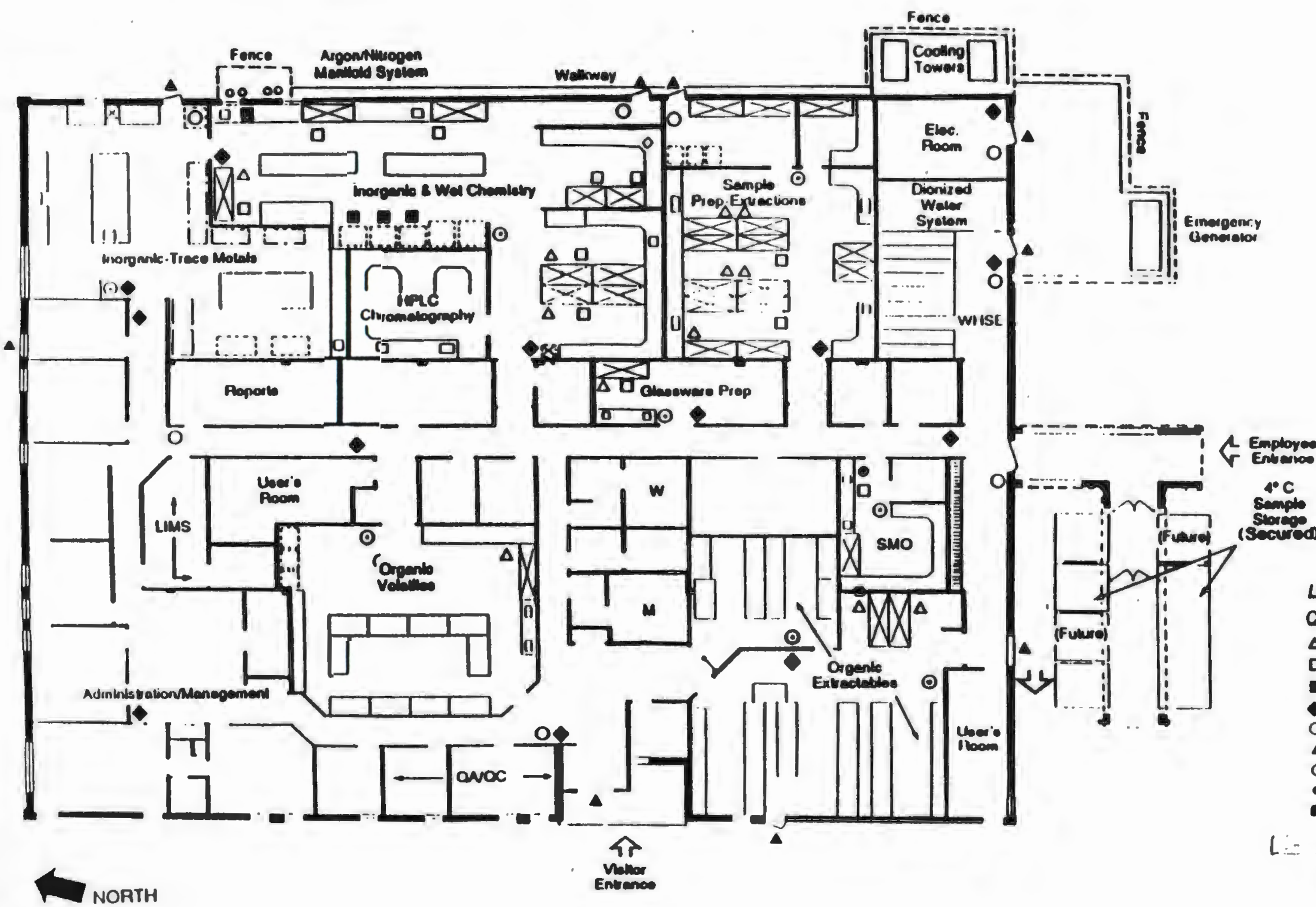


Overall laboratory organization.

