



DEPARTMENT OF THE AIR FORCE

HEADQUARTERS 49TH FIGHTER WING (ACC)
HOLLOMAN AIR FORCE BASE, NEW MEXICO

20 OCT 1994

MEMORANDUM FOR NEW MEXICO ENVIRONMENT DEPARTMENT

Attn: Mr Steve Pullen
Hazardous & Radioactive Materials Bureau
P O Box 26110
1190 St Francis Drive
Santa Fe NM 87502

FROM: 49 CES/CEVR
550 Tabosa Avenue
Holloman AFB, NM 88330-8458

SUBJECT: Review of RCRA Facility Investigation (RFI) Work Plans

1. Attached are copies of the Phase I RFI for Table 2 Solid Waste Management Units (SWMUs) (Volumes I, II, III), and the RFI Work Plan for Table 3 SWMUs (Volume III only) for review by NMED.
2. In order to keep on schedule, review comments should be submitted by 18 November 1994. A meeting will be held in Santa Fe, NM during the week of 5 December 1994 to discuss all issues.
3. Direct any questions or comments on this matter to Mr Warren Neff at (505) 475-5395.


HOWARD E. MOFFITT
Deputy Base Civil Engineer

Attachments:

1. Phase I RFI Volumes I, II, III
2. RFI Work Plan, Volume III

*Volumes
Not Found*

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*Headquarters, Air Combat Command
Langley Air Force Base,
Virginia*

Work Plan

Table 3 RCRA Facility Investigation

Volume III

April 1994



*49 CES/CEV
Holloman Air Force Base,
New Mexico*

**WORK PLAN
TABLE 3 RCRA FACILITY INVESTIGATION**

VOLUME III

Prepared for:

49 CES/CEV
Holloman Air Force Base, NM
and
HQ ACC/DEVC
Langley Air Force Base, VA

Prepared by:

EBASCO Services, Inc.
143 Union Blvd., Suite 1010
Lakewood, Colorado 80228-1824

and

Radian Corporation
8501 North Mopac Boulevard
Austin, Texas 78720-1088

Under Contract No. DACW45-94-D-0003 with:

U.S. Army Corps of Engineers
Omaha District
Omaha, Nebraska

Revision 0: February 1994 (FOP, QAPP, CRP)

Revision 1: April 1994 (FOP, QAPP, CRP)

Revision 2: September 1994 (PMP, HSP)

Revision 3: October 1994 (PMP, HSP)

PURPOSE OF DOCUMENT

- A. This Resource Conservation and Recovery Act (RCRA) facility investigation (RFI) work plan is for use by the selected RFI contractor and laboratory to conduct the Table 3 Phase I and Phase II RFI at Holloman Air Force Base (AFB), New Mexico. It was prepared for, and in cooperation with, the Base Environmental Flight: 49 CES/CEV, 550 Tabosa Avenue, Holloman AFB, NM 88330-8458, (505) 475-3931. The Base's federal Hazardous and Solid Waste Amendment (HSWA) Permit requires six plans to be included in the RFI work plan. The six plans are: the sampling and field measurements plan; the data management plan; the quality assurance project plan (QAPP); the community relations plan (CRP); the project management plan (PMP); and the site safety and health plan (SSHP). Information contained in this work plan is designed to: 1) facilitate the investigation of 36 RCRA solid waste management units (SWMUs) and one area of concern (AOC) that may have potentially released hazardous waste or hazardous constituents to the environment; 2) determine if a release of hazardous waste or hazardous constituents to the environment has occurred from the SWMUs; 3) determine the nature and extent of any detected releases; and 4) support a risk assessment and a corrective measures study, if required.
- B. The sampling and field measurements plan and the data management plan are contained in Volume I and are referred to as the field operations plan (FOP). The FOP details the procedures for investigatory methods, sample collection, waste management, data management, and reporting. It also identifies the SWMU-specific potential contaminant migration pathways and the potential receptors of the contamination. Information describing each SWMU is provided, as well as SWMU-specific investigation and sampling plans.
- C. The QAPP is contained in Volume II and presents the procedures and information necessary for the analysis and evaluation of all samples collected during the RFI. Measurement data quality objectives and acceptance criteria are provided for laboratory analytical results. Analytical methods to be used for sample analysis during the investigation are cited and described.
- D. The CRP, also contained in Volume II, presents the mechanisms for public dissemination of information during the RFI. A discussion of public involvement in the RCRA process is provided, as well as information concerning the investigation and its role in the Base's ongoing suite of environmental investigations.
- E. The PMP is contained in Volume III and presents the overall management approach to the RFI. The technical approach, schedule, budget, and key personnel are presented.
- F. The SSHP, also contained in Volume III, identifies the hazards and contains procedures for protecting the health and safety of the personnel working under the RFI. The procedures for decontamination, site control, and ambient air monitoring are addressed. The plan documents the key personnel and emergency response actions. Training requirements for field personnel are outlined for the RFI.

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Section 1

INTRODUCTION

This project management plan (PMP) has been prepared for the Resource Conservation Recovery Act (RCRA) facility investigation (RFI) of the solid waste management units (SWMUs) on Table 3 of Holloman Air Force Base's (AFB) Hazardous and Solid Waste Amendments (HSWA) permit. The PMP and health and safety plan are submitted as Volume III of the RFI work plan and complete the requirements of the work plan. Volume I of this work plan is the field operations plan, which contains site-specific sampling plans, evaluation of site-specific pathways and receptors, field and laboratory procedures, and data and waste management plans. Volume II contains the quality assurance project plan (QAPP) and the community relations plan (CRP). The PMP documents the overall management approach to the Table 3 RFI and discusses the schedule, budget, and key personnel.

Table 3 includes 36 RCRA SWMUs and one area of concern. Twenty-seven of the

SWMUs on Table 3, all of which are oil/water separators, are being investigated in this field effort. Table 1-1 lists the SWMUs on Table 3 and their status. RCRA facility investigations utilize a phased approach: Phase I to determine whether a release has occurred and Phase II to fully characterize the nature and extent of the release. The technical approach for the Table 3 RFI allows for Phase I and Phase II investigations to occur in one comprehensive field effort by utilizing a field screening technique. The soil and groundwater samples will be analyzed in the field for a suspected indicator compound, total petroleum hydrocarbons (TPH). If it is determined that there has been a release from a SWMU, a Phase II investigation will begin immediately. The approach is presented in detail in the field operations plan (Volume I of the work plan). Remedial action may be taken at abandoned SWMUs or if a release is determined. The U.S. Environmental Protection Agency (EPA), Region VI will be notified prior to any action.

Table 1-1
Solid Waste Management Units on Table 3 for Holloman AFB

SWMU No.	Unit Name	RFI Phase
1	Bldg. 55 Oil/Water Separator	I/II
3	Bldg. 130 Oil/Water Separator	I/II
4	Bldg. 131 Oil/Water Separator	I/II
5	Bldg. 137 Oil/Water Separator	NFA (a)
6	Bldg. 193 Oil/Water Separator	NFA
7	Bldg. 198 Oil/Water Separator	I/II
8	Bldg. 231 Oil/Water Separator	I/II
9	Bldg. 282 Oil/Water Separator	I/II
10	Bldg. 283 Oil/Water Separator	I/II
11	Bldg. 300 Oil/Water Separator	I/II
12	Bldg. 304 Oil/Water Separator	I/II
13	Bldg. 304A Oil/Water Separator	I/II
14	Bldg. 306 Oil/Water Separator	I/II
16	Bldg. 315 Oil/Water Separator	I/II
18	Bldg. 500 Oil/Water Separator	I/II
19	Bldg. 638 Oil/Water Separator	I/II
20	Bldg. 639 Oil/Water Separator	I/II
21	Bldg. 702 Oil/Water Separator	I/II
23	Bldg. 800 Oil/Water Separator	(b)
24	Bldg. 801 Oil/Water Separator	I/II
25	Bldg. 805 Oil/Water Separator	I/II
26	Bldg. 809 Oil/Water Separator	NFA
27	Bldg. 810 Oil/Water Separator	I/II
28	Bldg. 822 Oil/Water Separator	I/II
29	Bldg. 827 Oil/Water Separator	I/II
30	Bldg. 830 Oil/Water Separator	NFA
31	Bldg. 855 Oil/Water Separator	I/II
33	Bldg. 869 Oil/Water Separator	NFA
34	Bldg. 902 Oil/Water Separator	I/II
35	Bldg. 903 Oil/Water Separator	I/II
37	Bldg. 1080 Oil/Water Separator	I/II
38	Bldg. 1080A Oil/Water Separator	I/II
41	Bldg. 1266 Oil/Water Separator	I/II
229	T-38 Test Cell Fuel Spill	(b)
230	Bldg. 828 Fuel Spill	(b)
231	Incinerator/Landfill (IRP Site LF-58)	II (c)
AOC-V	Officer's Club (IRP Site SS-57)	(b)

*No further action.

^bSites have been investigated under previous field programs.

^cSWMU 231 will be investigated under a separate field program.

Section 2

PROJECT ORGANIZATION AND RESPONSIBILITIES

Several individuals and organizations will interact in the decision-making process of this RFI. Figure 2-1 shows the organizational structure for the Table 3 RFI. Roles and responsibilities of the agencies and key project personnel are summarized in this section.

2.1 Holloman AFB

Holloman AFB personnel will be responsible for reviewing and approving all project plans and reports; for implementing the CRP; and for obtaining the appropriate clearances and permits, when requested by Radian's field task leader. Mr. Warren Neff, the Base remedial project manager, has overall responsibility for all activities conducted as part of the RFI. Mr. Neff will function as the primary interface between the EPA, the New Mexico Environment Department (NMED), and the rest of the project team.

2.2 U.S. Army Corps of Engineers

The U.S. Army Corps of Engineers (USACE), Omaha District, will oversee the work performed to ensure that the data quality objectives outlined in the field operations plan and the chemical quality objectives outlined in the QAPP are met. The USACE technical manager, Mr. Tom Zink, will be notified of any significant problems and will be responsible for providing guidance and/or concurrence with corrective actions to be implemented.

The USACE Missouri River Division (MRD) Laboratory will be responsible for providing quality assurance (QA) services to the technical manager and the project chemist. These services will include validation of contractor laboratories, analysis of QA samples,

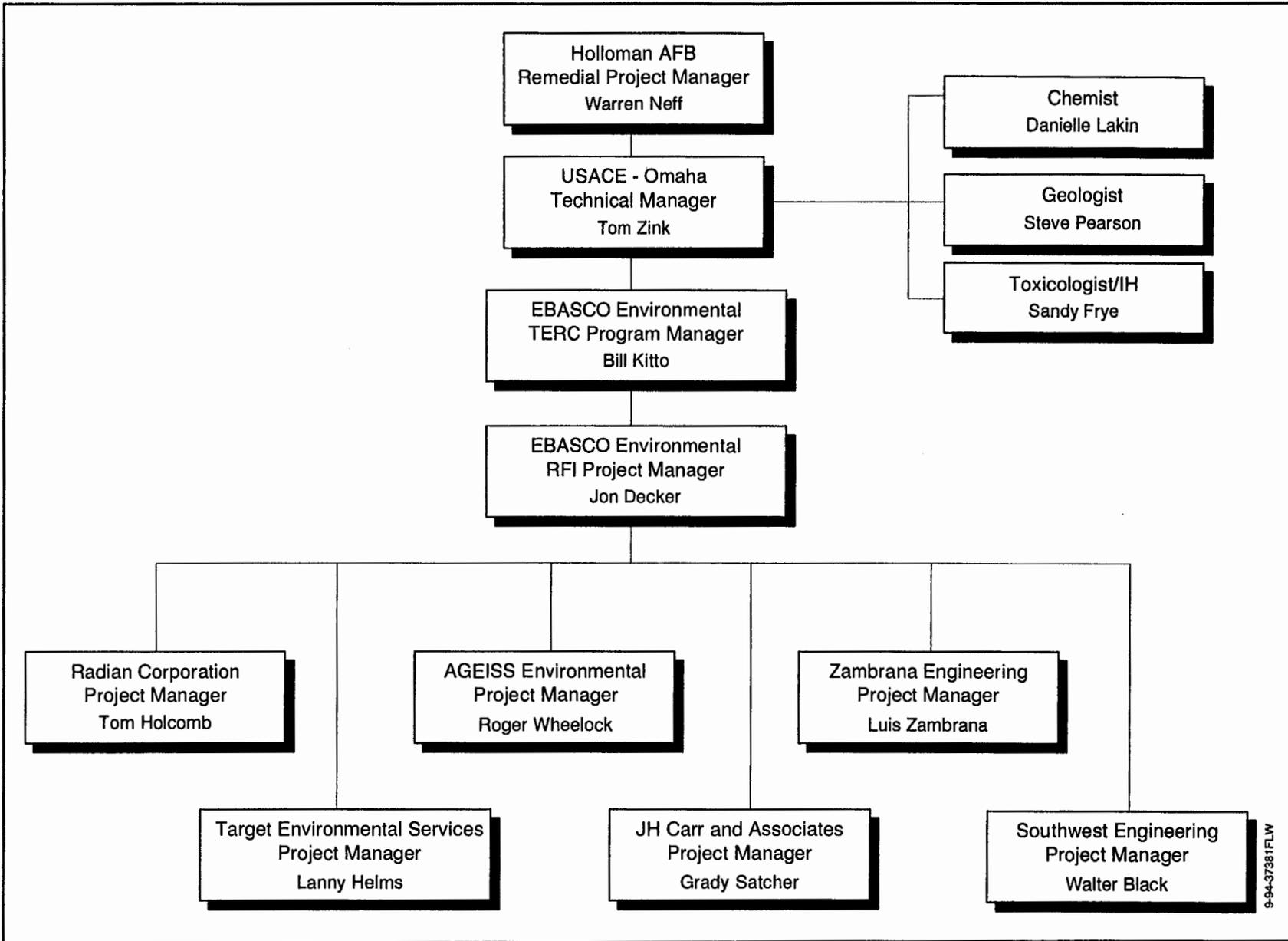
and a review of the reported analytical data to assess data quality.

2.3 U.S. Environmental Protection Agency and New Mexico Environment Department

The EPA, Region VI will have sole responsibility for reviewing and approving any proposed changes to the work plan or the QAPP. The EPA will also provide active participation and timely feedback to the Base during the RFI and will have final responsibility for reviewing and approving the RFI report. The EPA will make revisions to the Base's HSWA permit on the basis of the results of the RFI. The EPA will coordinate with the NMED during the RFI, but the EPA retains final authority on all matters related to the RFI.

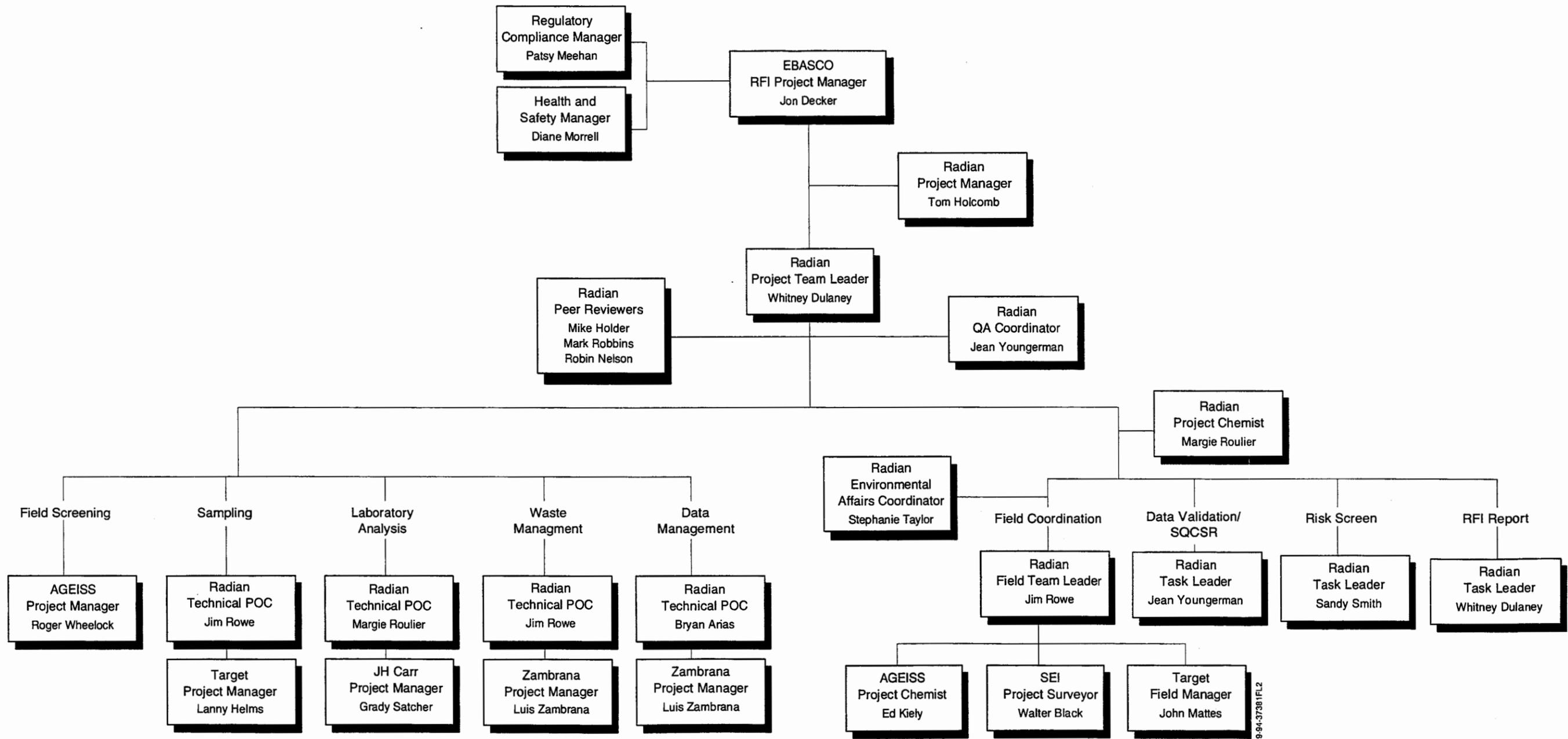
2.4 EBASCO Environmental

EBASCO Environmental is the prime contractor to the USACE for the Table 3 RFI. The Enserch project team will consist of four key individuals: a total environmental restoration contract (TERC) manager, a RFI project manager, regulatory compliance manager, and a health and safety manager. Mr. Bill Kitto will serve as the TERC program manager and will have overall responsibility for the TERC program. Mr. Jon Decker will serve as the RFI project manager. In this role, Mr. Decker will have overall responsibility for the RFI project, and he will manage the various subcontractors for the RFI. As the regulatory compliance manager, Ms. Patsy Meehan will review the remediation compliance plan. Ms. Diane Morrell will be the health and safety manager and will provide review of the site safety and health plan for the RFI.



9-94-37381FLW

Figure 2-1. Organization of the Table 3 RFI TERC Team



POC Point of Contact

Figure 2-2. Organization of the Table 3 RFI Contractor's Project Team

2.5 Radian Corporation

Radian Corporation will provide the technical lead on the Table 3 RFI. Figure 2-2 presents an organizational chart for the technical aspects of the project. Radian will be responsible for coordinating the field investigation, data validation and preparation of the summary quality control summary report, performance of the risk screen, and preparation of the RFI report. The Radian team will consist of eight key personnel: a contract manager, project manager, project team leader, field task leader, QA coordinator, project chemist, risk screen task leader, and environmental affairs coordinator (EAC).

Mr. Wallace Hise will serve as contract manager for this project. He will have responsibility for meeting all contractual requirements for the program. Mr. Tom Holcomb will serve as project manager for the RFI. In this role, he will function as the primary interface between Enserch and Radian on all contractual and technical aspects of the program.

Ms. Whitney Dulaney will serve as the project team leader for the Table RFI. In this capacity, she will be responsible for organizing and directing the technical activities of the project and for reporting the results of these activities. She will have day-to-day interaction with the project team and will facilitate coordination between the subcontractors.

Ms. Jean Youngerman will serve as the QA coordinator. She will be responsible for the development and execution of contractor QA activities in all phases of the project, including project execution, data reduction, and reporting. Ms. Youngerman will conduct the QA audit of the field laboratory and coordinate the data validation and QA reporting tasks.