APPENDIX B

BUILDING LAYOUT

CHEMICAL HYGIENE PLAN
EA LABORATORIES FLOORPLAN



LEGEND

CHEMICAL HYGIENE PLAN

- △ - Solvent Storage } Under Counter
- □ - Acid Storage } Under Counter
- ■ - Dry Chemical Storage - Floor Mounted
- ◆ - Fire Extinguishers
- ○ - Fire Station (Pull Box)
- ▲ - Emergency Exit
- ⊙ - Emergency Shower & Eyewash
- ● - Emergency Eyewash
- ■ - Audio/Visual Alarm Argon Nitrogen Cylinders - Empty Status
- [ ] - Labconco 8 ft Fume Hood with Auxiliary Air Supply and Guardian Monitor with Audio/Visual Alarm for Airflow Below 105 Lineal Feet per Minute

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APPENDIX C

HAZARDOUS LISTING OF COMPOUNDS

APPENDIX C:

HAZARDOUS CHEMICALS

ACETIC ACID (Glacial) Hazardous with chromic acid and other strong oxidizers. Very corrosive to skin.

ACETONE Hazardous with a mixture of conc H_2SO_4 and HNO_3.

ACETYLENE Hazardous with copper, silver, halogens, mercury.

ACROLEIN Violent action on the eyes.

ACRYLONITRILE (Vinyl Cyanide) Extremely toxic; gives no warning.

ALUMINUM CHLORIDE (Anhydrous) Reacts vigorously with water-forming HCl. Bottles may develop considerable pressure. To open, wrap in cloth, and open behind a shield while wearing leather gloves. Once open, a bunsen valve should be used to exclude moisture but relieve pressure. Hazardous with ethylene. Nitrobenzene is recommended in place of carbon disulfide in Friedel Crafts reactions to minimize explosion possibility.

AMMONIA (Anhydrous) Hazardous with halogens, mineral acids, calcium hypochlorite, and mercury.

ANILINE Hazardous with fuming nitric acid and hydrogen peroxide. Absorbed through skin.

BENZENE More toxic than toluene or xylene because it may produce permanent damage to bone marrow through long-term chronic poisoning.

BENZOYL PEROXIDE Strong organic oxidizer, flammable; explosive if subjected to heat by friction or grinding. Preferably handled and stored with 30 percent water by weight. Hazardous with oxidizable substances (see oxidizers) and inorganic oxidizers. Recrystallization from hot chloroform has resulted in severe explosions. When used as an initiator of reactions with unsaturated hydrocarbons, great care should be taken to restrict the reaction rate and provide adequate means for dissipating the best of reaction. Explosions have occurred while opening bottles.

BROMIDE Hazardous with ammonia, hydrogen, petroleum gases, turpentine, benzene, and metal powders. Small quantity may be disposed of by dissolving in sodium hydroxide solution and pouring into drain with large quantity of water. Glass containers may break if not handled cautiously because of high density. Extremely corrosive.

CALCIUM CARBIDE Liberates acetylene with water.

HYDROFLUORIC ACID Hazardous with ammonia. This is also a reagent to be treated with respect. It causes painful sores on the skin, usually not noticed until the next day. It is extremely irritating to the eyes.

HYDROGEN PEROXIDE The 30-percent hydrogen peroxide used in laboratories is quite a hazardous chemical. It causes severe burns, characterized by a whitening of the skin. In addition, allowing it to dry on organic material such as paper or cloth can lead to spontaneous combustion. It slowly decomposes with evolution of oxygen, requiring the container to be vented. Copper, chromium, iron, other metals and their salts cause rapid catalytic decomposition of hydrogen peroxide. Also hazardous with flammable liquids, aniline, notrobenzene. Many persons, accustomed only to the 3 percent H_2O solution sold in stores, are unaware of these properties of the concentrated solution. Stored quantities should be provided with vent caps.

LEAD COMPOUNDS Embryotoxin. Women of childbearing age should handle only in a hood and while wearing appropriate protective apparel.

LITHIUM ALUMINUM HYDRIDE Hazardous with water. Not safe for drying methyl ethers. Destroy with ethyl acetate.

MAGNESIUM In finely divided form, it liberates hydrogen in contact with water.

MERCURY Hazardous with ammonia, halogens, alkali. Vapors are extremely toxic and cumulative, but fortunately mercury is not very volatile at room temperature. A high degree of cleanliness must be maintained, apparatus containing mercury must be placed under an exhaust hood and in a collecting tray if possible, or at least handle at sites that can be readily cleaned-not where the metal could accumulate beneath benches, lodge in rough floor surfaces such as pipes, hotplates, or ovens. Smoking must be avoided; washing hands and rinsing out mouth is advisable after operation is completed.

Spills must be sprinkled immediately with sulfur or zinc powder and picked up with a capillary tube through a suction flask trap. A penny or a copper wire coated with mercury will pick up minute quantities. Spills on hot surfaces such as with a broken thermometer in an oven must be regarded as extremely hazardous. Shut the oven door, turn off the heat, and leave the room until assured by the Safety Officer that the area is safe to enter. Do not discard mercury into sink. For help in cleaning up gross spillage, call the Safety Office.