Mr. Jim Rowe will serve as the field task leader and will be responsible for the overall coordination of on-site activities and documentation of the field investigation. Mr. Rowe will supervise the project field staff and oversee all on-site activities, including sample collection, field analysis, chain of custody, and reporting.

Ms. Margie Roulier will serve as the project chemist. She will function as the primary interface between the laboratories and the project team.

Ms. Sandy Smith will serve as the risk screen task leader. In this role she will be responsible for conducting the Phase II risk screen.

2.6 AGEISS Environmental

AGEISS Environmental, Inc. will provide the equipment and personnel for on-site analysis of field screening samples for total recoverable petroleum hydrocarbons (TRPH). Mr. Roger Wheelock will serve as the AGEISS project manager and will oversee coordination of material procurement and setup of the on-site field laboratory. Mr. Ed Kiely will function as the field laboratory analyst.

2.7 Target Environmental Services

Target Environmental Services, Inc. will provide direct push technology (DPT) sampling services for the collection of soil and groundwater samples during the project. Mr. Lanny Helms will serve as the Target project manager, and in this function will ensure the availability and scheduling of DPT rigs and personnel to meet the project sampling requirements. Mr. John Mattes will serve as the Target field manager and be responsible for the daily supervision of all Target personnel. Mr. Mattes will also act as the on-site liaison between Radian and Target's home office.

2.8 J.H. Carr and Associates

J.H. Carr and Associates will perform the laboratory analysis during the RFI. Mr. Grady Satcher will serve as the project manager. He will ensure that the data meet the chemical quality objectives specified in the QAPP. J.H. Carr is an MRD-approved laboratory.

2.9 Zambrana Engineering

Zambrana Engineering will be responsible for total management of project data. Mr. Luis Zambrana will serve as the project manager and will oversee the loading of all analytical results and field data, as well as the production of all analytical result tables necessary during the RFI process.

Zambrana Engineering will also provide investigation-derived waste (IDW) management services to the project. Proper staging, characterization for disposal, and documentation of IDW will be conducted under the supervision of Mr. Zambrana and Zambrana Engineering.

2.10 Southwest Engineering

Southwest Engineering, Inc. (SEI) will complete the surveying of all sampling locations. Mr. Walter Black, a registered professional land surveyor, has been assigned to this project and will be responsible for ensuring that the procedures outlined in the subcontractor scope of work are followed.

Section 3

APPROACH TO PROJECT MANAGEMENT

Several distinct entities will participate in overall management of the Table 3 RFI at Holloman AFB, NM: Holloman AFB; the USACE; EPA, Region VI; NMED; Enserch; and Radian.

3.1 Management Approach

Holloman AFB will have final authority on the performance of the RFI by the USACE and Enserch. Enserch is contracted by the USACE, which functions as a service center/contracting agency for the Base. All other subcontractors are contracted to Enserch. The USACE will provide oversight for the investigation and will work with the Base and Enserch to ensure that the RFI objectives are met. Radian will provide the technical lead for the project and will manage daily coordination with the subcontractor project team.

The EPA Region VI is the lead agency for the RFI; the EPA has final authority at this time on all regulatory and permit matters. The agencies will work with the Base to ensure that the applicable conditions of the Base's HSWA permit are fulfilled. The EPA retains final authority as to the acceptability of the results of the RFI. NMED will provide input during the RFI.

The RFI will be conducted according to the approved RFI work plan and QAPP. Any deviations from these plans will be submitted to

the agencies by the Base for prior approval. If field conditions necessitate immediate changes, any deviations will be thoroughly documented and submitted to the agencies in a timely fashion for review and approval.

3.2 Project Schedule

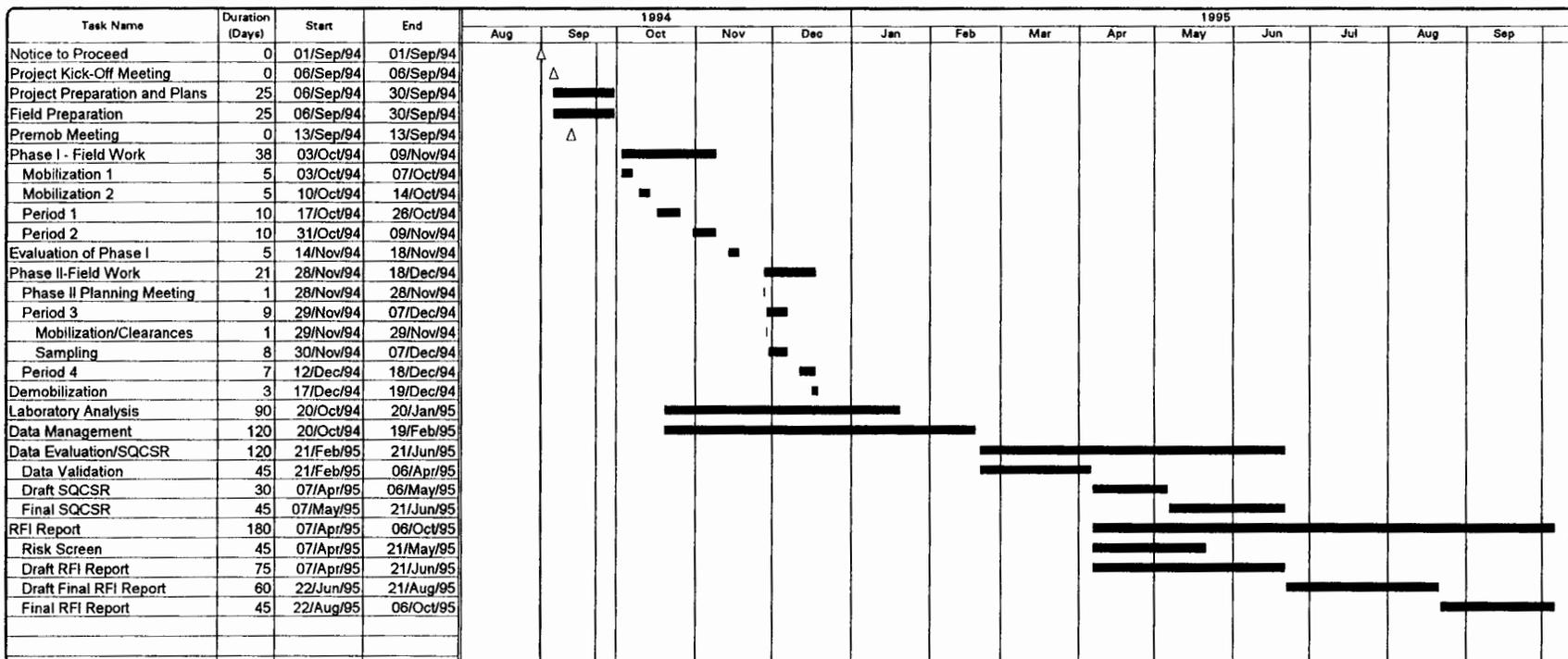
The schedule for the performance of the Table 3 RFI is shown in Figure 3-1. Formal approval of the RFI work plan by EPA was received on 26 May 1994. The RFI will last approximately 12 months from the start of the RFI field work and culminate with the submittal of the final RFI report in October 1995. The draft RFI report has a regulatory deadline of 26 July 1994.

3.3 Project Budget

The total budget for the Phase I RFI is approximately \$798,000. Table 3-1 shows a breakdown of the costs by major tasks.

3.4 Project Report

The final product of the RFI will be the RFI report. The report will provide a description of all activities performed and the results of the investigation on a SWMU-by-SWMU (or site-by-site) basis. The conclusions of statistical evaluation of the analytical results and of site-specific risk screens will also be included. The final report will provide recommendations for future actions.



Printed: 23/Sep/94
Page 1

Figure 3-1. Project Schedule for the Table 3 RFI

Table 3-1
Budget for Table 3 RFI by Task

Task Description	Approximate Budget
Project Plans	\$17,000
Field Investigation	\$520,000
Waste Management	\$28,000
Data Management	\$62,000
Data Validation/SQCSR	\$35,000
Risk Screen	\$20,000
RFI Report	\$116,000
TOTAL	\$798,000

**TABLE 3 RCRA FACILITY INVESTIGATION WORK PLAN
SITE SAFETY AND HEALTH PLAN APPROVAL**

This Site Safety and Health Plan (SSHP) was developed to outline health and safety guidelines and procedures for the RCRA Facility Investigation (RFI) at Holloman AFB, New Mexico. It meets the Occupational Safety and Health Administration (OSHA) requirements of 29 CFR Section 1910.120 and 29 CFR Part 1926. The signatures below indicate concurrence with the procedures specified in the plan and a commitment to disseminate the plan and the philosophy of quality to all project personnel.

	<u>Signature</u>	<u>Date</u>
Jon Decker, RFI Project Manager, Enserch		<u>12 OCT 94</u>
Diane Morrell, Health and Safety Manager, Enserch		<u>10-12-94</u>

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Section 1 PURPOSE, SCOPE, AND ORGANIZATION

This site safety and health plan (SSHP) was prepared to identify the potential health and safety hazards associated with the Table 3 RCRA Facility Investigation (RFI) at Holloman Air Force Base (AFB), New Mexico and to document procedures to ensure protection of on-site personnel performing the field activities. It meets the Occupational Safety and Health Administration (OSHA) requirements of 29 CFR Section 1910.120 and 29 CFR Part 1926. The general procedures and information presented in Sections 1 through 10 of this SSHP apply to all personnel working at the Table 3 sites. They are based on the current understanding of site conditions, the required scope of field activities and anticipated potential hazards. Additionally, each subcontractor is required to provide a project-specific health and safety plan (HSP) to cover their own field personnel. These subcontractor plans are included in Appendix A of this SSHP.

Each subcontractor project manager (SPM) must certify that all of their personnel who are participating in the field activities are current on all applicable medical surveillance and health and safety training requirements prior to the start of field work. He must also ensure that all necessary and appropriate health and safety equipment for their use is available on site. All personnel participating in the field investigation must sign a statement verifying that they have read, understand and will adhere to the requirements included in this SSHP.

1.1 Organization of Document

Section 1.2 describes the health and safety roles and responsibilities of key project personnel. Section 2 provides summary descriptions of the Table 3 RFI (hereafter referred to as "Table 3")

sites, relative to their locations at Holloman AFB, the Table 3 field activities that will be performed, and the site-specific chemicals of potential concern. Section 3 identifies the physical hazards associated with each major Table 3 field activity, the health hazards associated with the chemicals of potential concern in Table 3, and potential biological hazards. It also includes a site-specific summary of all types of hazards associated with the Table 3 field effort. Section 4 identifies the minimum requirements for personal protective equipment (PPE), to be supplemented, as deemed appropriate by each subcontractor project manager, based on their own project-specific HSP. Sections 5, 6 and 7 describe the approach for monitoring personnel exposure to chemical and physical hazards during field work, personnel health and safety training and communications requirements, and medical surveillance requirements, respectively. Site control measures (work zones) and personnel decontamination procedures are presented in Section 8 and emergency response procedures are presented in Section 9. Health and safety reporting requirements are included in Section 10. Appendices A through D to this SSHP include, respectively, the subcontractor-specific project HSPs; general safe operating practices and standard operating procedures; local emergency phone numbers and hospital locations map; and material safety data sheets (MSDSs) for chemicals that will be used during the Table 3 field investigation.

1.2 Project Organization, Responsibilities and Key Contacts

Table 1-1 summarizes the health and safety roles and responsibilities of the Holloman Table 3 RFI team.

Table 1-1. Key Project Personnel, Roles and Responsibilities

Title	Applicable Team Member	Health and Safety Responsibilities
Client Technical Manager (TM)	USACE/Tom Zink	Has overall responsibility for the project.
RFI Project Manager	Enserch/Jon Decker	Has overall responsibility for the health and safety of site personnel.
Subcontractor Project Managers (SPM)	Radian Corporation/Tom Holcomb Agiess Environmental Inc./ Roger Wheelock Southwest Engineering, Inc./Walter Black Target Environmental Services/ Lanny Helms JH Carr & Assoc./Grady Satcher Zambrana Engineering, Inc./ Luis Zambrana	Ensures that field work is scheduled with adequate personnel and resources to complete the job safely. Ensures that adequate telephone or radio communication between field crews and emergency response personnel is maintained.
Health and Safety Coordinator (HSC)	Enserch/Diane Morrell	Oversees site health and safety and health and safety issues associated with project. Reviews and approves the SSHP and all subcontractor Health and Safety Plan (HSP). Performs field audits of field operations.
Site Safety and Health Officer (SSHO)	Radian Corporation/Jim Rowe	Has responsibility for on-site personnel adherence to general SSHP requirements. Conducts and documents weekly on-site safety briefings. Completes and maintains health and safety reports and record keeping required by SSHP. Notifies the Enserch HSC of all incidents/accidents. Has authority to halt operations due to unsafe conditions or need to re-evaluate PPE requirements based on site conditions or real-time monitoring results. Initiates action or delegates responsibility for emergency responses, as necessary. Performs real-time or other appropriate monitoring.
Subcontractor Health and Safety Officer (HSO)	Radian Corporation/Jim Rowe (SSHO) AGEISS Environmental Inc./Ed Kiely Target Environmental Services/John Mathes Southwest Eng./Walter Black Zambrana Eng./Mike Robertson	Primary responsibility for subcontractor on-site personnel and ensuring their adherence to the subcontractor HSP. Executes required documentation/notification of accidents/incidents involving subcontractor personnel. Authority to suspend site operations due to unsafe conditions or need to re-evaluate PPE requirements. Has authority to halt operations due to unsafe conditions or need to re-evaluate PPE requirements based on site conditions or real-time monitoring results. Initiates action or delegates responsibility for emergency responses, as necessary. Performs real-time or other appropriate monitoring.
Field Crew Personnel	Radian Corporation/Jim Rowe AGEISS Environmental Inc.	Comply with this SSHP and subcontractor Health and Safety Plan (HSP-Appendix A) requirements. Report any unsafe or potentially hazardous conditions to the SSHO and subcontractor HSO.

Section 2

SITE DESCRIPTION AND TABLE 3 RFI FIELD ACTIVITIES

Holloman Air Force Base (AFB) is located in south-central New Mexico in Otero County, about 75 miles north-northeast of El Paso, Texas. The base property includes approximately 50,700 acres. The nearest population center to is the city of Alamogordo, New Mexico which is located approximately 7 miles east of the base.

For the Table 3 RFI, 27 solid waste management units (SWMUs) will be investigated. The locations of these SWMUs at Holloman AFB

are shown in Figure 1-2. The site specific descriptions and figures for each SWMU can be found in the *Work Plan—Table 3 RCRA Facility Investigation (Volume I)*, (April 1994, Radian). The site-specific field activities included in this investigation and the types of contaminants to which project personnel could be exposed, based on previous site studies, are identified in Table 2-1.

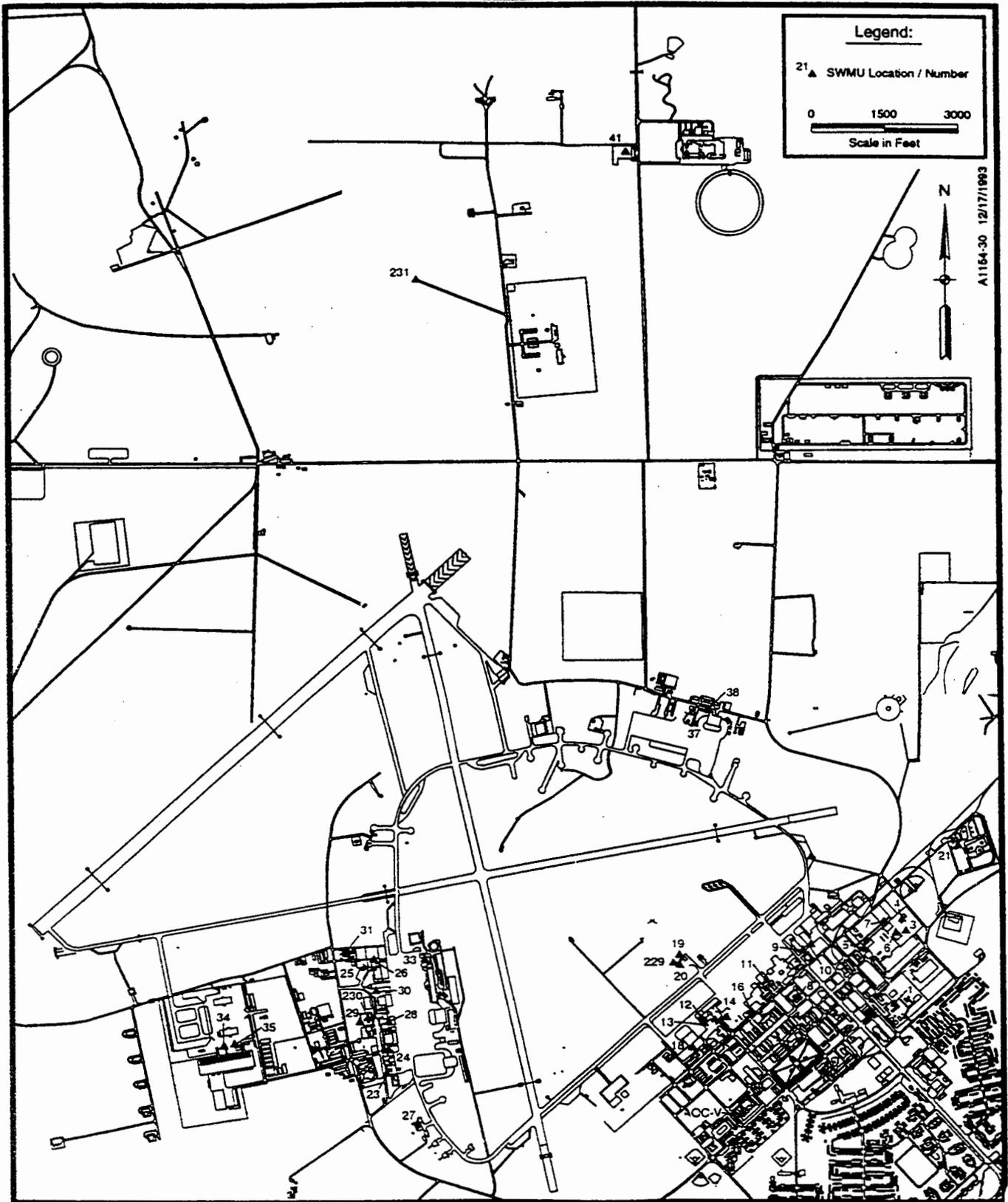


Figure 2-1. Location of Table 3 SWMUs

Table 2-1
Table 3 RFI Field Activities and Potential Contaminants by Solid Waste Management Unit (SWMU)

SWMU No.	Unit Name	Proposed Activities	Potential Contaminants
1	Bldg 55 Oil/Water Separator	Surface Soil Sampling, Subsurface Soil Sampling, Subsurface Logging, Field Screening, Sample Handling, Decontamination Activities, Waste Characterization and Disposal, and Surveying	Oil, Grease, and Other Vehicle Fluids
3	Bldg 130 Oil/Water Separator	Surface Soil Sampling, Subsurface Soil Sampling, Subsurface Logging, Field Screening, Sample Handling, Decontamination Activities, Waste Characterization and Disposal, and Surveying	Oil, Lubricants, Fuel, Hydraulic Fluid, Other Vehicle Fluids, and Solvents
4	Bldg 131 Oil/Water Separator	Surface Soil Sampling, Subsurface Soil Sampling, Subsurface Logging, Field Screening, Sample Handling, Decontamination Activities, Waste Characterization and Disposal, and Surveying	Oil, Lubricants, Fuel, Other Vehicle Fluids
7	Bldg 198 Oil/Water Separator	Surface Soil Sampling, Subsurface Soil Sampling, Subsurface Logging, Field Screening, Sample Handling, Decontamination Activities, Waste Characterization and Disposal, and Surveying	Oil, Lubricants, Fuel, Other Vehicle Fluids, Simple Green®, PD-680, and Solvents
8	Bldg 231 Oil/Water Separator	Surface Soil Sampling, Subsurface Soil Sampling, Subsurface Logging, Field Screening, Sample Handling, Decontamination Activities, Waste Characterization and Disposal, and Surveying	Oil, Lubricants, Fuel, Hydraulic Fluid, Other Vehicle Fluids, Simple Green®, and Solvents