METHANOL Known also as wood alcohol or methyl alcohol; death or blindness can be caused by ingestion, respiration, or skin absorption; in contact with the skin, it must be flushed off with a large quantity of water.

NITRIC ACID Hazardous with aniline, hydrogen sulfide, flammable solvents, hydrazine, metal-powders especially zinc, aluminum, and magnesium. Gaseous nitrogen oxides from nitric acid and from other nitrogen-containing compounds can cause severe lung damage and death several days after exposure although they produce little or no discomfort at the time of inhalation. A gas mask must be worn when cleaning up spills. Use caution when cleaning glassware. A slight residue could cause an explosion, inadvertently, when it is allowed to nitrate an organic substance introduced into the newly cleaned container. Acid cleaning mixtures must not contain more than 5 percent nitric acid.

NITROGEN (Liquid) Produces a lower temperature than liquid air or liquid oxygen. Air and oxygen are potentially hazardous and should never be substituted for nitrogen as a coolant. Do not allow a rod or funnel to remain in the thermal type containers because ice formed from vapors may readily block the opening thus creating a potential bomb.

OXALIC ACID Hazardous with silver and mercury.
XIDIZERS (Perchlorates, peroxides, permanganates, persulfates, perborates, nitrates, halogens, chlorates, chlorites, bormates, iodates; conc. Sulfuric, conc. nitric, chromic acids) Hazardous with most metal powders, ammonium salts, phosphorus, finely divided organics such as sugar, flammable liquids, acids, sulfur, sulfides, sulfites.

PALLADIUM-CHARCOAL CATALYST Add organics behind shield in case of ignition.

PERCHLORIC ACID Hazardous with drying agents (extremely sensitive to heat and shock when concentration is raised from 72 percent upward toward 90-100 percent) such as sulfuric acid, acetic anhydride, bismuth compounds, almost all organic matter; a preliminary treatment with nitric acid is recommended to destroy all easily oxidizable material.

PHENOL The same as cresol, they behave not only as skin irritants but as local anesthetics, so that burns may not be felt until serious damage has been done. They can be absorbed through the skin with fatal results. Clothing splashed with phenol must be changed immediately.

PHOSGENE Lethal exposure can occur before any serious symptoms appear.

PHOSPHORIC ANHYDRIDE Hazardous with water. Powerful dehydrating agents. Particularly hazardous to eyes. Small quantities may be disposed of by allowing it to liquefy slowly upon exposure to air in the hood - dispose in drain with large volume of water.

PHOSPHORUS Although not a commonly used chemical, white phosphorus requires caution when used. In addition to its fire hazard (it ignites at $30^{\circ}C$ in moist air), burning phosphorus sticks to the skin - hazardous in contact with oxidizing material.

PHOSPHORUS OXCHLORIDE Violent with water; an eye irritant.

PHOSPHORUS TRICHLORIDE Like all other phosphorus halides, it produces an extremely violent reaction with water and may form phosphine.

PICRIC ACID In dry state, it is highly sensitive to shock, and in contact with metals and ammonia, it produces picrates which are more sensitive to explosion than the picric acid. Readily absorbed through skin and irritating to eyes.

POTASSIUM More active than sodium. Use tertiary butyl alcohol rather than ethanol to destroy. Handle under xylene rather than the more mobile, volatile, and toxic benzene to minimize fire hazard. Keep a piece of noncombustible board nearby to smother possible fire and also a container of Met-L-X, and extinguishing agent. Do not heat glassware containing metallic potassium beyond its melting point ($62^{\circ}C$) - an explosive reaction with the glass can result.

POTASSIUM HYDROXIDE Use extreme caution in adding water - since considerable heat is liberated, use Pyrex or metal container. Same for sodium hydroxide.

POTASSIUM PERMANGANATE Decomposes with explosive violence under certain conditions of excessive heat. Hazardous with sulfuric acid and organics.

PYRIDINE A cumulative poison.

SILVER Hazardous with acetylene, oxalic acid, ammonium compounds.

SILVER NITRATE Powerful oxidizing agent; strongly corrosive; dust or solid form is dangerous to the eyes.