**Table 2-1
(Continued)**

SWMU No.	Unit Name	Proposed Activities	Potential Contaminants
9	Bldg 282 Oil/Water Separator	Surface Soil Sampling, Subsurface Soil Sampling, Subsurface Logging, Field Screening, Sample Handling, Decontamination Activities, Waste Characterization and Disposal, and Surveying	Oil, Cleaning Compounds, MEK, TCE, PCE, Paint Stripper and Thinner, Paint, and Varnish Remover
10	Bldg 283 Oil/Water Separator	Surface Soil Sampling, Subsurface Soil Sampling, Subsurface Logging, Field Screening, Sample Handling, Decontamination Activities, Waste Characterization and Disposal, and Surveying	Waste Oil, Fuel, Hydraulic Fluid, and Kerosene
11	Bldg 300 Oil/Water Separator	Surface Soil Sampling, Subsurface Soil Sampling, Subsurface Logging, Field Screening, Sample Handling, Decontamination Activities, Waste Characterization and Disposal, and Surveying	Oil, Alkaline Cleaners, PD-680, and Solvents
12	Bldg 304 Oil/Water Separator	Surface Soil Sampling, Subsurface Soil Sampling, Subsurface Logging, Field Screening, Sample Handling, Decontamination Activities, Waste Characterization and Disposal, and Surveying	Oil, Grease, Fire Suppressants, Paint, Solvents, Aircraft Soap, and Fuel
13	Bldg 304A Oil/Water Separator	Surface Soil Sampling, Subsurface Soil Sampling, Subsurface Logging, Field Screening, Sample Handling, Decontamination Activities, Waste Characterization and Disposal, and Surveying	Oil, Grease, Fire Suppressants, Paint, Solvents, Aircraft Soap, and Fuel

**Table 2-1
(Continued)**

SWMU No.	Unit Name	Proposed Activities	Potential Contaminants
14	Bldg 306 Oil/Water Separator	Surface Soil Sampling, Subsurface Soil Sampling, Subsurface Logging, Field Screening, Sample Handling, Decontamination Activities, Waste Characterization and Disposal, and Surveying	Waste Oil, Fuel, PD-680, Methyl Chloride, Solvents, Alkaline Cleaners, Ammonium Hydroxide, Furfuryl Alcohol, Phosphoric Solution, and Chromic Acid
16	Bldg 315 Oil/Water Separator	Surface Soil Sampling, Subsurface Soil Sampling, Subsurface Logging, Field Screening, Sample Handling, Decontamination Activities, Waste Characterization and Disposal, and Surveying	Oil, Hydraulic Fluid, JP-4, MIBK and MEK (Potentially Handled Listed Waste - F003: MIBK spent solvent, F005: MEK spent solvent)
18	Bldg 500 Oil/Water Separator	Surface Soil Sampling, Subsurface Soil Sampling, Subsurface Logging, Field Screening, Sample Handling, Decontamination Activities, Waste Characterization and Disposal, and Surveying	Engine Oil, Hydraulic Fluid, JP-4, and Battery Acid
19	Bldg 638 Oil/Water Separator	Surface Soil Sampling, Subsurface Soil Sampling, Subsurface Logging, Field Screening, Sample Handling, Decontamination Activities, Waste Characterization and Disposal, and Surveying	Engine Oil, Jet Fuel, PD-680, and Solvents
20	Bldg 639 Oil/Water Separator	Surface Soil Sampling, Subsurface Soil Sampling, Subsurface Logging, Field Screening, Sample Handling, Decontamination Activities, Waste Characterization and Disposal, and Surveying	Engine Oil, Grease, Jet Fuel, and Solvents

**Table 2-1
(Continued)**

SWMU No.	Unit Name	Proposed Activities	Potential Contaminants
23	Bldg 800 Oil/Water Separator	Surface Soil Sampling, Subsurface Soil Sampling, Subsurface Logging, Field Screening, Sample Handling, Decontamination Activities, Waste Characterization and Disposal, and Surveying	Engine Oil, Grease, Hydraulic Fluid, Simple Green, Aircraft Soap, and PD-680
24	Bldg 801 Oil/Water Separator	Surface Soil Sampling, Subsurface Soil Sampling, Subsurface Logging, Field Screening, Sample Handling, Decontamination Activities, Waste Characterization and Disposal, and Surveying	Engine Oil, Grease, Hydraulic Fluid, Fuel, Ethanol, TCA, Aircraft Soap, and PD-680 (Potentially Handled Listed Waste - F001: TCA spent solvent for degreasing)
25	Bldg 805 Oil/Water Separator	Surface Soil Sampling, Subsurface Soil Sampling, Subsurface Logging, Field Screening, Sample Handling, Decontamination Activities, Waste Characterization and Disposal, and Surveying	Engine Oil, and Other Vehicle Fluids
27	Bldg 810 Oil/Water Separator	Surface Soil Sampling, Subsurface Soil Sampling, Groundwater Sampling, Subsurface Logging, Field Screening, Sample Handling, Decontamination Activities, Waste Characterization and Disposal, and Surveying	Fuel, Synthetic Oils, Grease, Hydraulic Fluid, JP-4, PD-680 TCA, and Freon (Potentially Handled Listed Waste - F001: TCA spent solvent for degreasing, F002 - 1,2,2-Trifluoroethane Spent Solvent)
28	Bldg 822 Oil/Water Separator	Subsurface Soil Sampling, Subsurface Logging, Field Screening, Sample Handling, Decontamination Activities, Waste Characterization and Disposal, and Surveying	Engine Oil, Grease, Hydraulic Fluid, Antifreeze, Simple Green, Ethanol, TCA, Aircraft Soap, and PD-680 (Potentially Handled Listed Waste - F001: TCA spent solvent for degreasing)

**Table 2-1
(Continued)**

SWMU No.	Unit Name	Proposed Activities	Potential Contaminants
29	Bldg 827 Oil/Water Separator	Surface Soil Sampling, Subsurface Soil Sampling, Subsurface Logging, Field Screening, Sample Handling, Decontamination Activities, Waste Characterization and Disposal, and Surveying	Engine Oil, Grease, Hydraulic Fluid, Fuel, Aircraft Soap, and PD-680 (Potentially Handled Listed Waste - F001: TCA spent solvent for degreasing)
31	Bldg 855 Oil/Water Separator	Surface Soil Sampling, Subsurface Soil Sampling, Subsurface Logging, Field Screening, Sample Handling, Decontamination Activities, Waste Characterization and Disposal, and Surveying	Engine Oil, Grease, Hydraulic Fluid, and Other Vehicle Fluids
34	Bldg 902 Oil/Water Separator	Surface Soil Sampling, Subsurface Soil Sampling, Subsurface Logging, Field Screening, Sample Handling, Decontamination Activities, Waste Characterization and Disposal, and Surveying	Engine Oil, Grease, Hydraulic Fluid, Other Vehicle Fluid, and Fuels
35	Bldg 903 Oil/Water Separator	Surface Soil Sampling, Subsurface Soil Sampling, Subsurface Logging, Field Screening, Sample Handling, Decontamination Activities, Waste Characterization and Disposal, and Surveying	Engine Oil, Grease, Hydraulic Fluid, Primer and Paint, Paint Stripper and Thinner, PD-680, Toluene, and Sand Blast Residuals (Potentially handled Listed Waste: F005 - MEK and Toluene Spent Solvent)
37	Bldg 1080 Oil/Water Separator	Surface Soil Sampling, Subsurface Soil Sampling, Subsurface Logging, Field Screening, Sample Handling, Decontamination Activities, Waste Characterization and Disposal, and Surveying	Engine Oil, Grease, Hydraulic Fluid, Simple Green, Other Vehicle Fluids, Aircraft Soap, and PD-680

**Table 2-1
 (Continued)**

SWMU No.	Unit Name	Proposed Activities	Potential Contaminants
38	Bldg 1080A Oil/Water Separator	Surface Soil Sampling, Subsurface Soil Sampling, Subsurface Logging, Field Screening, Sample Handling, Decontamination Activities, Waste Characterization and Disposal, and Surveying	Engine Oil, Hydraulic Fluid, Aircraft Soap, and Other Vehicle Fluids
41	Bldg 1266 Oil/Water Separator	Surface Soil Sampling, Subsurface Soil Sampling, Subsurface Logging, Field Screening, Sample Handling, Decontamination Activities, Waste Characterization and Disposal, and Surveying	Engine Oil, Hydraulic Fluid, Antifreeze, Other Vehicle Fluids, Diesel Fuel, and Aircraft Soap

Section 3 HAZARDS ASSESSMENT

The following subsections identify the potential physical, chemical, and biological hazards associated with performing the Table 3 field work.

3.1 Physical Hazards Associated with Table 3 Field Activities

The major investigative activities that will be performed for this project are summarized in Table 2-1. The types of physical hazards that are associated with each of these major activities, and related activities necessary to support them (e.g., surveying, sample handling, etc.), are identified in Table 3-1.

The possibility of encountering explosive hazards during this project is considered remote. Fire hazards will be minimized by performing an underground electrical utility search before breaking ground, and keeping open flames away from flammable liquids. Fire hazards are associated mainly with DPT operations. Descriptions of the other major types of physical hazards are provided below.

Mechanical Hazards

Physical hazards that may be encountered during drilling operations include snapping cables; brush; equipment or gas main fires; being hit by equipment; becoming entwined in rotating tools; and falling objects. The subcontractor HSOs are responsible for inspecting their equipment to ensure its safe operation. All on-site personnel must remain alert to potential hazards and maintain adequate separation distances from operating machinery.

Electrical Hazards

Based on the line voltage, drill rig masts

must maintain the minimum clearances from overhead power lines listed below:

Nominal System Voltage	Minimum Required Clearance
0-50 kV	10 ft
51-100 kV	12 ft
101-200 kV	15 ft
201-300 kV	20 ft
301-500 kV	25 ft
501-750 kV	35 ft
751-1000 kV	45 ft

When using extension cords, ensure that they are in good condition. Never use extension cords in wet areas without plugging the extension cord into a ground fault interrupter (GFI). GFIs will sense a short to ground and cut power. Also, identify the location of the electrified security fences, if present at the work sites, and ensure that personnel and equipment do not touch them.

Heat and Cold Stress

Workers who wear protective clothing will be at increased risk of heat injury when temperatures are above 70°F and/or under heavy workload in protective clothing. See Appendix B, SOP A: Heat Stress for heat stress monitoring guidelines and control.

Fatal exposure to cold among workers has almost always resulted from accidental exposures involving failure to escape from low air temperatures or from immersion in low temperature water. The single most important aspect of life-threatening hypothermia is the fall in the deep core temperature of the body. Employees should be protected from exposure to cold so that the deep core temperature does not fall below 36 degrees Celsius; reduced body

**Table 3-1
 Table 3 RFI Field Activities and Associated Physical Hazards**

Activity	Mechanical	Electrical	Fire	Explosive	Thermal	Acoustical	Biological	Chemical
Surficial soil sampling by hand auger and stainless steel spoon	✓				✓		✓	✓
Subsurface soil sampling by hand- and power-augers	✓	✓	✓	✓	✓	✓	✓	✓
Subsurface soil sampling by direct-push tube (DPT) method	✓	✓	✓	✓	✓	✓	✓	✓
Groundwater sample collection using DPT	✓	✓	✓	✓	✓	✓	✓	✓
Soil logging					✓	✓	✓	✓
Sample evaluation by field screening techniques (infrared analysis)								✓
Sample handling								✓
Decontamination activities	✓	✓	✓		✓	✓	✓	✓
Waste characterization and disposal activities	✓		✓		✓			✓
Surveying	✓				✓		✓	

temperature will very likely result in reduced mental alertness, reduction in rational decision making, or loss of consciousness with the threat of fatal consequence. See SOP B: Cold Stress in Appendix B for cold stress monitoring guidelines and control.

Acoustical Hazards

Experience with site activities has shown that typical noise levels will not equal or exceed an 8-hour time-weighted average (TWA) of 85 dB. However, personnel working at sites near active runway or taxiways must don hearing protection because the sound levels may be 85 dB or greater. Personnel exposed to 85 dB TWA must don ear protection.

Lacerations and Contusions (Cuts and Bruises)

The field team members could cut and bruise themselves during this project. Drilling activities usually involve working in close proximity to moving machinery and physical objects and pose the greatest hazard. The SSHO and subcontractor HSOs must be prepared to deal with cuts and bruises. A first aid kit will be present to each site.

Climbing Hazards

In the course of the drilling activity, workers may have to work on equipment by climbing the mast. The drilling subcontractor HSO will ensure that climbing activities will conform with any applicable NIOSH and OSHA requirements. The activities will also be overseen by the SSHO.

Slips, Trips, and Falls

The most common hazards potentially associated with field work are slips, trips, and falls. Use common sense to avoid these hazards. Avoid slippery surfaces, do not hurry, and maintain good housekeeping.

Lifting Hazards

Field team members may be exposed to injury caused by lifting heavy objects. Drilling operations involve manual movement of heavy drilling casing, auger flights, and various other pieces of equipment, and sample handling (i.e. preparation for shipment) could result in injury. All field team members will be trained in the proper methods for lifting and cautioned against lifting objects that are too heavy for one person.

3.2 Potential Chemical Hazards Associated with Table 3 Field Activities

The types of contaminants to which on-site personnel may be exposed during the Table 3 field effort are discussed in the following paragraphs in terms of the types of health risks posed by these classes of chemicals (or specific constituents, where applicable), and symptoms of exposure. The contaminants discussed were selected based on previous detection at levels of concern or their suspected occurrence in soil or groundwater. The main potential routes of exposure are dermal contact and inhalation.

Petroleum Hydrocarbons and BTEX

The petroleum hydrocarbon liquids and vapors that may be encountered at the Table 3 sites are classified as neurotoxicants, hepatotoxicants, nephrotoxicants, hemotoxicants, irritants, carcinogens, teratogens, and allergic sensitizers.

Benzene, toluene, ethylbenzene, and xylenes are known to be among the components. The toxicity of benzene is greater than that of the other VOCs. Inhalation of and skin exposure to petroleum hydrocarbon components produce the following health effects: central nervous system depression with symptoms of dizziness, unconsciousness, and coma; muscular weakness; staggering; skin paresthesia; pulmonary edema; nausea and vomiting; abdominal pain; irritation

of eyes, nose, throat, and skin; and bone marrow, kidney, liver, and hemolytic disorders.

Benzene

Benzene is a colorless to light-yellow liquid with an aromatic odor. It is a known human carcinogen. It may enter the body by inhalation, ingestion, or dermal absorption. Blood toxicity, characterized by a decrease in various circulating blood cells, and immunotoxicity are the main chronic effects; some individuals may develop leukemia. Exposure to high concentrations of benzene may cause irritation of the eyes, nose, and respiratory tract, as well as headache, nausea, and dizziness. The OSHA Permissible Exposure Limit (OSHA-PEL) is 1 ppm, with a short-term exposure limit (STEL) of 5 ppm.

Furfuryl Alcohol

Furfuryl alcohol is a clear, colorless, moderately flammable liquid that turns brown to dark red on exposure to light. Inhalation may cause dizziness, nausea, diarrhea, and vomiting. Eye exposure may cause eye irritation. The OSHA-PEL is 10 ppm, with a skin exposure notation.

Metals

Arsenic—The toxic effects of arsenic exposure are usually seen only in industrial workers who have inhalation exposure to arsenic trioxide (As_2O_3) a suspect human carcinogen (A_2). The OSHA-PEL is 0.01 mg/m³.

Beryllium—Short term inhalation exposure to high levels of beryllium leads to the development of lung inflammation with symptoms similar to pneumonia. Contact dermatitis is caused by dermal exposure. The OSHA-PEL 0.002 mg/m³ and it is classified as an A_2 suspect human carcinogen.

Chromium—Inhalation exposure to most forms of chromium causes respiratory irritation, starting with the nasal mucosa. Dermal exposure to hexavalent chromium can cause skin necrosis. Hexavalent chromium inhalation causes increased respiratory cancer mortality. The TLV for total chromium is 0.5 mg/m³. The OSHA-PEL for hexavalent chromium is 0.2mg/m³.

Lead—Inhalation, ingestion, and dermal absorption of lead causes central nervous system, blood, gastrointestinal, gums, and kidney effects. The early effects are nonspecific and are difficult to distinguish from the symptoms of minor seasonal illnesses. The OSHA-PEL for lead is 0.905 mg/m³.

Mercury—Either acute or chronic exposure may produce permanent changes to the following organ systems: central nervous system, respiratory system, kidneys, skin, and eyes. Acute inhalation causes pneumonitis and bronchitis. Dermal exposure causes irritation. The OSHA-PEL is 1.0 mg/m³ ceiling level, meaning that individuals should not be exposed above that concentration for any period of time.

Thallium—Thallium and its compounds are used as rodenticides. It is an extremely toxic and cumulative poison and may enter the body by inhalation, ingestion, or chemical absorption. Acute poisoning is usually due to ingestion and symptoms include abdominal colic, loss of kidney function, peripheral neuritis, visual impairment, disorientation, convulsions, joint pain, and loss of hair. The OSHA-PEL is 0.1 mg/m³ (TWA).

MEK

MEK is a colorless liquid with a moderately sharp, fragrant, mint- or acetone-like odor. If inhaled, MEK may cause irritation to the eyes, nose, and head. If ingested, MEK may

produce dizziness and may cause vomiting. The OSHA PEL is 200 ppm (TWA).

MIBK

MIBK is a colorless liquid with a pleasant odor. If inhaled, MIBK may cause irritation to the eyes and the mucous membranes. If ingested, MIBK may cause headaches, and may cause narcosis, coma, or dermatitis. The OSHA PEL is 50 ppm (TWA).

Tetrachloroethene (PCE)

PCE is a colorless liquid with a mild, chloroform-like odor. If inhaled, PCE may cause irritation to the eyes, nose, and throat. If ingested, PCE may cause nausea, redness of the face and neck. If contacted by the skin or eyes, PCE may cause dizziness, incoordination, headaches, drowsiness, redness of the skin, and liver damage. PCE is a carcinogen. The OSHA PEL is 25 ppm (TWA).

Trichloroethene (TCE)

TCE is a colorless liquid with a sweet odor resembling chloroform. Possible symptoms from inhalation or ingestion are euphoria, rapid breathing, and irregularity in the force rhythm of the heartbeat. Skin irritation, blistering, and paralysis of the fingers may result when hand is immersed in TCE. The OSHA PEL is 50 ppm (TWA).

Ethanol

Ethanol is a clear, colorless, mobile volatile liquid. Excessive inhalation of vapors is irritating to the eyes and upper respiratory tract with slight symptoms of intoxication. Excessive ingestion of ethanol will cause depression, drowsiness, impaired vision, ataxia, and stupor. The ACGIH TLV is 1880 mg/m³.

PD-680

PD-680 is a clear, colorless liquid with a characteristic hydrocarbon odor. Acute effects

due to inhalation or ingestion may cause throat irritation, nausea, vomiting, injury to the muscular tissue of the heart, irregular heartbeats, headaches, dizziness, incoordination, numbness, and unconsciousness. Chronic exposure may cause conjunctivitis. The OSHA PEL is 500 ppm (TWA).

Methylene Chloride

A colorless liquid with a chloroform-like odor. If inhaled, methylene chloride will cause fatigue and sleepiness. If ingested, methylene chloride will cause light-headedness and numbness of the limbs. Skin and/or eye contact with methylene chloride may cause a tingling sensation, nausea, and irritation to the eyes. Methylene chloride is a suspected carcinogen. The OSHA PEL is 500 ppm.

1,1,1,-Trichloroethane (TCA)

A colorless liquid with a mild, chloroform-like odor. Inhalation will cause headaches, exhaustion, and depression of the central nervous system. Ingestion may cause poor equilibrium and irritation to the eyes. Skin and/or eye contact may cause dermatitis and cardiac arrest. The OSHA PEL is 350 ppm (TWA).

Freon 113

Freon 113 is a colorless gas with an ether-like odor at extremely high concentrations. Inhalation may cause dizziness and tremors. Skin and/or eye contact may cause unconsciousness, irregularity in the force or rhythm of the heartbeat, and cardiac arrest. The OSHA PEL is 1,000 ppm (TWA).

3.3 Potential Biological Hazards Associated with Table 3 Field Activities

The Table 3 field team should be aware that site activities, mainly in remote areas, may disturb the local wildlife population. Therefore, there is potential for field personnel to be bitten

by snakes, animals, and/or insects. Prompt first aid measures are extremely important. All field team members should be properly briefed regarding the potential for encountering wildlife, as well as prompt first aid procedures in the event of a snake, insect, or animal bite. The standard operating procedures (SOPs) for emergency response in the event of a snake bite is included in Appendix B.

3.4 Summary of Site-Specific Health and Safety Hazards

Table 3-2 is a matrix which cross-references each Table 3 site with the potential physical, chemical and biological hazards associated with site conditions and the required field activities. Table 3-2 provides the basis for identifying the minimum requirements for personal protective equipment (section 4) and exposure monitoring (section 6).

Table 3-2
Potential Site-Specific Health and Safety Hazards Associated with the Table 3 RFI
(Sites 1 through 19)

SWMUs and AOCs														
Physical Hazards														
	1	3	4	7	8	9	10	11	12	13	14	16	18	19
Surficial Soil Sampling	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Subsurface Soil Sampling by Hand- and Mechanical-Powered Auger	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Subsurface Soil Sampling by DPT	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Soil Logging	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Field Screening	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Sample Handling	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Decontamination Activities	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Waste Characterization and Disposal Activities	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Surveying	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Chemical Hazards														
	1	3	4	7	8	9	10	11	12	13	14	16	18	19
Petroleum Hydrocarbons	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Unspecified Solvents		✓		✓	✓	✓		✓	✓	✓	✓	✓		✓
Unspecified Cleaning Compounds				✓	✓	✓			✓	✓				
Paint Stripper, Paint Thinners, Paint, and Varnish Remover						✓			✓	✓				
Fire Suppressants									✓	✓				
Ammonium hydroxide											✓			
Furfuryl Alcohol											✓			
Phosphoric Solution											✓			
Chromic Acid											✓			
Battery Acid													✓	
Biological Hazards														
	1	3	4	7	8	9	10	11	12	13	14	16	18	19
Insects, Snakes, etc.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Table 3-2
 (Continued)
 Sites 20 through 41

SWMUs and AOCs													
Physical Hazards													
	20	23	24	25	27	28	29	31	34	35	37	38	41
Surficial Soil Sampling	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓
Subsurface Soil Sampling by Hand- and Mechanical-Powered Auger	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Subsurface Soil Sampling by DPT	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Groundwater sampling by DPT					✓								
Soil Logging	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Field Screening	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Sample Handling	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Decontamination Activities	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Waste Characterization and Disposal Activities	✓	✓	✓	✓	✓		✓	✓	✓				✓
Surveying	✓	✓	✓	✓	✓		✓	✓	✓				✓
Chemical Hazards													
Petroleum Hydrocarbons	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Unspecified Solvents	✓	✓	✓		✓	✓	✓				✓		
Unspecified Cleaning Compounds		✓	✓			✓	✓				✓	✓	✓
Paint Stripper, Paint Thinners, Paint, and Varnish Remover										✓			
Ethanol			✓			✓							
Sand Blasting Residuals										✓			
Biological Hazards													
Insects, Snakes, Etc.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Section 4 PERSONAL PROTECTIVE EQUIPMENT

Based on the potential site-specific health and safety hazards identified in section 3.4, the minimum level of personal protective equipment (PPE) expected to be required for performance of the Table 3 field activities at most of the sites is EPA Level D. The need to upgrade to a higher level of protection will be determined by each subcontractor's HSO, based on real-time monitoring data, provided by the SSHO (see section 5).

Description of the basic components of Level D, modified Level D and Level C PPE ensembles are provided below:

- **Level D**—Cloth work clothes, steel-toed leather boots, hard hat, and eye protection.
- **Level D (modified)**—Includes the requirements listed for Level C without the respirator. An air purifying respirator or an escape mask must be readily available in the event that real-time monitoring indicates chemical vapors above levels of concern (as described in section 5).
- **Level C**—To be used when the types and concentrations of respirable contaminants are known, but are not greater than the protection limitations of the air purifying

respirators, and appropriate cartridges are available. Includes the requirements listed for Level D with a chemical protective suit over the cloth work clothes, chemical resistant gloves, and a full-face or half-face respirator, as appropriate, based on the potential for splash hazards.

Table 4-1 is a matrix that identifies the *minimum* level of PPE required for field activities at each site, options available for consideration by each subcontractor in his HSP (Appendix A), and types of alternative PPE construction/materials. These minimum requirements are based on compatibility with, and protection from, the known and suspected site contaminants and the Table 3 field activities, according to the manufacturers' performance specifications.

Each subcontractor's HSP includes an assessment of task-specific hazards to which his personnel could be exposed (section 5 of HSP). Based on this assessment, as appropriate, each subcontractor has specified supplemental PPE requirements for his personnel during each task (section 7 of HSP). In no case, however, may the subcontractor HSP require a lower level of protection than the minimum requirements specified in Table 4-1.

**Table 4-1
 Minimum Recommended PPE for the Table 3 Investigation by Site**

Personnel Protective Equipment	SWMUs													
	1	3	4	7	8	9	10	11	12	13	14	16	18	19
Hard Hat	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Steel-Toe Boots	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Safety Glasses	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Goggles	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Coveralls (Tyvek®, Kleenguard®, or Cotton)	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Respirator	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Nitrile Gloves	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Butyl Rubber Gloves											X		X	
	20	23	24	25	27	28	29	31	34	35	37	38	41	
Hard Hat	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Steel-Toe Boots	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Safety Glasses	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Goggles	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Coveralls (Tyvek®, Kleenguard®, or Cotton)	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Respirator	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Nitrile Gloves - Petroleum Hydrocarbons	X	X	X	X	X	X	X	X	X	X	X	X	X	X

O = Optional
 X = Required
 A = Must Be Available

Section 5

EXPOSURE MONITORING PLAN

Exposure of on-site personnel to chemical and physical hazards will be monitored by the SSHO and subcontractor HSOs to ensure that potential hazards are identified, evaluated, and controlled. Potential hazards at each site are listed in Table 3-2. Personal protective equipment (e.g., respirators) will be upgraded, and other control measures will be implemented, as specified in Tables 5-1.

OSHA requires all personnel on a multi-employer site to monitor for potential hazards for all personnel. Potential hazards identified during Table 3 field activities must be brought to the attention of the SSHO and subcontractor HSOs.

On the basis of previous sampling efforts, risk assessments, the distance from populated areas, and the nature of the tasks to be performed, it has been determined that fence-line or perimeter monitoring is not necessary.

5.1 Chemical Exposure Monitoring

Real-time monitoring of organic vapor concentrations in the breathing zone, from cuttings, soil samples, and downhole will be conducted during field operations with an organic vapor meter (OVM). The OVM will be an HNU® Model PI-101 with an 11.3 eV photoionization detector (PID), or equivalent. This device responds to gases and vapors that have an ionization potential less than the electron voltage of the lamp. It will be operated during drilling activities and other intrusive activities in which contaminated soil or groundwater may be encountered. Air monitoring will be conducted whenever new soil is broken and at least hourly after that. The instrument will be calibrated using known calibration gases at the beginning

and the end of the field project. If air concentration levels in the breathing zone exceed the levels indicated in Table 5-1, respiratory protection or additional monitoring with colorimetric detector tubes is required.

Due to the low threshold limit value (TLV) or PEL for benzene (1 ppm) and its potential to be present at Table 3 sites where volatile organic compounds are of concern, it will be used as the primary indicator for respiratory protection requirements. Benzene concentrations in gasolines are normally in the 3%-5% range, but a 20% potential concentration will be assumed for added safety.

Draeger tubes (colorimetric detector tubes) will be used to monitor airborne contaminants for all Table 3 sites. The benzene detection ranges for these tubes are 0.5-10 ppm.

A GCA miniram was used for aerosol monitoring conducted during similar sampling efforts at Holloman AFB in the past. No levels of respirable dust reached the upgrade concentrations. Levels are not expected to reach this concentration during this sampling effort due to the similarity in sampling methods and locations. Therefore, aerosol monitoring is not anticipated. However, if abnormally windy conditions and high levels of dust are generated, operations will be suspended until the potential risk and need for aerosol monitoring can be re-evaluated.

Calibration procedures for all measuring or analysis devices will be followed daily to ensure the quality of the readings or results. OVMs will be calibrated at the beginning and end of each field day with gas of known

Table 5-1
Airborne Contaminant Response Criteria

Airborne Concentrations in the Breathing Zone by Direct Reading Instruments	Sampling Frequency	Remedial/Protective Action
Organic vapors <5* ppm.	Once an hour or more frequently	No action: continue work in recommended EPA Level D protection.
Organic vapors ≥5 ppm but <50 ppm.	Once an hour or more frequently	Test for benzene vapor with detector tube. If benzene ≥1 ppm, don air purifying respirators with organic vapor cartridge (EPA Level C); if ≤1 ppm, continue work in EPA Level D protection.
Organic vapors ≥5 ppm but <50 ppm. Benzene concentration ≤1 ppm from detector tube.	Once every 30 min.	Continue detector tube measurements.
Organic vapors ≥5 ppm but <50 ppm. Benzene concentration >25 ppm from detector tube.	Once every 30 min.	Suspend field activities.
Organic vapor >50 ppm. Benzene concentration <1 ppm from detector tube.	Once every 30 min.	Suspend field activities.

*Assuming benzene is 20% of volatile petroleum hydrocarbon composition as a safety measure (normal amount is 3%-5% in gasoline).

Section 6

PERSONNEL TRAINING

All authorized on-site personnel must have satisfactorily completed the required OSHA 40-hour Hazardous Waste Training Course and the 8-hour annual refresher training. Certification that required training has been completed by subcontractor employees is documented in Appendix A by attachments to the subcontractor's HSPs.

6.1 On-Site Safety, Health, and Emergency Response Training

An on-site orientation session will be required for all field personnel and will include the following:

- Review of the employees rights and responsibilities under OSHA;
- Health effects and hazards of the chemicals identified or suspected to be on-site;
- Protection against chemical, physical, and biological hazards;
- Implementation of the "buddy system";
- Personal hygiene;
- Decontamination procedures;
- Standard Operating Procedures;
- PPE;
- Work area and zone health and safety information including:
 - Site layout,
 - Procedures for entry and exit of areas and zones, and
 - Standard safe work practices;
- Medical surveillance program;
- Emergency procedures, including:
 - Emergency contacts,

- Instructions for implementing the emergency response and contingency plan, and
- Location of emergency equipment; and
- Review of information contained in this SSHP.

The SSHO will maintain a record of the on-site training participants on the site-specific Training Record Form (Figure 6-1). Also, the SSHO will conduct weekly safety meetings. A record of the meetings must be maintained on the Safety Meeting Record Form (Figure 6-2).

6.2 Hazard Communication Training

To comply with the OSHA Hazard Communication Standard (HCS)(29CFR 1910.1200), all subcontractor field personnel will supply certification that they have received hazard communication training from their employer.

6.3 SSHO and Subcontractor HSO Minimum Qualifications

The SSHO and each subcontractor HSO must provide documentation of training or equivalent hands on experience in the following areas:

- First Aid/CPR,
- Instrument operation and calibration,
- Ambient conditions monitoring, and
- Hazard recognition.

This documentation will be provided to Enserch for review and approval prior to commencement of field work.

<p>Site Name: _____</p> <p>Location: _____</p> <p>Meeting date: _____ Meeting time: _____</p> <p>Meeting conducted by: _____</p> <p>The following topics shall be discussed:</p> <ul style="list-style-type: none">Biological HazardsChemical HazardsRadiological HazardPhysical HazardsToxicologyPersonal HygieneRights and Responsibilities under OSHAMonitoring PlanSite Safety and Health PlanStandard Operating ProceduresPersonal Protective EquipmentMedical Monitoring ProgramDecontaminationEmergenciesPublic Relations <p>Suggestions/Comments: _____</p> <p>_____</p> <p>_____</p> <p>Meeting Participants' Signatures:</p> <p>_____</p> <p>_____</p> <p>_____</p>

Figure 6-1. Site Specific Training Record Form

SAFETY MEETING RECORD FORM

Site name: _____

Location: _____

Meeting date: _____ Meeting time: _____

Meeting conducted by: _____

Topics Discussed

Accidents Reviewed

Suggestions/Comments Made

Figure 6-2. Safety Meeting Record Form

Section 7

MEDICAL SURVEILLANCE

All on-site personnel must be enrolled in an ongoing medical surveillance program which complies with the requirements of OSHA's hazardous waste operations standard (29 CFR 1910.120). Therefore, all personnel must have had a medical examination within 12 months prior to the start of field activities. All subcontractors must provide documentation certifying that their personnel are enrolled in a medical surveillance program meeting the 1910.120 requirements.

Subcontractor's HSPs are included in Appendix A. Attached to these HSPs is a list of all the subcontractor's field personnel, the date of their last medical exam, and the examining

physician. Copies of "Physician's Written Opinions" will be provided on request. All medical exams must be conducted and/or reviewed by a physician who is board-certified in occupational medicine.

A general medical examination will be performed if an employee develops signs or symptoms indicating possible overexposure to hazardous substances and/or thermal stress. Since no substances or conditions at the sites are expected to produce disease or biological changes not detected by the general surveillance program, no project-specific medical monitoring is expected.

Section 8

SITE CONTROL MEASURES AND DECONTAMINATION PROCEDURES

The Holloman AFB security consists of gates, guard posts, and a permit system. Permits must be obtained prior to initiating sampling activities. In high security areas, personnel must check in with the day security staff.

To minimize the possibility of transferring hazardous substances from a site, contamination control procedures are needed. Contaminants must be removed from clothing, personnel and equipment prior to relocation from a work zone. Areas will have restricted access to prevent unqualified personnel from entering.

8.1 Work Zones

Prevention of exposure and spread of contamination will be controlled through the establishment of work zones. Three work zones will be used in this project: 1) exclusion zone; 2) contamination reduction zone; and 3) support zone. At each applicable site, the zones will be established and defined by the SSHO.

8.1.1 Exclusion Zone

The exclusion zone is the area where disturbance or "intrusive" activities (test well installation) are conducted and where contaminants may be present. Only properly authorized and trained individuals, wearing appropriate PPE will be allowed to enter and work in this zone. This area will be well marked to prevent inadvertent entry, and an entry and exit log (Figure 8-1) will be maintained. In the case of drilling activities, the standard exclusion zone is approximately 25 ft around the borehole.

8.1.2 Contamination Reduction Zone

This zone is the area where personnel and equipment are cleaned before moving

to/through the support zone. The contamination reduction zone will be located upwind from the sampling operations, if possible.

The configuration of the contamination reduction zone will depend on the site layout. Some areas will be confined by natural or man-made features, or other obstructions that limit the size and shape of the work zones. Optimally, decontamination operations will be conducted in an area at least 25 ft from the borehole.

8.1.3 Support Zone

The support zone contains the break area, eating area, storage area, and staging area. It is extremely important to locate the support zone in an area that is known to be free of contamination and as far as possible upwind of drilling activities.

8.2 Decontamination Procedures

Decontamination of site personnel and PPE are discussed in this section. Drilling and sampling equipment decontamination is covered in the work plan. Personnel and PPE can become contaminated in a number of ways, including:

- Contacting vapors, gases, mists, or particulates in the air;
- Being splashed by materials while sampling or handling sample containers;
- Coming in contact with contaminated soil or water; and
- Using previously contaminated equipment or instruments.

During equipment decontamination, personnel must adhere to the following procedures to decontaminate the equipment safely and

avoid exposing themselves to the decontaminated wastes:

- All steam cleaning personnel will protect their eyes during all steam cleaning operations;
- Storage of fuel for the steam cleaner must be secured in a safe place, away from ignition sources;
- If the steam cleaner is operated with electricity, provisions will be made to keep the electrical cord up off the wet ground; and

PPE will be decontaminated or disposed of in the following manner:

- Outer gloves will be removed and disposed of in a designated trash container. Hard hats, safety glasses, and boots will be cleaned at the end of the day or when leaving the exclusion zone using a complexing agent or detergent. Wash and rinse stations will be set up within the decontamination zone with detergent, potable water, and brushes.
- Disposable protective clothing (if used) will be removed and placed in waste drums or roll-off boxes.
- Inner gloves and respirator (if used) will be cleaned in the decontamination area and be removed in the support zone.
- Respirators (if used) will be disassembled and washed with detergent and rinsed with water at the end of each work day.

Section 9

EMERGENCY RESPONSE AND CONTINGENCY PROCEDURES

The objective of emergency response and contingency procedures is to ensure that effective actions are implemented in a timely manner to minimize or control the effects of adverse events (potential chemical exposures, personal injuries, fires/explosions, spills/releases). The following subsections describe the basic emergency responses required for the field investigation.

9.1 Accident and Emergency Medical Response

Accident and emergency medical response planning for potential chemical exposures and personal injuries is included in this SSHP. Before beginning site activities, the subcontractor's HSO will ensure that each of his team members has completed a Medical Data Sheet (Figure 9-1) and knows how to get to the nearest emergency medical facility. The closest hospital is the Base Hospital, which is to be used in cases of serious emergencies at the direction of the SSHO or subcontractor's HSO. For other medical emergencies, the Gerald Champion Memorial Hospital in Alamogordo will be used. The telephone numbers of the local emergency services will be available in the support zone, and the SSHO will brief the field team on the procedures for calling for help in an emergency. A list of emergency phone numbers, maps, and accident report forms are included in Appendix C.

The field team will be aware of the location of a first aid kit kept on site. Each subcontractor's HSO should be prepared to handle minor injuries and certified to perform cardiopulmonary resuscitation (CPR).

Depending on the severity of an accident or medical emergency, the SSHO or subcontractor's HSO will be responsible for:

- Removing the injured or ill person from the hazardous area;
- Transporting of the injured worker to a medical facility;
- Requesting emergency medical assistance;
- Treating minor injuries; and
- Making appropriate notifications.

Accidents or medical emergencies that require support will be brought to the attention of the Holloman AFB Base Environmental Coordinator (BEC) as soon as possible. The SSHO and subcontractor's HSO will cooperate with the BEC in accomplishing all required administrative functions.

In the event of an accident or injury, the USACE TM (Tom Zink, 402-221-7711) will be notified by the SSHO. In addition, the subcontractor's HSO and the SSHO will notify the Enserch HSC and the SPM (for accidents involving subcontractor personnel).

Before starting site work, the subcontractors HSO will provide the following information to Gerald Champion Memorial Hospital (Alamogordo) and Holloman AFB emergency medical personnel:

- The nature and duration of work being performed;
- Locations of drilling sites;
- Number of site workers;
- Potential chemical, physical, and biological hazards involved with the site

EED HEALTH AND SAFETY PROGRAM MANUAL

Page A-11 of A-14

TITLE: Health and Safety Plans

NO. HS-3
DATE: 8/92

REVISION:
1

FIGURE 14-1. MEDICAL DATA SHEET

The brief Medical Data Sheet shall be completed by all on-site personnel and will be kept in the Support Zone by the HSO as a project record during the conduct of site operations. It accompanies any personnel when medical assistance is needed or if transport to a hospital is required.

Project _____

Name _____ Home Telephone _____

Address _____

Age _____ Height _____ Weight _____ Blood Type _____

Name and Telephone Number of Emergency Contact _____

Drug or Other Allergies _____

Particular Sensitivities _____

Do you wear contacts? _____

Provide a checklist of previous illness _____

What medications are you presently using? _____

Do you have any medical restrictions? _____

Name, address, and phone number of personal physician:

MISC/6-91/01181A

Figure 9-1. Medical Data Sheet

work that might be encountered when responding to site-related emergencies; and

- Anticipated types and severities of injuries.

9.2 Fire Emergency Procedures

The threat of fire on this particular project is considered slight, due to the fact that any contaminated material will be aqueous or solid in nature. Fire hazards can, however, exist during equipment re-fueling and steam cleaner fuel storage and re-fueling activities.

Each subcontractor's HSO will check to see that each vehicle and drilling rig fire extinguisher is appropriate for the fire hazard presented by this project. Subcontractors are required to provide the appropriate extinguisher for their equipment and vehicles. Generally, Type ABC extinguishers will be appropriate and must have been hydrostat tested within the past year.

Immediately upon discovery of any fire, the field team will notify the SSHO. All fires will require the help of the Base fire department, and the subcontractor's HSO or SSHO should call for help at the earliest possible time. Be aware that toxic products produced in a fire situation can be very dangerous, and the fire department personnel should be briefed on these hazards before attending to the fire.