SODIUM Hazardous with water, organic halides, acids, warm alcohols, carbon dioxide. Do not expose large quantities to the atmosphere unnecessarily. Dispose of small quantities by slowly adding them to ethyl alcohol and then add water slowly to the ethanol. Make certain reaction is complete before pouring into drain. Large quantities must be disposed of by the Safety Officer. Never use a water or carbon tetrachloride extinguisher on a fire; carbon dioxide extinguisher should be used cautiously - use dry sand or "Met-L-X".

SULFURIC ACID Pour acid into water - never pour water into acid. ALWAYS ADD ACID is a readily remembered phrase. Before flushing out bottles with water, drain out all of the acid first and add water cautiously to prevent violent reaction. Wear a face shield during this operation.

TETRAHYDROFURAN Forms high concentration of peroxides.

TRICHLOROETHYLENE May react to form explosive mixtures with strong alkalies such as caustic soda to form dichloroacetylene.

WATER Hazardous with alkali metals, acetyl bromide, acetyl chloride, benzoyl chloride, boro-hydride, calcium barium peroxide, conc H_2SO_4, solid Na and K hydroxides, sodium peroxide, sodium amide, phosphorus oxychloride, phosphorus trichloride, phosphoric anhydride, sulfuryl chloride, thionyl chloride, chlorosulfonic acid.

ZIRCONIUM Highly flammable in dry state. Hazardous with oxidizing agents.

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APPENDIX D

MANDATORY PROTECTIVE MEASURE
SEWAGE/INFLUENT/SLUDGE SAMPLES

Revision: 1
Date: August 22, 1990

Job Hazard Analysis: Preparation and
Analysis of Raw Sewage
Samples in the Laboratory

Approved By: ____________________ 23 Aug 90
Vice President, EA Laboratories Date
Robert S. Runkle

____________________ 23 Aug 1990
Corporate Safety and Health Officer Date
Jill V. Breysse

JOB HAZARD ANALYSIS: PREPARATION AND ANALYSIS OF RAW SEWAGE SAMPLES IN THE LABORATORY

DESCRIPTION OF OPERATIONS

EA Laboratories occasionally receives raw sewage/influent samples to be analyzed for the presence of volatile organic chemical chemicals, pesticides, base-neutral/acid (BNA) extractable organic compounds, metals, and wet chemistry parameters (ie: cyanide etc.). Samples will be shipped in two 1-gallon containers and in 40-ml volatile organic analysis (VOA) vials and will be checked into sample custody. The 1-gallon samples will be split into subsample volumes required for BNA and pesticide extractions. VOA samples from a particular site will be composited, and an aliquot will be placed directly on the purge and trap instrument of a GC/MS. BNA samples will be extracted with methylene chloride prior to analysis by GC/MS. Pesticide samples will be extracted with methylene chloride, solvent-exchanged into hexane and subsequently analyzed using a GC/ECD. Metals and wet chemistry samples will be distributed as required for each assigned analysis.

HAZARD EVALUATION

The raw sewage and wastewater samples may be composed of sanitary sewage (i.e., the spent water supply of a community), domestic sewage (wastewater from kitchens, bathrooms, lavatories, toilets, and laundries), and industrial wastes. Sewage components may include:

- Human excrement
- Paper
- Soap
- Dirt, sand gravel
- Food wastes
- Community storm water
- Water used to fight fires
- Surface runoff water
- Leaves and other debris
- Incidental plastic materials

Constituents may be suspended in the samples, dissolved, or present as colloidal particles. Due to its organic nature, the waste material is subject to decomposition by saprophytic microorganisms (organisms that feed upon dead organic matter), is generally unstable and may yield offensive odors (e.g., hydrogen sulfide). Pathogenic organisms discharged by persons harboring intestinal parasites or suffering from gastrointestinal infections (e.g., bacterial, viral) may be present in domestic sewage. The most likely route of transmission of these organisms in occupational settings is by percutaneuos inoculation (e.g., a needle stick), by contact of the contaminated material with an open wound, nonintact skin, or mucous membranes, by employees carrying the contaminated material from contaminated hands to their mouths, or by aerosols generated during grinding/maceration prcedures or from accidents. Therefore, the protective measures and safe work practices discussed below focus on preventing these types of exposures to the contaminated materials. The nature of industrial wastes present in wastewaters and sewage depends on the original industrial process. In general, industrial wastewaters are subject to strict Federal, State, and local discharge regulations which limit the types and concentrations of chemicals associated with industrial wastes and therefore minimizes risks from these sources.