In event of a fire, the subcontractor's HSO, SSHO or his designee will direct precautionary actions on site after notifying the fire department. These precautionary actions include:

- Notification of all site personnel that a fire exists and to return to the support area;
- Immediate shut-down of site activities;

- Accounting for all site workers; and
- Site evacuation to a predetermined evacuation area, if necessary.

9.3 Chemical Spills and Releases

The project activities pose only a small risk of a chemical spill or release into the environment because of Enserch's spill prevention plan and spill response preparation. The spill prevention plan includes: 1) storing a sufficient amount of spill containment equipment (i.e., adsorbents, scoops, and disposal containers) in proximity to the bulk chemicals; and 2) limiting the amount of chemicals transported, handled, and stored to the smallest amount needed to complete the field activities. All chemicals brought on the site will be appropriately contained before, during, and after use and chemical-resistant containers will be used for secondary containment as needed. MSDSs for chemicals to be used in field activities are presented in Appendix D. Chemicals included are Alconox®, hexane, hydrochloric acid, nitric acid, sulfuric acid, and sodium hydroxide.

All field personnel are trained to watch for equipment leaks and to prevent spills while handling chemicals. In the event of a chemical spill, the Enserch Regulatory Compliance Manager (Ms. Patsy Meehan, 303/980-3659) will be notified by the SSHO. All field personnel are trained to respond in the following manner:

- Alert all employees in the area;
- Identify the material;
- Contain the spill by immediately stopping further spillage and by using the containment equipment, without risking personal injury;
- Prohibit access to spill area except for properly protected personnel involved in cleanup and disposal;

- Clean up the spill if there is not a hazardous chemical and there is no risk of injury; and
- Correctly dispose of waste material.

9.4 Emergency Communications and Services

The following is a list of emergency telephone numbers and agencies:

Emergency Agency	From Civilian or Pay Phone	From Military Phone
Emergency Telephones (Alamogordo)	911	9-911
Base Fire Department	479-7228	7228
Security Police	479-7171	7171
Nearest Civilian Hospital Facility (Gerald Champion Memorial Hospital, Alamogordo)	439-2100	9-439-2100
Civilian Ambulance Service	911	9-911
Base Environmental Coordinator (BEC)	479-3931	3931
Base Hospital (life threatening emergencies only)	479-3260	3260

A separate list of emergency telephone numbers and facility locations is also provided as Appendix C of this SSHP. Copies will be available for each worker and each vehicle. Prior to the start of field activities, the subcontractor's HSO will call to verify the telephone numbers and then distribute the emergency telephone list to workers and vehicles.

9.5 Accident Prevention

Potential physical, chemical, biological, and safety hazards have been previously discussed in this SSHP. Field personnel are required to be aware of potential hazards and to use appropriate protective gear to prevent accidents. If an accident does occur, a USACE Accident Reporting Form (Eng Form 3394) must be completed and submitted. The subcontractor's HSO will also complete and submit an Enserch Accident/Incident Report form (Figure 9-2) within 24 hours. A First Report of Injury Form (Figure 9-3) will be completed and submitted to the SPM. Subcontractors are responsible for their own OSHA and Workers' Compensation reporting.

ERASCO ENVIRONMENTAL
A Division of Ebasco Services Incorporated

Recordable

Non-Recordable

ACCIDENT/INCIDENT REPORT										Page 1 of 1
<input type="checkbox"/> Original Submittal		Report Prepared By (please print):					Date Prepared:			
<input type="checkbox"/> Correction Submittal										
Project:			Project Location (Address, City, State, Zip):							
Involved Employee Name (Last, First, M.I.):					Social Security No.:		Severity of Injury/Illness		Lost Work Days:	
Sex: M or F	Age:	Date Reported:	Accident Date:	Accident Time (Military):		0 First Aid			Est.:	
Home Address: _____ Street _____ City State Zip Phone: ()						1 Medical			Actual:	
						2 Lost Time			Restricted Work Days:	
						3 Fatal			Est.:	
						4 Non-Industrial			Actual:	
Company Name:				Department:			Work Phone: ()			
Regular Job Title:			Supervisor:							
Time on Job:		Time Employed:			Experience:					
Years:	Months	Years:	Months:	Years:	Months:	Years:	Months:			
Witnesses to Incident:										
<input checked="" type="checkbox"/> 1 Name: _____ Company: _____										
Address: _____										
Home Phone: ()					Work Phone: ()					
<input checked="" type="checkbox"/> 2 Name: _____ Company: _____										
Address: _____										
Home Phone: ()					Work Phone: ()					
If Hospitalized:										
Name of Hospital: _____						Phone: ()				
Address: _____										
Street			City			State		Zip		
Physician's Name: _____						Phone: ()				
Address: _____										
Street			City			State		Zip		
Property Damage (describe property damaged and dollar estimate of damage):										

Figure 9-2. Enserch Accident/Incident Report

EBASCO ENVIRONMENTAL
A Division of Ebasco Services Incorporated

ACCIDENT/INCIDENT REPORT (cont)								Page 2 of 4
Narrative Report of Accident/Incident (include date, time, location, etc.):								
Causative Factors of Accident/Incident (i.e., training, carelessness, faulty equipment, weather conditions, etc.):								
Use Space Below to Map Location of Accident/Incident (include landmarks such as well number, borehole number, cross street names, section number, etc.):								

Figure 9-2. Enserch Accident/Incident Report (Continued)



ACCIDENT/INCIDENT REPORT (cont.)			
Page 4 of 4			
Incident Analysis (circle one from each category):			
Worker Class 1 technician 2 assistant 3 associate 4 engineer 5 other Craft 01 administration 02 driller 03 laborer 04 electrician 05 engineer 06 technician 07 welder 08 geologist/hydrogeologist 09 health and safety 10 biologist 11 meteorologist 12 air quality 13 QA/QC 14 other Work Phase 01 excavation 02 construction 03 general labor 04 mechanical 05 office 06 warehouse 07 welding 08 drilling 09 sampling (specify) _____ 10 other _____	Time of Accident 01 0801-1000 02 1001-1200 03 1201-1400 04 1401-1600 05 1601-1800 06 1801-2000 07 2001-2200 08 2201-2400 09 0001-0200 10 0201-0400 11 0401-0600 12 0601-0800 Injury Type 01 amputation 02 strain/sprain 03 crush/mash/amash 04 fracture 05 cut/puncture/laceration 06 burn 07 contusion/abrasions 08 foreign body/eye injury 09 faint/dizziness 10 bruises 11 blisters 12 hearing loss 13 none—refer to illness code 14 other Body Part 01 head/face 02 eye 03 ear 04 neck/shoulders 05 arm/elbow 06 wrist/hand 07 thumb/finger 08 back 09 chest/lower trunk 10 ribs 11 hip 12 leg/knee 13 foot/ankle 14 toe 15 hernia/rupture 16 heart attack 17 internal 18 death 19 other	Injury Cause Struck by Tool or Object 01 hand tool or machine in use 02 falling or flying objects 03 tipping, sliding, or rolling objects 04 object handled by others 05 moving parts of machine 06 object being lifted or handled 07 motor vehicle Strain or Overexertion 10 lifting 11 using tool or machine 12 pushing or pulling 13 holding or carrying 14 reaching Cut, Puncture, Scrape Injury by 15 hand tool/hot powered 16 powered hand tool/appliance 17 object being lifted/handled 18 broken glass Fall or Slip 21 on same level 22 from different level 23 slipped, but not fall Striking Against 31 object being handled 32 stepping on sharp objects 33 stationary object 34 moving parts of machine 35 moving object Motor Vehicle Injuries 41 collision with another vehicle 42 collision with a fixed object 43 vehicle upset Caught On, In, or Between 51 machine or machine parts 52 mechanical apparatus 53 object handled/other object Burn or Heat-Cold Exposure 61 steam or hot fluids 62 welding operations 63 fire or flame 64 contact with hot object 65 acids-chemicals 66 heat exhaustion 67 heat stroke 68 hyperthermia 69 frostbite	Miscellaneous Causes 71 contact with electrical current 72 suffocation 73 explosion or flashback 74 by animal or insect 75 foreign body in eye 76 miscellaneous describe Illness 81 skin disease 82 respiratory disease 83 accidental poisoning 84 systemic effects 85 disorders due to physical agents 86 repetitive trauma disorders 87 other describe
Employment Period 01 1 week or less 02 2-4 weeks 03 1-2 months 04 2-6 months 05 6-12 months 06 1-2 years 07 2-5 years 08 5-10 years 09 over 10 years 10 unknown			
Approximate Age 01 under 20 02 20-30 03 31-40 04 41-50 05 51-60 06 over 61 07 unknown			

Figure 9-2. Enserch Accident/Incident Report (Continued)

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ACCIDENT/INCIDENT REPORT FOLLOW UP		
Date: _____		
Name of Involved Employee:		
_____	_____	_____
First	Middle	Last
Date of Accident/Incident: _____ Project: _____		
Actions Taken to Prevent Recurrence:		

Outcome of Incident:		

Physician's Recommendations (attach return-to-work form if available):		

Follow-up Report Prepared By:		
_____	_____	_____
Print Clearly		Signature
Attach any additional information to this form.		

Figure 9-2. Enserch Accident/Incident Report (Continued)

EMPLOYER'S FIRST REPORT OF INJURY OR ILLNESS

1. Name (Last, First, M.I.)		2. Sex F <input type="checkbox"/> M <input type="checkbox"/>		15. Date of Injury (m-d-y)		16. Time of Injury : am <input type="checkbox"/> pm <input type="checkbox"/>		17. Date Last Time Began (m-d-y)		
3. Social Security Number		4. Home Phone ()		5. Date of Birth (m-d-y)		18. Nature of Injury*		19. Part of Body Injured or Exposed*		
6. Does the Employee Speak English? If No, Specify Language YES <input type="checkbox"/> NO <input type="checkbox"/>										
7. Race White <input type="checkbox"/> Black <input type="checkbox"/> Asian <input type="checkbox"/>			8. Ethnicity Hispanic <input type="checkbox"/> Native American <input type="checkbox"/> Other <input type="checkbox"/>			20. How and Why Injury/Illness Occurred*				
9. Mailing Address Street or P.O. Box City State ZIP Code County										
10. Marital Status Married <input type="checkbox"/> Widowed <input type="checkbox"/> Separated <input type="checkbox"/> Single <input type="checkbox"/> Divorced <input type="checkbox"/>										
11. Number of Dependent Children			12. Spouse's Name			21. Was employee doing his regular job? YES <input type="checkbox"/> NO <input type="checkbox"/>		22. Worksite Location of Injury (stair, dock, etc.)*		
13. Doctor's Name										
14. Doctor's Mailing Address (Street or P.O. Box) City State ZIP Code										
23. Address Where Injury or Exposure Occurred Name of business if incident occurred on a business site Street or P.O. Box City State ZIP Code										
24. Cause of Injury (fall, tool, machine, etc.)*										
25. List Witnesses										
26. Return to work date or expected (m-d-y)			27. Did employee die? YES <input type="checkbox"/> NO <input type="checkbox"/>		28. Supervisor's Name		29. Date Reported (m-d-y)			
30. Date of Hire (m-d-y)		31. Was employee hired or recruited in Texas? YES <input type="checkbox"/> NO <input type="checkbox"/>		32. Length of Service in Current Position Months _____ Years _____		33. Length of Service in Occupation Months _____ Years _____				
34. Employee Payroll Classification Code										
36. Rate of Pay at this Job \$ _____ Hourly \$ _____ Weekly			37. Full Work Week is: _____ Hours _____ Days			35. Occupation of Injured Worker		38. Last Paycheck was: \$ _____ for _____ Hours or _____ Days		39. Is employee an Owner, Partner, or Corporate Officer? YES <input type="checkbox"/> NO <input type="checkbox"/>
40. Name and Title of Person Completing Form					41. Name of Business					
42. Business Mailing Address and Telephone Number Street or P.O. Box Telephone () City State ZIP Code					43. Business Location (If different from mailing address) Number and Street City State ZIP Code					
44. Federal Tax Identification Number			45. Primary Standard Industrial Classification (SIC) Code* (4 digit)		46. Specific SIC Code* (4 digit)		47. Texas Comptroller Taxpayer No.			
48. Workers' Compensation Insurance Company					49. Policy Number					
50. Did you request accident prevention services in past 12 months? YES <input type="checkbox"/> NO <input type="checkbox"/> If yes, did you receive them? YES <input type="checkbox"/> NO <input type="checkbox"/>										
51. Signature and Title (READ INSTRUCTIONS ON INSTRUCTION SHEET BEFORE SIGNING) X _____ Date _____										

TWCC-1 (2-91)
21391

Rule 120.2

Figure 9-3. Subcontractor's First Report of Injury Form

**Holloman Air Force Base - TERC Team
Mobile Laboratory Chemical Hygiene Plan
AGEISS Environmental Inc.**

Under the requirements of 29 CFR 1910.1450, a Chemical Hygiene Plan shall be readily available to employees, employee representatives and, upon request, to the Assistant Secretary. The Chemical Hygiene Plan shall include the elements listed below and shall indicate specific measures that the employer will take to ensure laboratory employee protection. The responses to these requirements are also included.

- 1). Standard operating procedures relevant to safety and health considerations to be followed when laboratory work involves the use of hazardous chemicals must be included.

Standard operating procedures including #A9-Total Petroleum Hydrocarbon (TPH) Testing by infrared Analysis, #A10-Method Detection Limit Study for the On-site Infrared Spectrophotometer and the Task-Specific Health and Safety Plan for Work Order Directive 1 (WAD1) contain relevant health and safety considerations to be followed when conducting laboratory operations. These procedures and requirements will be followed by all team members working on this task.

- 2). Criteria that the employer will use to determine and implement control measures to reduce employee exposure to hazardous chemicals including engineering controls, the use of personal protective equipment and hygiene practices; particular attention shall be given to the selection of control measures for chemicals that are known to be extremely hazardous.

Engineering controls including a fume hood are installed in the mobile laboratory. Any mixing of chemicals, sample extractions, etc. will be conducted within the confines of the fume hood. Special control measures as specified by the manufacturer of chemicals in use within the laboratory will be implemented. Material Safety Data Sheets that will be provided by the manufacturer at the time of the chemical shipment to Holloman Air Force Base will be included as an attachment to this Chemical Hygiene Plan.

- 3). A requirement that fume hoods and other protective equipment are functioning properly and specific measures that shall be taken to ensure proper and adequate performance of such equipment shall be included as part of the Chemical Hygiene Plan.

The fume hood will be tested by qualitative methods such as smoke tests prior to and during laboratory operations. Appropriate personal protective equipment will be worn by laboratory employees during analysis procedures.

- 4). Provisions for employee information and training shall be included in the Chemical Hygiene Plan.

All laboratory employees will be instructed in the safe and proper usage of all laboratory equipment prior to the beginning of sample analysis activities. Information concerning the safe handling of hazardous chemicals and environmental samples will be discussed and made available at this time.

- 5). The circumstances under which a particular laboratory operation, procedure or activity shall require prior approval from the employer or the employer's designee before implementation shall be provided.

All laboratory operations, procedures, changes etc. will be approved by Project Management prior to implementation.

- 6). Designation of personnel responsible for implementation of the Chemical Hygiene Plan including the assignment of a Chemical Hygiene Officer and, if appropriate, establishment of a Chemical Hygiene Committee; and provisions for additional employee protection for work with particularly hazardous substances. These include "select carcinogens", reproductive toxins, and substances which have a high degree of acute toxicity. Specific consideration shall be given to the following provisions which shall be included where appropriate:
- (A) Establishment of a designated area;
 - (B) Use of containment devices such as fume hoods or glove boxes;
 - (C) Procedures for safe removal of contaminated waste; and,
 - (D) Decontamination procedures.

All personnel performing sample analysis activities during WAD1 are responsible for implementation of this Chemical Hygiene Plan. It is not anticipated that "particularly hazardous substances" such as defined above will be used at the mobile laboratory. However, if any substances that fall within this definition are used, appropriate measures will be taken as required by the applicable regulations. Also, a chemical hygiene officer will be designated at the time of laboratory operations.

SUBCONTRACTOR SPECIFIC HEALTH & SAFETY PLAN

1.0 PROJECT

Subcontractor: Southwest Engineering, Inc.

Client: ENSERCH

Contract No.: DACW45-94-D-003, DO3, WAD1

Subcontractor Project Leader(s):

Field: Walter C. Black

Analytical: _____

Office: _____

2.0 SUBCONTRACTOR INFORMATION

Subcontractor: Name, address, phone number

Southwest Engineering, Inc.

475 Archuleta Road

Las Cruces, New Mexico 88005

505/526-3381

3.0 PROJECT DESCRIPTION

3.1 Give a brief description of the project or attach project instructions.

Sampling points survey, HAFB, 26 individual sites

3.2 List Activities (e.g., drilling, groundwater sampling, sample analysis):

- a. Surveying d. _____
- b. _____ e. _____
- c. _____ f. _____

4.0 EMERGENCY MEDICAL INFORMATION

Client Safety Contact: _____ Phone: _____
 Subcontractor Safety Contact (site): Walter C. Black
 Subcontractor Safety Contact Office): Paul Pompeo III

4.1 First Aid

Available? YES NO
 Location(s): on-site first aid kit

 Phone or Ext.: _____

4.2 Hospital

Name: Gerald Champion Memorial
 Location: 1209 E. 9th Street - Alamogordo
 Distance: off base - nearby Phone: 439-2100

4.3 Emergency Numbers

Service:	Phone Number:
<u>Base Fire Dept.</u>	<u>479-7228</u>
<u>Security Police</u>	<u>479-7171</u>
<u>Base EOD</u>	<u>479-5141</u>
<u>BEC</u>	<u>479-3931</u>

5.0 ENVIRONMENTAL HAZARDS (Circle "YES" or "NO" and list safeguards, safe practices, protective equipment on comment lines).

- a. Electrical? YES NO

- b. Temperature extremes? YES NO

- c. Heights? YES NO

- d. Noise? YES NO

- e. Explosion/Fire: YES NO

- f. Radiation? YES NO

- g. Confined spaces? YES NO

- h. Trenches? YES NO

i. Haz. Ambient Concentrations? YES **NO**
 (Provide MSDS(s))
 Have been provided MSDS

j. Other Chemical Hazards? YES **NO**
 (e.g. Solvents, reagents - provide MSDS(s))
 Have been provided MSDS

k. Other: _____

6.0 MONITORING REQUIREMENTS

6.1 Personal? YES **NO**
 Equipment: _____

6.2 Environmental? YES **NO**
 Equipment: _____

Comments: _____

Frequency: Continuous Hourly Daily Other: _____

7.4 **Gloves**

Inner _____ Outer _____

Rational for Selection: _____

7.5 **Respirator**

_____ SCBA	_____ 5 min. escape pack
_____ air supplied	_____ powered air purifying
_____ air purifying (full face)	_____ air purifying (half face)
_____ dust mask	

Rational for Selection: _____

7.6 **Cartridges/Filters**

_____ organic vapor	_____ acid gas
_____ ammonia/amine	_____ mercury
_____ HEPA	_____ dust/mist
_____ combination:	_____
_____ other:	_____

Rational for Selection: _____

7.7 **Other**

_____ hardhat	_____ ear plugs
_____ ear muffs	_____ cooling vest
_____ walkie talkies	_____ lanyards
_____	_____
_____	_____

Rational for Selection: _____

8.0 DECONTAMINATION REQUIREMENTS NOT APPLICABLE

(Designate decon steps by consecutive numbering)

<u>Decontamination Procedure</u>	<u>Protective Equipment</u>	<u>Field Equip</u>
High-pressure Water Spray	_____	_____
Steam Clean	_____	_____
Detergent Wash	_____	_____
Trisodium Phosphate	_____	_____
Alconox	_____	_____
Other: _____	_____	_____
 <u>Solvent Rinse</u>		
Acetone	_____	_____
Methanol	_____	_____
Other: _____	_____	_____
 <u>Water Rinse</u>		
DI H ₂ O	_____	_____
DI/Distilled H ₂ O	_____	_____
Analyte free H ₂ O	_____	_____
Other: _____	_____	_____

9.0 DISPOSAL PROCEDURES (list expendable clothing/equipment and method of disposal)

NOT APPLICABLE

10.0 PERSONNEL (Provide names of field crew and dates for training and respirator fit testing. Attach additional sheets if necessary.)

10.1 Training

<u>Name</u>	<u>OSHA 40 hr.</u>	<u>8 Hr. Refresher</u>	<u>Rep. Fit Test</u>	<u>Yrs. Exp.</u>
<u>Walter C. Black</u>	<u>03-94</u>	<u></u>	<u>03-94</u>	<u>35</u>
<u>Lawrence Rosas</u>	<u>07-91</u>	<u>03-94</u>	<u>03-94</u>	<u>4</u>
<u>Alex Sanchez</u>	<u>10-87</u>	<u>03-94</u>	<u>03-94</u>	<u>8</u>
<u>Art Valtierra</u>	<u>10-87</u>	<u>03-94</u>	<u>03-94</u>	<u>10</u>
<u>Paul J. Pompeo</u>	<u>03-94</u>	<u></u>	<u>03-94</u>	<u>10</u>
<u>Paul Pompeo III</u>	<u>07-91</u>	<u>03-94</u>	<u>03-94</u>	<u>22</u>

10.2 Medical

a. Medical Monitoring Protocol same as described in Project SSHP?

YES NO¹

b. Medical Monitoring Requirements fulfilled by the following individuals:

<u>Name</u>	<u>Med Exam Data</u>	<u>Restrictions</u>
<u>Walter C. Black</u>	<u>03-94</u>	<u>none</u>
<u>Lawrence Rosas</u>	<u>03-94</u>	<u>none</u>
<u>Alex Sanchez</u>	<u>03-94</u>	<u>none</u>
<u>Art Valtierra</u>	<u>03-94</u>	<u>none</u>
<u>Paul J. Pompeo</u>	<u>03-94</u>	<u>none</u>

¹If you answered "NO", then attach a brief description of the 29 CFR 1910.120-required medical monitoring exam provided for your employees involved under this contract.

10.3 Signatures: (all crew members must sign that they have read and understand this H&S Plan prior to start of any field work)

<u>Crew</u>	<u>Date</u>
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

10.4 This section requires a signature from the subcontractor's Health and Safety Officer or the other subcontractor health and safety representative that certifies the above information is factual and the above individuals have fulfilled the training and medical examination requirements of 29 CFR 1910.120

_____	_____
Signature	Date

Title	

- 11.0 ATTACHMENTS (circle if attachments supplied)**
- A = MSDS(s)
 - B = Client/Plant Safety Plan or Rules
 - C = Confined Spaces
 - D = Subcontractors Information

General Safety Procedures

All on-site personnel will observe the following general safe work practices:

- Prohibit food, drink and tobacco products from exclusion and contamination reduction zones;
- Prohibit loose clothing, hair, and jewelry around moving equipment;
- Implement "buddy system" whereby a pair of co-workers "watch out" for each other while in proximity of potential physical work hazards; and
- Avoid the formation of aerosols from potentially contaminated soil and water.

Respiratory Protection

Respiratory protection will be available for field personnel to use as required. All subcontractors must have their own respiratory protection program if respirators are used. The respirators, their proper fitting, use, and maintenance are the responsibility of each contracting company that has field personnel. Subcontractor employees are personally responsible for scheduling fit tests (annually or more frequently, as required) and respiratory protection training, and for properly using, cleaning, maintaining, and storing the respirators issued to them. The air-purifying respirator equipped with organic vapor cartridges and HEPA filters is capable of filtering airborne organic vapors, mists, and fumes out of inhaled air. This respirator does not provide oxygen and should not be used in oxygen deficient atmospheres. It will not provide adequate protection if the face seal is not tight. All members of the field team will be required to be clean shaven before wearing this mask. It is a violation of OSHA regulations to wear this mask with any facial hair that interferes with the face seal.

Personal Hygiene Practices

The field team must pay strict attention to sanitation and washing requirements to avoid personal contamination. The following instructions will be discussed and must be followed:

- Never put anything in the mouth, including fingers.
- All employees must wash their hands, forearms, face, and neck before eating, drinking, smoking, or using the restroom. There will be no exceptions to this rule.
- At the end of the day, each employee will shower thoroughly immediately upon returning to his/her living quarters.

Material and Drum/Container Handling Procedures

Material handling procedures consist of storing cuttings and fluids in drums during the installation and sampling of monitoring wells, and storing decontamination fluids in containers. Procedures are outlined in the work plan published separately from this SSHP.

Electrical Safety

Subcontractor personnel and subcontractors must follow the subcontractor safety measures discussed in subsection 3.1 for electrical hazards and the OSHA 29 CFR Part 1926, Subpart K, Electrical Safety Regulations

Fire Safety

Subcontractor personnel must have immediate access to an ABC-type portable fire extinguisher and be trained in its proper use. Flammable liquids (e.g., hexane) will be stored and transported in approved safety cans/cabinets. "No Smoking" signs must be posted at the worksite

and in flammable storage and refueling areas. OSHA 29 CFR, Part 1926, Subpart F, Fire Protection and Prevention Regulations must be followed by all field personnel.

Fall Protection

No special requirements are needed since working at heights is not required in any site investigation activities.

Illumination

All work is planned for daylight hours; therefore, no special requirements are needed.

Sanitation

Subcontractors will supply their own potable water and toilet facilities, if necessary.

Engineering Controls

No special engineering controls are required for planned investigations.

SOP A: Heat Stress

SOP B: Cold Stress

SOP C: Snake Bite

SOP A:

Heat Stress

1.0 Heat Stress

Wearing PPE puts a hazardous waste worker at considerable risk of developing heat stress. Because heat stress is one of the most common (and potentially serious) illnesses at hazardous waste sites, regular monitoring and other preventive precautions (controls) are vital. See Table 1 for the signs and symptoms of heat stress.

1.1 Monitoring

Because the incidence of heat stress depends on a variety of factors, all workers, even those not wearing protective equipment, should be monitored.

As follows:

- For workers wearing permeable clothing (lightweight pants and short), follow recommendations for monitoring requirements and suggested work/rest schedules in the current American Conference of Governmental Industrial Hygienists' (ACGIH) Threshold Limit Values for Heat Stress. If the actual clothing worn differs from the above ACGIH standard ensemble in insulation value and/or wind and vapor permeability, change the monitoring requirements and work/rest schedules.
- For workers wearing semipermeable or impermeable encapsulating ensembles, the ACGIH standard cannot be used. For these situations, workers should be monitored when the temperature in the work area is above 70°F (21°C). To monitor the worker, measure:
 - 1) Heart rate. Count the radial pulse during a 30-second period as early as possible in the rest period.

Table 1

Signs and Symptoms of Heat Strees

Stress Type	Cause	Symptoms
Heat rash	Continuous exposure to heat or humid air.	Red, itchy rash on the body.
Heat cramps	Heavy sweating with inadequate electrolyte replacement.	Muscle spasms, pain in the hands, feet, and abdomen.
Heat exhaustion	Increased stress on various body organs including inadequate blood circulation due to cardiovascular insufficiency or dehydration.	Pale, cool, moist skin, heavy sweating, dizziness, nausea, fainting.
Heat stroke	The most serious form of heat stress. Temperature regulation fails, and the body temperature rises to critical levels. Immediate action must be taken to cool the body before serious injury and death occur. Competent medical help must be obtained.	Red, hot, and usually dry skin, lack of or reduced perspiration, nausea, dizziness, or confusion, strong and rapid pulse, coma.

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

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

-- If oral temperature exceeds 99.6°F (37.6°C), shorten the next work cycle by one-third without changing the rest period.

-- If oral temperature still exceeds 99.6°F (37.6°C) at the beginning of the next rest period, shorten the following work cycle by one-third.

-- Do not permit a worker to wear a semipermeable or impermeable garment when his/her oral temperature exceeds 100.6°F (38.1°C).

3) Body water loss, if possible. Measure weight on a scale accurate to ± 0.25 lb at the beginning and end of each work day to see if enough fluids are being taken to prevent dehydration. Weights should be taken while the employee wears similar clothing. The body water loss should not exceed 1.5 percent total body weight loss in a work day.

- Initially, the frequency of physiological monitoring depends on the air temperature adjusted for solar radiation and the level of physical work (see Table 2). The length of the work cycle will be governed by the frequency of the required physiological monitoring.

1.2 Control

Proper training and preventive measures will help avert serious illness and loss of work productivity. Preventing heat stress is particularly important because once someone suffers from heat stroke or heat exhaustion, that person may be predisposed to additional heat injuries. To avoid heat stress, the SSHO or subcontractor HSO should take the following steps:

Table 2

**Suggested Frequency of Physiological Monitoring
for Fit and Acclimatized Workers^a**

Adjusted Temperature ^b	Normal Work Ensemble ^c	Impermeable Ensemble
90° F (32.2° C) or above	After each 45 minutes of work	After each 15 minutes of work
87.5° -90° F (30.8° -32.2° C)	After each 60 minutes of work	After each 30 minutes of work
82.5° -87.5° F (28.1° -30.8° C)	After each 90 minutes of work	After each 60 minutes of work
77.5° -82.5° F (25.3° -28.1° C)	After each 120 minutes of work	After each 90 minutes of work
72.5° -77.5° F (22.5° -25.3° C)	After each 150 minutes of work	After each 120 minutes of work

^a For work levels of 250 kilocalories/hour.

^b Calculate the adjusted air temperature (ta adj) by using this equation: $ta\ adj\ ^\circ F = ta\ ^\circ F (13 X \% \text{ sunshine})$. Measure air temperature (ta) with a standard mercury-in-glass thermometer, with the bulb shielded from radiant heat. Estimate percent sunshine by judging what percent time the sun is not covered by clouds that are thick enough to prevent a shadow. (100 percent sunshine = no cloud cover and a sharp, distinct shadow; 0 percent sunshine = no shadows.)

^c A normal work ensemble consists of cotton coveralls or other cotton clothing with long sleeves and pants.

- **Adjust work schedules:**
 - **Modify work/rest schedules according to monitoring requirements.**
 - **Mandate work slowdowns as needed.**
 - **Rotate personnel: alternate job functions to minimize overstress or overexertion at one task.**
 - **Add additional personnel to work teams.**
 - **Perform work during cooler hours of the day if possible or at night if adequate lighting can be provided.**
- **Provide shelter (air-conditioned, if possible) or shaded areas to protect personnel during rest periods.**
- **Maintain workers' body fluids at normal levels. Daily fluid intake must approximately equal the amount of daily weight lost. When heavy sweating occurs, encourage the worker to drink more. The following strategies may be useful:**
 - **Maintain water temperature at 50° to 60°F (10° to 15.6°C).**
 - **Have workers drink 16 ounces (0.5 liters) of fluid (preferably water or dilute drinks) before beginning work.**
 - **Urge workers to drink a cup or two every 15 to 20 minutes, or at each monitoring break. A total of 1 to 1.6 gallons (4 to 6 liters) of fluid per day are recommended, but more may be necessary to maintain body weight.**
 - **Weigh workers before and after work to determine if fluid replacement is adequate.**
- **Encourage workers to maintain an optimal level of physical fitness.**
- **Train workers to recognize and treat heat stress. As part of training, identify the signs and symptoms of heat stress.**

SOP B:

Cold Stress

1.0 COLD STRESS

Fatal exposure to cold among workers has almost always resulted from accidental exposures involving failure to escape from low air temperatures or from immersion in low temperature water. The single most important aspect of life-threatening hypothermia is the fall in deep core temperature of the body. Employees should be protected from exposure to cold so that the deep core temperature does not fall below 36 degrees Celsius; lower body temperature will very likely result in reduced mental alertness, reduction in rational decision making, or loss of consciousness with the threat of fatal consequences.

1.1 Evaluation and Control

For exposed skin, continuous exposure should not be permitted when the air speed and temperature results in an equivalent chill temperature of -32 degree Celsius. At temperatures of 2 degrees Celsius or less, it is imperative that employees who become immersed in water or whose clothing becomes wet be immediately provided with a change of clothing and be treated for hypothermia. Special protection of the hands is required to maintain manual dexterity for the prevention of accidents.

1.1.1 Work Below 4 Degrees Celsius

Provisions for additional total body protection is required if work is performed at or below 4 degrees Celsius as follows:

- The employees shall wear cold protective clothing appropriate for the level of cold and physical activity.

- If the air velocity at the site is increased by wind or artificial ventilation, the cooling effect of the wind shall be reduced by shielding the work area, or by wearing a removable outer windbreak garment.
- If the clothing on the employee may become wet on the job site, the outer layer of the clothing in use should be water repellent.
- If the available clothing does not give adequate protection to prevent hypothermia or frostbite, work shall be modified or suspended until adequate clothing is made available or until weather conditions improve.
- Employees handling evaporative liquids at temperatures below 4 degrees Celsius shall take special precautions to avoid soaking of clothing or gloves because of the added danger of cold injury due to the evaporative cooling.

1.1.2 Work Below -12 Degrees Celsius

For work practices at or below -12 degrees Celsius, the following shall apply:

- The worker shall be under constant protective observation (buddy system).
- If work must be done, rest periods must be taken in heated shelters and opportunity for changing into dry clothing shall be provided.
- New employees shall not be required to work full-time in cold in the first few days until they become accustomed to the working conditions and required protective clothing.
- The work shall be arranged in such a way that sitting still or standing still for long periods is minimized.
- The workers shall be instructed in safety and health procedures. The training program shall include as a minimum, instruction in:
 - Proper rewarming procedures and appropriate first aid treatment.
 - Proper clothing practices.
 - Proper eating and drinking habits.
 - Recognition of impending frostbite.

- Recognition signs and symptoms of impending hypothermia or excessive cooling of the body even when shivering does not occur.
- Safe work practices.

1.2 Special Workplace Recommendations

Special caution shall be exercised when working with toxic substances and when workers are exposed to vibration. Cold exposure may require reduced exposure limits. Eye protection shall be provided to workers employed out-of-doors in a snow and/or ice terrain. Trauma sustained in freezing or subzero conditions requires special attention because an injured worker is predisposed to secondary cold injury. Special provisions must be made to prevent hypothermia and secondary freezing of damaged tissues in addition to providing for first aid treatment.

SOP C:
Snake Bite

1.0 STANDARD OPERATING PROCEDURE - SNAKE BITE

Normally, the noise created by a person approaching a snake habitat is sufficient to frighten the snakes off. However, extreme caution is necessary when exploring areas where snakes might be found, such as behind rocks, under bushes, or in holes, crevices, and abandoned pipes.

The rules to follow if bitten by a snake are:

- **Do not** cut the bite area as it will exacerbate the effect of the venom.
- **Do not** apply suction to the wound as it is minimally effective in removing venom.
- **Do not** apply a tourniquet since venom is most dangerous when concentration in a small area.
- **Do not** allow the victim to run for help as this allows accelerated circulation.
- **Do** seek immediate medical attention.
- **Do** keep the victim calm and immobile.
- **Do** have the victim hold the affected extremity lower than the body while waiting for medical assistance.

Appendix C

EMERGENCY TELEPHONE NUMBERS AND HOSPITAL LOCATIONS

Emergency Agency	From Civilian or Pay Phone	From Military Phone
Emergency Telephones (Alamogordo)	911	9-911
Base Fire Department	479-7228	7228
Security Police	479-7171	7171
Nearest Civilian Hospital Facility (Gerald Champion Memorial Hospital, Alamogordo)	439-2100	9-439-2100
Civilian Ambulance Service	911	9-911
Base Environmental Coordinator (BEC)	479-3931	3931
Base Hospital (life threatening emergencies only)	479-3260	3260

Hospital Address:

Gerald Champion Memorial Hospital
1209 East 9th Street
Alamogordo, NM

The location of the Alamogordo hospital is shown on Figure C-1. The location of the Base hospital is shown on Figure C-2. The Base hospital should only be used in case of serious emergencies at the direction of the SSHO or subcontractor HSOs.

The forms to be used for reporting accidents and incidents are provided in section 9 of the SSHP.

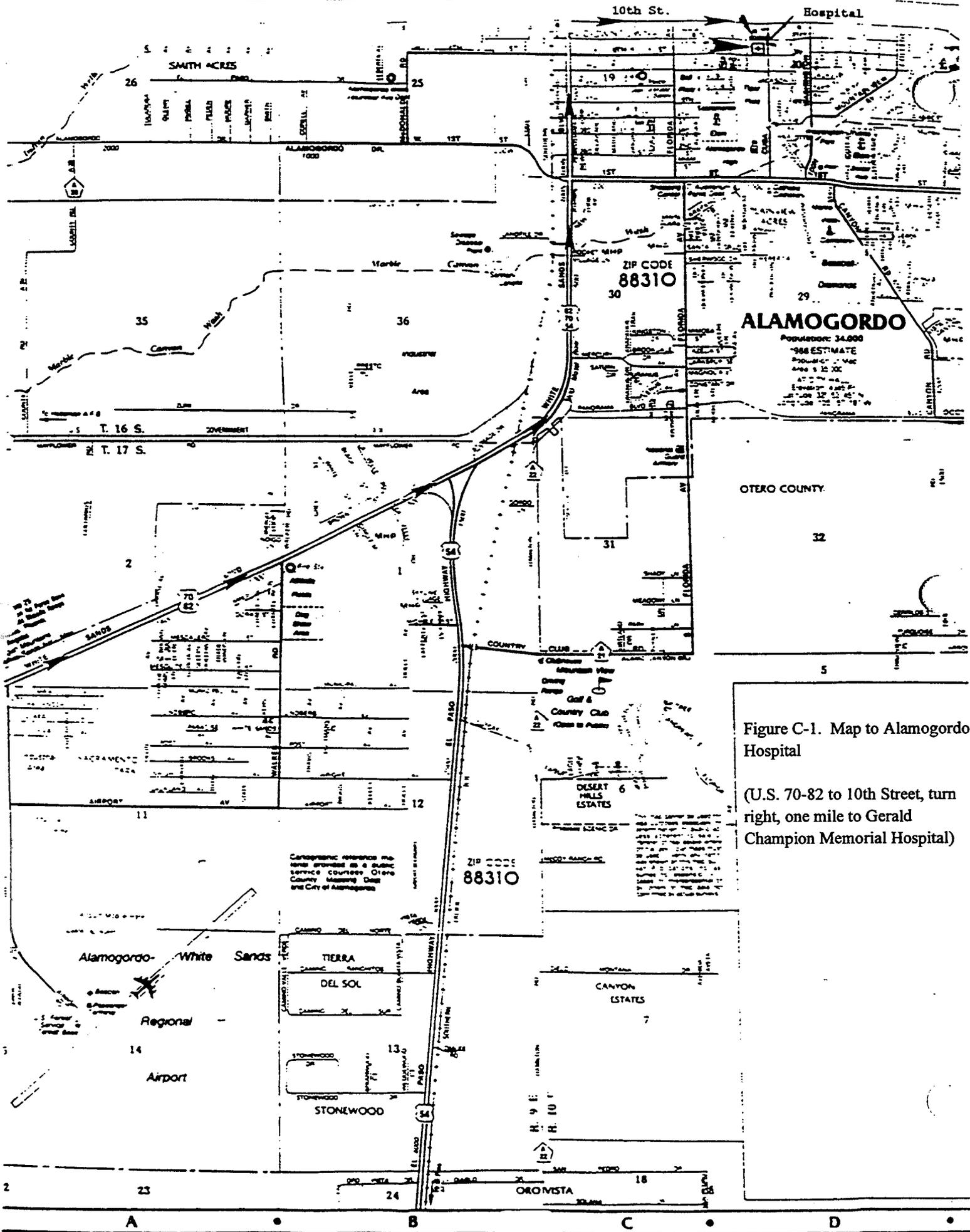


Figure C-1. Map to Alamogordo Hospital
(U.S. 70-82 to 10th Street, turn right, one mile to Gerald Champion Memorial Hospital)