MANDATORY PROTECTIVE MEASURES

Steps must be taken to prevent direct contact with hazardous components of raw sewage samples; therefore, in addition to EA Laboratories requirements for safety glasses and laboratory coats, latex gloves and laboratory coats are required for all operations involving potential contact with raw sewage samples. Disposable plastic aprons may also be worn to keep laboratory coats clean. These protective measures should prevent transmission of pathogenic organisms as well as minimize risks associated with exposure to industrial chemicals potentially present. All work with sewage materials shall be conducted under hoods to prevent inhalation of aerosols that may be generated. All EA personnel who have the potential to directly contact raw sewage materials in their work operations must have a tetanus (DPT) vaccination prior to the initiation of their work tasks and re-innoculation within 10 years. Individuals who have received a tetanus vaccine within the last ten years do not need to receive additional vaccines.

Other safety equipment that must be present in the laboratory includes eye wash stations, drench safety showers and a first aid kit. Personnel must be trained in the proper use of this equipment.

OPTIONAL PROTECTIVE MEASURES

There are a lot of unknown risks involved in handling untreated sewage samples which contain a variety of substances including bodily fluids. The scientific literature, regulatory groups such as NOSH and consultative opinions do not come to a conclusive recommendation regarding vaccination against possible hepatitis A or B viral infection from such raw sewage samples. Some experts recommend such vaccination, while others do not. As an added precaution to provide <u>maximum</u> protection against infection, EA recommends that all employees potentially exposed to such sewage samples in the course of sample preparation, analysis or support functions have optional vaccination for hepatitis A and B.

SAFETY WORK PRACTICES

When working with raw sewage/influent samples, employees must not touch their face, other skin areas or hair without first disinfecting their gloves and hands as described below.

All workers must wear the above-described personal protective equipment at all times while working with raw sewage samples. Lab coats must remain in the lab; they must be removed prior to employees leaving the lab for any reason, including breaks.

No eating, drinking, or smoking is permitted in the laboratory.

All work operations must be conducted in a manner which minimizes the generation of aerosols from the samples. All work potentially generating aerosols must be conducted in an enclosed area or in a hood, which must be cleaned after use with a 70% isopropyl alcohol wipe-down. Laboratory personnel who have not received the vaccinations are not permitted to participate in activities involving contact with raw sewage materials.

Prior to leaving the laboratory, laboratory personnel involved in the above-described operations must rinse gloves with isopropyl alcohol, discard gloves and wash their hands in a 70% solution of isopropyl alcohol, followed by soap and water. Contaminated clothing will not be re-used until laundered. Ripped, torn, or cut gloves will immediately be discarded and replaced.

All bench and hood areas will be washed with a 70% solution of isopropyl alcohol after the completion of each work operation. Quantities of 70% solution of isopropyl alcohol should always be available in case of spills. Spills should be cleaned up immediately. Sample residue shall be disposed of in accordance with EAL-SOP-01801.

EMERGENCY PROCEDURES

Employees should report any hazardous conditions to their supervisors. Supervisors should in turn notify the Laboratory Safety Manager. In case of an accident, injury, or illness, the supervisor must complete and Accident report to be submitted within 24 hours to the Corporate Safety and Health officer. Details concerning accident reporting are provided in the EA Safety and Health Program Manual (SHP-001). The following telephone numbers should be called in case of emergency:

Laboratory Safety Manager	Robert D. Lentz, Jr. (301) 771-4920
Laboratory Director	Robert S. Runkle, (301) 771-4920
Corporate Safety and Health Officer	Jill Breysse, (301) 771-4950 X352
Fire Department	9-911
Ambulance	9-911

APPENDIX E

EMERGENCY NOTIFICATION

APPENDIX E:

AFTER HOURS EMERGENCIES

Notify one of the following:

Name	Home Phone
(1) Robert D. Lentz, Jr.	(717) 235-0695
(2) Gary R. Smith	(301) 527-0840
(3) Robert S. Runkle	(301) 561-5204
(4) Mary M. Uhlfelder	(301) 561-1898
(5) Anthony J. Kosiba	(301) 285-4642

BUILDING PROBLEMS:

Notify Ecolair Representative

John Bishop	(301)538-7252
Trent May	(717)235-3983
Paul Loder	(717)993-3230
John Spencer	(301)823-0060

EA LABORATORIES SAFETY AND HEALTH COORDINATOR:

Robert D. Lentz, Jr.	(717) 235-0695

APPENDIX F
EMERGENCY EVACUATION ROUTES

EMERGENCY ESCAPE ROUTES
EA LABORATORIES FLOORPLAN