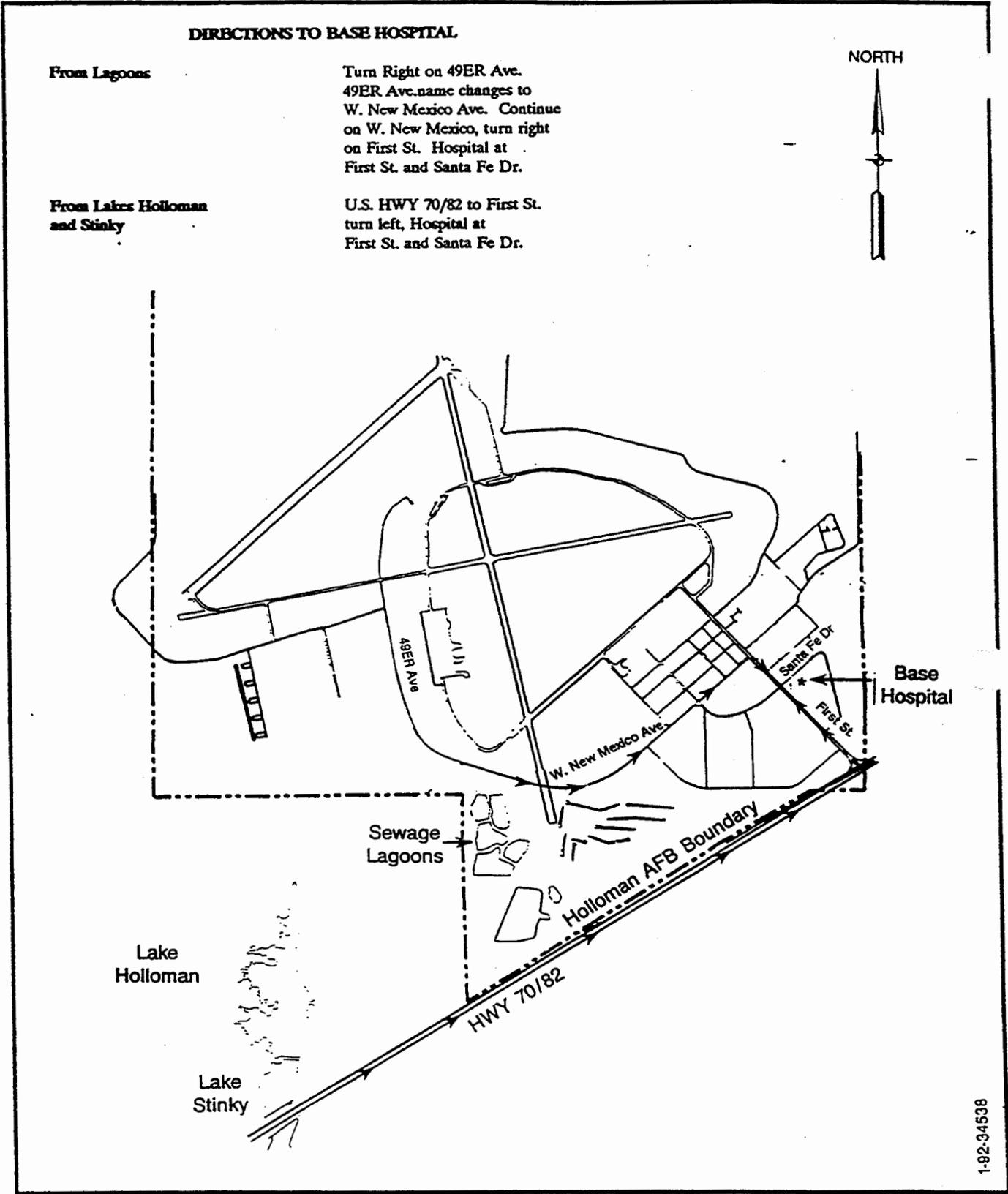


Figure C-2. Location of Base Hospital

Appendix D

MATERIAL SAFETY DATA SHEETS

Material Safety Data Sheet
 May be used to comply with
 OSHA's Hazard Communication Standard,
 29 CFR 1910.1200. Standard must be
 consulted for specific requirements.

U.S. Department of Labor
 Occupational Safety and Health Administration
 (Non-Mandatory Form)
 Form Approved
 OMB No. 1218-0072



IDENTITY (As Used on Label and List) **ALCONOX** Note: Blank spaces are not permitted. If any item is not applicable, or no information is available, the space must be marked to indicate this.

Section I

Manufacturer's Name ALCONOX, INC.	Emergency Telephone Number (212) 473-1300
Address (Number, Street, City, State, and ZIP Code) 215 PARK AVENUE SOUTH	Telephone Number for Information (212) 473-1300
NEW YORK, N.Y. 10003	Date Prepared JULY 1, 1989
	Signature of Preparer (optional)

Section II — Hazardous Ingredients/Identity Information

Hazardous Components (Specific Chemical Identity, Common Name(s))	OSHA PEL	ACGIH TLV	Other Limits Recommended	% (OSHA)
THERE ARE NO INGREDIENTS IN ALCONOX WHICH APPEARED ON THE OSHA STANDARD 29 CFR 1910 SUBPART Z.				

Section III — Physical/Chemical Characteristics

Boiling Point	N.A.	Specific Gravity (H ₂ O = 1)	N.A.
Vapor Pressure (mm Hg.)	N.A.	Melting Point	N.A.
Vapor Density (AIR = 1)	N.A.	Evaporation Rate (Butyl Acetate = 1)	N.A.

Solubility in Water **APPRECIABLE (GREATER THAN 10 PER CENT)**

Appearance and Odor **WHITE POWDER INTERSPERED WITH CREAM COLORED FLAKES - ODORLESS**

Section IV — Fire and Explosion Hazard Data

Flash Point (Method Used) NONE	Flammable Limits	LEL N.A.	UEL N.A.
--	------------------	--------------------	--------------------

Extinguishing Media **WATER, CO₂, DRY CHEMICAL, FOAM, SAND/EARTH**

Special Fire Fighting Procedures
FOR FIRES INVOLVING THIS MATERIAL DO NOT ENTER WITHOUT PROTECTIVE EQUIPMENT AND SELF CONTAINED BREATHING APPARATUS.

Unusual Fire and Explosion Hazards **NONE**

Section V — Reactivity Data

Stability	Unstable		Conditions to Avoid NONE
	Stable	XX	

Incompatibility (Materials to Avoid) **AVOID STRONG ACIDS**

Hazardous Decomposition or Byproducts **MAY RELEASE CO₂ GAS ON BURNING**

Hazardous Polymerization	May Occur		Conditions to Avoid NONE
	Will Not Occur	XX	

Section VI — Health Hazard Data

Route(s) of Entry: Inhalation? **YES** Skin? **NO** Ingestion? **YES**

Health Hazards (Acute and Chronic) **INHALATION OF POWDER MAY PROVE LOCALLY IRRITATING TO MUCOUS MEMBRANES. INGESTION MAY CAUSE DISCOMFORT AND/OR DIARRHEA.**

Carcinogenicity: NTP? **NO** IARC Monographs? **NO** OSHA Regulated? **NO**

Signs and Symptoms of Exposure **EXPOSURE MAY IRRITATE MUCOUS MEMBRANES. MAY CAUSE SNEEZING.**

Medical Conditions Generally Aggravated by Exposure **RESPIRATORY CONDITIONS MAY BE AGGRAVATED BY POWDER.**

Emergency and First Aid Procedures
**EYES-FLUSH WITH PLENTY OF WATER FOR 15 MINUTES SKIN-FLUSH WITH PLENTY OF WATER
 INGESTION-DRINK LARGE QUANTITIES OF WATER, GET MEDICAL ATTENTION FOR DISCOMFORT**

Section VII — Precautions for Safe Handling and Use

Steps to Be Taken in Case Material is Released or Spilled **MATERIAL FOAMS PROFUSELY. SHOVEL AND RECOVER AS MUCH AS POSSIBLE. RINSE REMAINDER TO SEWER. MATERIAL IS COMPLETELY BIODEGRADABLE.**

Waste Disposal Method **SMALL QUANTITIES MAY BE DISPOSED OF IN SEWER. LARGE QUANTITIES SHOULD BE DISPOSED OF ACCORDING TO LOCAL REQUIREMENTS FOR NON-HAZARDOUS DETERGENTS**
 Precautions to Be Taken in Handling and Storing **STORE IN A DRY AREA TO PREVENT CAKING.**

Other Precautions **NO SPECIAL REQUIREMENTS OTHER THAN THE GOOD INDUSTRIAL HYGIENE AND SAFETY PRACTICES EMPLOYED WITH ANY INDUSTRIAL CHEMICAL.**

Section VIII -- Control Measures

Respiratory Protection (Specify Type) **DUST MASK**

Ventilation	Local Exhaust	NORMAL	Special	N.A.
	Mechanical (General)	N.A.	Other	N.A.

Protective Gloves **USEFUL-NOT REQUIRED** Eye Protection **USEFUL-NOT REQUIRED**

Other Protective Clothing or Equipment **NOT REQUIRED**

Work/Hygienic Practices **NO SPECIAL PRACTICES REQUIRED**

American Burdick & Jackson

Material Safety Data Sheet



emergency telephone no. 312/973-3600 (American Scientific Products)
chemtrec telephone no. 800/424-9300
information telephone no. 616/726-3171 (American Burdick & Jackson)

**MATERIAL SAFETY
DATA SHEET**

I. Identification

chemical name Benzene molecular weight 78.11
chemical family Aromatic Hydrocarbon formula C₆H₆
synonyms Benzol
DOT proper shipping name Benzene
DOT hazard class Flammable Liquid
DOT identification no. UN1114 CAS no. 71-43-2

BENZENE

II. Physical and Chemical Data

boiling point, 760mm Hg. 80°C freezing point 5.5°C evaporation rate (BuAc=1) ca 3
vapor pressure at 20°C 74.6 mm Hg vapor density (air = 1) 2.8 solubility in water @ 25°C 0.18%
% volatiles by volume ca 100 specific gravity (H₂O = 1) @ 20°C 0.879 stability Stable
hazardous polymerization Not expected to occur.
appearance and odor Clear, colorless liquid with a characteristic aromatic odor.
conditions to avoid Heat, sparks, open flame, open containers, and poor ventilation.

materials to avoid Strong oxidizing agents and strong acids.

hazardous decomposition products Incomplete combustion can generate carbon monoxide and other toxic vapors.

III. Fire and Explosion Hazard Data

flash point, (test method) -11°C (Tag closed cup) auto ignition temperature 562°C
flammable limits in air % by volume: lower limit 1.3 upper limit 7.1
unusual fire and explosion hazards Volatile and flammable.

extinguishing media Carbon dioxide, dry chemical or foam.

special fire fighting procedures Water will not be effective in extinguishing a fire and may spread it, but a water spray can be used to cool exposed containers. Wear full protective clothing and self-contained breathing apparatus. Heat will build pressure and rupture closed storage containers.

IV. Hazardous Components

Benzene % ca 100 TLV 10 ppm CAS no. 71-43-2

American Burdick & Jackson's Disclaimer: "The information and recommendations presented herein are based on sources believed to be reliable as of the date hereof. American Burdick & Jackson makes no representation as to the completeness or accuracy thereof. It is the user's responsibility to determine the product's suitability for its intended use, the product's safe use, and the product's proper disposal. No representations or warranties not expressly set forth herein are made hereunder, whether express or implied by operation of law or otherwise, including, but not limited to any implied warranties of MERCHANTABILITY OR FITNESS. American Burdick & Jackson neither assumes nor authorizes any other person to assume for it, any other or ADDITIONAL LIABILITY OR RESPONSIBILITY resulting from the use of, or reliance upon, this information."



American Burdick & Jackson

Subsidiary of American
Hospital Supply Corporation

1953 South Harvey Street
Muskegon MI 49442

V. Health Hazards

Occupational Exposure Limits

OSHA	8-hour PEL	-	10 ppm
	Ceiling	-	25 ppm
	Peak	-	50 ppm
ACGIH	TLV-TWA	-	10 ppm
	TLV-STEL (15-min)	-	25 ppm
	TLV-TWA	-	10 ppm
NIOSH	TLV-C	-	not listed

Concentration Immediately Dangerous to Health

OSHA/NIOSH 2,000 ppm

Odor Threshold

NSC 2 ppm
NIOSH not listed
OHS 1.5-5 ppm

Carcinogenic, Mutagenic, Teratogenic Data

Human carcinogen (NTP, IARC)
Suspect human carcinogen (ACGIH)
Mutagenic and teratogenic data (RTEC)
Animal carcinogen (IARC)

Primary Routes of Entry

Benzene may exert its effects through inhalation, skin absorption, and ingestion.

Industrial Exposure: Route of Exposure/Signs and Symptoms

- Inhalation:** Exposure can cause dizziness, intoxication, excitement, headache, vomiting, delirium, drowsiness, and unconsciousness.
- Eye Contact:** Liquid and high vapor concentration can cause irritation, neuritis, atrophy, visual impairment, edema, and cataracts.
- Skin Contact:** Prolonged or repeated skin contact can cause irritation and dermatitis through defatting of skin.
- Ingestion:** Can cause gastrointestinal tract discomfort.

Effects of Overexposure

Benzene is a primary skin irritant, central nervous system depressant, bone marrow depressant, and leukemogen. Acute benzene exposure from inhalation or ingestion initially produces excitation and euphoria, followed by headache, drowsiness, dizziness, vomiting, delirium and unconsciousness. Respiratory irritation and pulmonary edema are possible. Severe exposure causes blurred vision, tremors, shallow and rapid respiration, ventricular fibrillation, paralysis, and convulsions. Liver and kidney damage may occur. Chronic exposure to benzene poses the most significant toxic effects. Symptoms are headache, anorexia, nervousness, weariness, anemia, pallor, bleeding under the skin and eyes, and reduced clotting ability. Bone marrow damage and leukemia may develop. Liver and kidney damage may occur.

Medical Condition Aggravated by Exposure

Preclude from exposure those individuals with diseases of the heart, lung, kidney, liver, nervous system, or the blood, and those susceptible to dermatitis.

Emergency First Aid

Inhalation: Immediately remove to fresh air. If not breathing, administer mouth-to-mouth rescue breathing. If there is no pulse administer cardiopulmonary resuscitation (CPR). Contact physician immediately.

Eye Contact: Rinse with copious amounts of water for at least 15 minutes. Get emergency medical assistance.

Skin Contact: Flush thoroughly for at least 15 minutes. Wash affected skin with soap and water. Remove contaminated clothing and shoes. Wash clothing before re-use, and discard contaminated shoes. Get emergency medical assistance.

Ingestion: Call local Poison Control Center for assistance. Contact physician immediately. Aspiration-Hazard - Do not induce vomiting.

VI. Safety Measures and Equipment

Ventilation: Adequate ventilation is required to protect personnel from exposure to chemical vapors exceeding the PEL and to minimize fire hazards. The choice of ventilation equipment, either local or general, will depend on the conditions of use, quantity of material, and other operating parameters.

Respiratory: Use approved respirator equipment. Follow NIOSH and equipment manufacturer's recommendations to determine appropriate equipment (air-purifying, air-supplied, or self-contained breathing apparatus).

Eyes: Safety glasses are considered minimum protection. Goggles or face shield may be necessary depending on quantity of material and conditions of use.

Skin: Protective gloves and clothing are recommended. The choice of material must be based on chemical resistance and other user requirements. Generally, Buna-N offers acceptable chemical resistance. Individuals who are acutely and specifically sensitive to benzene may require additional protective equipment.

Storage: Benzene should be protected from temperature extremes and direct sunlight. Proper storage of benzene must be determined based on other materials stored and their hazards and potential chemical incompatibility. In general, benzene should be stored in an acceptably protected and secure flammable liquid storage room.

Other: Emergency eye wash fountains and safety showers should be available in the vicinity of any potential exposure. Ground and bond metal containers to minimize static sparks.

VII. Spill and Disposal Data

Spill Control: Protect from ignition. Wear protective clothing and use approved respirator equipment. Absorb spilled material in an absorbent recommended for solvent spills and remove to a safe location for disposal by approved methods. If released to the environment, comply with all regulatory notification requirements.

Waste Disposal: Dispose of benzene as an EPA hazardous waste. Hazardous waste numbers: U019(Ignitable, Toxic); D001(Ignitable).

Revision Date: 6/85

KEY

ca	Approximately	STEL	Short Term Exposure Level
na	Not applicable	TLV	Threshold Limit Value
C	Ceiling	TWA	Time Weighted Average
PEL	Permissible Exposure Level	BuAc	Butyl Acetate
NSC	National Safety Council ("Fundamentals of Industrial Hygiene", 1983)		
OHS	Occupational Health Services ("Hazardline")		



Du Pont Chemicals

2024FR

Revised 8-SEP-1993

Printed 14-DEC-1993

FREON 113 REFRIGERANT

CHEMICAL PRODUCT/COMPANY IDENTIFICATION

Material Identification

"FREON" is a registered trademark of DuPont.

Corporate MSDS Number DU000126

Formula CCl₂FCClF₂

Molecular Weight 187.38

Tradenames and Synonyms

TRICHLOROTRIFLUOROETHANE
 1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE
 "FREON" TF SOLVENT
 "FREON" TF CLEANING AGENT
 "FREON" PRECISION CLEANING AGENT
 "FREON" TF
 "FREON" PCA
 "FREON" TF 113
 CC0031
 CC0292

Company Identification

MANUFACTURER/DISTRIBUTOR
 Du Pont
 1007 Market Street
 Wilmington, DE 19898

PHONE NUMBERS

Product Information 1-800-441-9442
 Transport Emergency CHEMTREC: 1-800-424-9300
 Medical Emergency 1-800-441-3637

COMPOSITION/INFORMATION ON INGREDIENTS

Components Material

CAS Number %

*1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE ("FREON" 113)	76-13-1	100
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* Regulated as a Toxic Chemical under Section 813 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR part 372.

(Continued)

HAZARDS IDENTIFICATION

Potential Health Effects

PRINCIPAL HEALTH HAZARDS (Including Significant Routes, Effects, Symptoms of Overexposure, and Medical Conditions Aggravated by Exposure)

In acute toxicity testing in animals, "FREON" 113 was of very low toxicity by inhalation. However, life-threatening exposures may occur if handled carelessly. Vapors are heavier than air posing a hazard of asphyxiation if they are trapped in enclosed or low places. At flame temperatures, this fluorocarbon may decompose to hydrogen fluoride which may be lethal at low concentrations. "FREON" 113 poses a hazard of fatal heart irregularities if inhaled at high concentrations. Skin or eye contact may cause irritation. Prolonged skin contact may cause drying of the skin. Inhalation or ingestion may cause dizziness, headache, confusion, incoordination and loss of consciousness.

ANIMAL DATA:

Inhalation 4 hour LC50: 52,500 ppm in rats
Skin absorption ALD: >11,000 mg/kg in rabbits
Oral LD50: 43,000 mg/kg in rats

The liquid is a mild skin irritant and a slight eye irritant. The compound has produced a weak allergic skin reaction (sensitization) in guinea pigs.

Skin: Repeated exposure to high doses of the liquid maintained in close contact with the skin caused severe local irritation in rabbits. This reaction is typically seen when defatting agents are tested under similar conditions.

Inhalation: The effects in animals from high single exposures include anaesthetic effects such as tremors, dizziness, incoordination, and loss of consciousness, and irregular heartbeat (cardiac arrhythmias) due to the heart being made more sensitive to adrenalin (cardiac sensitization). Repeated exposure at high concentrations also produced central nervous system effects during exposure but no evidence of other systemic toxicity.

Ingestion: High, single oral administration of the liquid, at or near lethal doses, produced lethargy within several minutes. Survivors have shown no apparent toxic effects.

There is no evidence of carcinogenicity or teratogenicity in animal testing. In a reproductive toxicity study in rats, no adverse effects on reproductive performance were seen at concentrations of 500 ppm, and only minimal effects (slight decrease in corpora lutea) were observed at 12,500 ppm.

(Continued)

HAZARDS IDENTIFICATION(Continued)

This compound does not produce genetic damage in bacterial or mammalian cell cultures. It does not produce heritable genetic damage in male animals (dominant lethal test).

HUMAN HEALTH EFFECTS OF OVEREXPOSURE BY:

Skin contact may initially include: mild skin irritation, mainly due to rapid evaporation, with possible discomfort or rash. Prolonged skin contact may cause temporary tingling, numbness, coldness, or drying of skin. There are no reports of human skin sensitization. Significant skin permeation, and systemic toxicity, after contact appears unlikely.

Eye contact may initially include: mild eye irritation with discomfort, tearing, or blurring of vision.

The major ingestion hazard is aspiration (liquid entering the lungs during ingestion or vomiting) which may result in "chemical pneumonia". Symptoms include coughing, gasping, choking, shortness of breath, bluish discoloration of the skin, rapid breathing and heart rate, and fever. Pulmonary edema or bleeding, drowsiness, confusion, coma and seizures may occur in more serious cases. Symptoms may develop immediately or as late as 24 hours after the exposure, depending on how much chemical entered the lungs.

Inhalation or ingestion may include: temporary nervous system depression with anaesthetic effects such as dizziness, headache, confusion, incoordination, and loss of consciousness. Higher exposures may cause temporary alteration of the heart's electrical activity with irregular pulse, palpitations, or inadequate circulation. Fatality may occur from gross overexposure. One report cites two cases where workers who were repeatedly overexposed to the compound experienced liver damage; however, it was not proven that the compound actually caused the damage. Another study evaluated 50 workers exposed for an average of over 2 years to 46 - 4700 ppm. No adverse effects were found except for 1 case of dry skin.

Carcinogenicity Information

None of the components present in this material at concentrations equal to or greater than 0.1% are listed by IARC, NTP, OSHA or ACGIH as a carcinogen.

FIRST AID MEASURES**First Aid****INHALATION**

If high concentrations are inhaled, immediately remove persons to fresh air; keep them calm. If not breathing, give artificial respiration. If breathing is difficult,

(Continued)

FIRST AID MEASURES(Continued).

give oxygen. Call a physician.

SKIN CONTACT

In case of skin contact, flush skin with plenty of water for 15 minutes. Get medical attention if irritation is present.

EYE CONTACT

In case of eye contact, immediately flush eyes with plenty of water for 15 minutes. Call a physician.

INGESTION

If swallowed, no specific intervention is indicated as the compound is not likely to be hazardous by ingestion. Do not induce vomiting. However, consult a physician if necessary.

Notes to Physicians

Activated charcoal slurry may be administered. To prepare activated charcoal slurry suspend 50 g activated charcoal in 400 mL water in plastic bottle and shake well. Administer 5 mL/kg, or 350 mL for an average adult.

Because of a possible increased risk of eliciting cardiac dysrhythmias, catecholamine drugs, such as epinephrine, should be used with special caution in situations of emergency life support.

Because of the danger of aspiration, emesis or gastric lavage should not be employed unless the risk is justified by the presence of additional toxic substances. Activated charcoal may induce vomiting, but may be given after emesis or lavage to absorb toxic additives. Steroid therapy in mild to moderate cases does not improve outcome. Bacterial pneumonia often occurs after exposure, but prophylactic antibiotics are not indicated and should be reserved for documented bacterial pneumonia.

FIRE FIGHTING MEASURES**Flammable Properties**

Flash Point	Will not burn
Autodecomposition	300 C (572 F)

Fire and Explosion Hazards:

Drums may rupture under fire conditions. Decomposition may occur.

Extinguishing Media

As appropriate for combustibles in area.

Fire Fighting Instructions

Use water spray or fog to cool container. Self-contained breathing apparatus (SCBA) is required if drums rupture and contents are spilled under fire conditions.

(Continued)

ACCIDENTAL RELEASE MEASURES

Safeguards (Personnel)

NOTE: Review FIRE FIGHTING MEASURES and HANDLING (PERSONNEL) sections before proceeding with clean-up. Use appropriate PERSONAL PROTECTIVE EQUIPMENT during clean-up.

Accidental Release Measures

Ventilate area. Do not flush into sewers. Dike spill. Collect on absorbent material and transfer to steel drums for recovery or disposal. Use self-contained breathing apparatus (SCBA) for large spills. Comply with Federal, State, and local regulations on reporting releases.

HANDLING AND STORAGE

Handling (Personnel)

Avoid breathing vapors and prolonged skin exposure. Use with sufficient ventilation to keep employee exposure below recommended limits.

Storage

Clean, dry area. Do not heat above 125 deg F.

EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls

Normal ventilation for standard use procedures is generally adequate. Local exhaust should be used when large amounts are released. Mechanical ventilation should be used in low or enclosed places.

Personal Protective Equipment

Impervious gloves should be used to avoid prolonged or repeated exposure. Chemical splash goggles should be worn as needed to prevent eye contact. Under normal use conditions, no respiratory protection is required when using this product. Self-contained breathing apparatus (SCBA) is required if a large spill occurs.

Exposure Guidelines

Applicable Exposure Limits

	1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	
PEL (OSHA)		1,000 ppm, 7,600 mg/m ³ , 8 Hr. TWA
TLV (ACGIH)		1,000 ppm, 7,670 mg/m ³ , 8 Hr. TWA
		STEL 1,250 ppm, 9,590 mg/m ³
AEL * (Du Pont)		None Established

* AEL is Du Pont's Acceptable Exposure Limit. Where governmentally imposed occupational exposure limits which are lower than the AEL are in effect, such limits shall take precedence.

(Continued)

PHYSICAL AND CHEMICAL PROPERTIES
Physical Data

Boiling Point	48 C (118 F)
Vapor Pressure	6.46 psia at 25 deg C (77 deg F)
Vapor Density	2.9 (Air = 1.0) at 25 deg C (77 deg F)
% Volatiles	100 WT%
Evaporation Rate	(CCl4 = 1) Greater than 1
Solubility in Water	0.02 WT% @ 25 C (77 F)
pH	Neutral
Odor	Slight ethereal
Form	Liquid
Color	Clear, colorless
Density	1.57 g/cc at 25 deg C (77 deg F) - Liquid

STABILITY AND REACTIVITY
Chemical Stability

Material is stable. However, avoid open flames and high temperatures.

Incompatibility with Other Materials

Incompatible with alkali or alkaline earth metals- powdered Al, Zn, Be, etc.

Polymerization

Polymerization will not occur.

Other Hazards

Decomposition : Decomposition products are hazardous. This compound can be decomposed by high temperatures (open flames, glowing metal surfaces, etc.) forming hydrochloric and hydrofluoric acids, and possibly carbonyl halides.

ECOLOGICAL INFORMATION
Ecotoxicological Information**Aquatic Toxicity**

96-hour LC50, rainbow trout : 7.4 mg/L

DISPOSAL CONSIDERATIONS
Waste Disposal

Comply with Federal, State, and local regulations. Remove to a permitted waste disposal facility. EPA Hazardous Waste Nos. F001 and F002 may apply to waste materials.

(Continued)

TRANSPORTATION INFORMATION

Shipping Information
Shipping Containers

Tank Cars.
Tank Trucks.

Drums
NOT REGULATED AS A HAZARDOUS MATERIAL BY DOT OR IMO.

REGULATORY INFORMATION

U.S. Federal Regulations
TSCA Inventory Status Reported/Included.

TITLE III HAZARD CLASSIFICATIONS SECTIONS 311, 312

Acute : Yes
Chronic : No
Fire : No
Reactivity : No
Pressure : No

LISTS:

Extremely Hazardous Substance -No
CERCLA Hazardous Substance -No
Toxic Chemicals -Yes

OTHER INFORMATION

NFPA, NPCA-HMIS
NPCA-HMIS Rating
Health 1
Flammability 0
Reactivity 1

Personal Protection rating to be supplied by user depending on use conditions.

The data in this Material Safety Data Sheet relates only to the specific material designated herein and does not relate to use in combination with any other material or in any process.

Responsibility for MSDS Environmental Engineer
Address Du Pont
 Electronics
 Wilmington, DE 19880-0030
Telephone 800-441-9442

Indicates updated section.

End of MSDS

P.O. # 106373-019


SEP 04 1990

information/emergency telephone no. 616.726.3171
chemtrec telephone no. 800.424.9300
canadian emergency telephone no. 613.996.6666

**MATERIAL SAFETY
DATA SHEET**

HEXANE

pure

I. Identification

chemical name Hexane molecular weight 86.18
chemical family Aliphatic Hydrocarbon formula C₆H₁₄
synonyms n-Hexane
DOT proper shipping name Hexane
DOT hazard class Flammable Liquid
DOT identification no. UN1208 CAS no. 110-54-3

II. Physical and Chemical Data

boiling point, 760mm Hg. 68.7°C freezing point -95.3°C evaporation rate (BuAc=1) ca 10
vapor pressure at 20°C 124 mm Hg vapor density (air=1) 3.0 solubility in water @ 20°C 0.014%
% volatiles by volume ca 100 specific gravity (H₂O=1) @ 20°C 0.659 stability Stable
hazardous polymerization Not expected to occur.
appearance and odor Clear, colorless liquid with a mild hydrocarbon odor.
conditions to avoid Heat, sparks, open flame, open containers, and poor ventilation.

materials to avoid Strong oxidizing agents.

hazardous decomposition products Incomplete combustion can generate carbon monoxide and other toxic vapors.

III. Fire and Explosion Hazard Data

flash point, (test method) -26°C (Tag closed cup) auto ignition temperature 225°C
flammable limits in air % by volume: lower limit 1.1 upper limit 7.5
unusual fire and explosion hazards Very volatile and extremely flammable.

extinguishing media Carbon dioxide, dry chemical or foam.

special fire fighting procedures Water will not be effective in extinguishing a fire and may spread it, but a water spray can be used to cool exposed containers. Wear full protective clothing and self-contained breathing apparatus. Heat will build pressure and may rupture closed storage containers.

IV. Hazardous Components

Hexane and isomers % ca 100 TLV 50 ppm CAS no. 110-54-3

Burdick & Jackson's Disclaimer: The information and recommendations presented in this Material Safety Data Sheet are based on sources believed to be reliable on the date hereof. Burdick & Jackson makes no representation on its completeness or accuracy. It is the user's responsibility to determine the product's suitability for its intended use, the product's safe use, and the product's proper disposal. No representations or warranties, either express or implied, of merchantability or fitness for a particular purpose or of any other nature are made with respect to the information provided in this Material Safety Data Sheet or to the product to which such information refers. Burdick & Jackson neither assumes nor authorizes any other person to assume for it, any other or additional liability or responsibility resulting from the use of, or reliance upon, this information.

SEP 13 1990

CHW

V. Health Hazards

Occupational Exposure Limits

OSHA TWA - 50 ppm
 STEL - not listed
 Ceiling - not listed

ACGIH TLV-TWA - 50 ppm
 TLV-STEL - not listed
 (15-min)

OSH 10 hour TWA - 100 ppm
 15 min Ceiling -510 ppm

Concentration Immediately Dangerous to Health

OSHA/NIOSH 5,000 ppm

Odor Threshold -

NSC not listed
NIOSH not listed

Carcinogenic Data

Hexane is not listed as a carcinogen by IARC, NTP, OSHA, or ACGIH.

Primary Routes of Entry

Hexane may exert its effects through inhalation, skin absorption, and ingestion.

Industrial Exposure: Route of Exposure/Signs and Symptoms

Inhalation: Exposure can cause dizziness, numbness of extremities, and intoxication.

Eye Contact: Liquid and high vapor concentration can be irritating.

Skin Contact: Prolonged or repeated skin contact can cause irritation and dermatitis through defatting of skin.

Ingestion: Can cause gastrointestinal tract discomfort.

Effects of Overexposure

Hexane is a mild eye and mucous membrane irritant, primary skin irritant, central nervous system depressant and neurotoxin. Acute exposure causes irritation, narcosis, and gastrointestinal tract irritation. Chronic inhalation causes peripheral neuropathy. No systemic toxicity has been reported.

Medical Condition Aggravated by Exposure

Preclude from exposure those individuals susceptible to dermatitis.

Emergency First Aid

- Inhalation:** Immediately remove to fresh air. If not breathing, administer mouth-to-mouth rescue breathing. If there is no pulse administer cardiopulmonary resuscitation (CPR). Contact physician immediately.
- Eye Contact:** Rinse with copious amounts of water for at least 15 minutes. Get emergency medical assistance.
- Skin Contact:** Flush thoroughly for at least 15 minutes. Wash affected skin with soap and water. Remove contaminated clothing and shoes. Wash clothing before re-use, and discard contaminated shoes. Get emergency medical assistance.
- Ingestion:** Call local Poison Control Center for assistance. Contact physician immediately. Aspiration Hazard - Do not induce vomiting.

VI. Safety Measures and Equipment

- Ventilation:** Adequate ventilation is required to protect personnel from exposure to chemical vapors exceeding the PEL and to minimize fire hazards. The choice of ventilation equipment, either local or general, will depend on the conditions of use, quantity of material, and other operating parameters.
- Respiratory:** Use approved respirator equipment. Follow NIOSH and equipment manufacturer's recommendations to determine appropriate equipment (air-purifying, air-supplied, or self-contained breathing apparatus).
- Eyes:** Safety glasses are considered minimum protection. Goggles or face shield may be necessary depending on quantity of material and conditions of use.
- Skin:** Protective gloves and clothing are recommended. The choice of material must be based on chemical resistance and other user requirements. Generally, neoprene or nitrile rubber offer acceptable chemical resistance. Individuals who are acutely and specifically sensitive to hexane may require additional protective equipment.

Storage: Hexane should be protected from temperature extremes and direct sunlight. Proper storage of hexane must be determined based on other materials stored and their hazards and potential chemical incompatibility. In general, hexane should be stored in an acceptably protected and secure flammable liquid storage room.

Other: Emergency eye wash fountains and safety showers should be available in the vicinity of any potential exposure. Ground and bond metal containers to minimize static sparks.

VII. Spill and Disposal Data

Spill Control: Protect from ignition. Wear protective clothing and use approved respirator equipment. Absorb spilled material in an absorbent recommended for solvent spills and remove to a safe location for disposal by approved methods. If released to the environment, comply with all regulatory notification requirements.

Waste Disposal: Dispose of hexane as an EPA hazardous waste. Contact state environmental agency for listing of licensed hazardous waste disposal facilities and applicable regulations. Hazardous waste number: D001(Ignitable).

VIII. SARA/Title III Data

<u>Hazard Classification</u>		<u>Chemical Listings</u>	
Immediate Health	Yes (irritant)	Extremely Hazardous Substances	No
Delayed Health	Yes	CERCLA Hazardous Substances	No
Fire	Yes	Toxic Chemicals	No
Sudden Release	No		
Reactive	No		

Hexane is not subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA) and 40CFR Part 372. This product does not contain any other toxic chemical above 1% concentration or a carcinogen above 0.1% concentration.

Revision Date: July, 1989

KEY

ca	Approximately	STEL	Short Term Exposure Level (15 minutes)
na	Not applicable	TLV	Threshold Limit Value
C	Ceiling	TWA	Time Weighted Average (8 hours)
		BuAc	Butyl Acetate

CERCLA Comprehensive Environmental Response, Compensation and Liability Act
NSC National Safety Council ("Fundamentals of Industrial Hygiene," 3rd. Ed., 1988)



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aldrich chemical co.

P.O. Box 355, Milwaukee, Wisconsin 53201 USA • (414) 273-3850

ATTN: SAFETY DIRECTOR
RACIAN CORP
P C BOX 9948
AUSTIN TX 78766

DATE: 05/27/87
CUST # 41CC71 P.C. # 542C9

M A T E R I A L S A F E T Y C A T A S H E E T PAGE: 1

IDENTIFICATION

PRODUCT # 25814-8 NAME: HYDROCHLORIC ACID, A.C.S. REAGENT
CAS # 7647-01-0

TOXICITY HAZARDS

RTECS # MW4C25C0C

HYDROCHLORIC ACID

IRRITATION DATA

EYE-RBT 100 MG RINSE MLD

TXCYAC 23,281,82

TOXICITY DATA

IPL-HMN LCLO: 1300 PPM/3CM

29ZWAE - ,207,68

IPL-HMN LCLO: 3000 PPM/5M

TABIA2 3,231,33

UNR-MAN LCLO: 81 MG/KG

85CCAI 2,73,70

IPL-RAT LC50: 3124 PPM/1H

AMRL** TR-74-78,74

IPL-MUS LC50: 1108 PPM/1H

JCTODT 3,61,76

IPR-MUS LC50: 1449 MG/KG

COEAF 256,4043,63

CRL-RBT LC50: 900 MG/KG

BIZEA2 134,437,23

REVIEWS, STANDARDS, AND REGULATIONS

ACGIH TLV-CL 5 PPM 85INA8 5,313,86

CSHA STANDARD-AIR:CL 5 PPM FEREC 39,23540,74

EPA GENETCX PROGRAM 1986, NEGATIVE: CELL TRANSFORM.-SA7/SHE

EPA TSCA CHEMICAL INVENTORY, 1986

EPA TSCA SECTION 8(E) STATUS REPORT BEFC-C578-C146

EPA TSCA TEST SUBMISSION (TSCATS) DATA BASE, DECEMBER 1986

NICSH ANALYTICAL METHODS: SEE ACIDS, INORGANIC, 7903

MEETS CRITERIA FOR PROPOSED OSHA MEDICAL RECORDS RULE FEREC 47,30420,

E2

ONLY SELECTED REGISTRY OF TOXIC EFFECTS OF CHEMICAL SUBSTANCES (RTECS) DATA IS PRESENTED HERE. SEE ACTUAL ENTRY IN RTECS FOR COMPLETE INFORMATION

HEALTH HAZARD DATA

ACUTE EFFECTS

MAY BE FATAL IF INHALED, SWALLOWED, OR ABSORBED THROUGH SKIN.

CAUSES BURNS.

MATERIAL IS EXTREMELY DESTRUCTIVE TO TISSUE OF THE MUCOUS MEMBRANES

AND UPPER RESPIRATORY TRACT, EYES AND SKIN.

INHALATION MAY BE FATAL AS A RESULT OF SPASM, INFLAMMATION AND EDEMA

OF THE LARYNX AND BRONCHI, CHEMICAL PNEUMONITIS AND PULMONARY EDEMA.

SYMPTOMS OF EXPOSURE MAY INCLUDE BURNING SENSATION, COUGHING,

WHEEZING, LARYNGITIS, SHORTNESS OF BREATH, HEADACHE, NAUSEA AND

VOMITING.

FIRST AID

IN CASE OF CONTACT, IMMEDIATELY FLUSH EYES OR SKIN WITH COPIOUS

AMOUNTS OF WATER FOR AT LEAST 15 MINUTES WHILE REMOVING CONTAMINATED

CLOTHING AND SPACES.

ASSURE ADEQUATE FLUSHING OF THE EYES BY SEPARATING THE EYELIDS

WITH FINGERS.

IF INHALED, REMOVE TO FRESH AIR. IF NOT BREATHING GIVE ARTIFICIAL

RESPIRATION. IF BREATHING IS DIFFICULT, GIVE OXYGEN.

IN CASE OF EXPOSURE, OBTAIN MEDICAL ATTENTION IMMEDIATELY.

WASH CONTAMINATED CLOTHING BEFORE REUSE.

DISCARD CONTAMINATED SHOES.

USA
Aldrich Chemical Co., Inc.
940 West Saint Paul Avenue
Milwaukee, Wisconsin 53233
Telephone: (414) 273-3850
TWY 410 262, 263

Belgium
Aldrich Chemie N.V./S.A.
1 Rue Caporal Class
B-1030 Brussels
Telephone: (32) 242750

France
Aldrich-Chemie S.A.S.
27, Fond des Treus
F-47000 Sarlat-la-Canéda
Telephone: (89) 327010

Japan
Aldrich Japan
Kyoko Bldg, Shinjuku
10 Kanda-Mitsuchiro
Chiyoda-Ku, Tokyo

United Kingdom
Aldrich Chemical Co., Ltd.
The Old Brickyard, New Road
Quinton, Oxford OX4 4JA
Telephone: 02748 2211

West Germany
Aldrich-Chemie GmbH & Co. KG
D-7084 Mannheim
Telephone: (6720) 67-0
Telex: 71403 Aldr D



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M A T E R I A L S A F E T Y C A T A S H E E T

CATALOG # 25814-8

NAME: HYDRICHLORIC ACID, A.C.S. REAGENT

-----PHYSICAL DATA-----

SPECIFIC GRAVITY: 1.200

----- FIRE AND EXPLCSIGN HAZARD DATA -----

FLASH POINT: NONE
 EXTINGUISHING MEDIA
 NONCOMBUSTIBLE.
 USE EXTINGUISHING MEDIA APPROPRIATE TO SURROUNDING FIRE CONDITIONS.
 SPECIAL FIRE FIGHTING PROCEDURES
 WEAR SELF-CONTAINED BREATHING APPARATUS AND PROTECTIVE CLOTHING TO
 PREVENT CONTACT WITH SKIN AND EYES.
 USE WATER SPRAY TO COOL FIRE-EXPOSED CONTAINERS.
 UNUSUAL FIRE AND EXPLCSIGN HAZARDS
 NOT APPLICABLE

----- REACTIVITY DATA -----

INCOMPATIBILITIES
 BASES
 AMINES
 ALKALI METALS
 COPPER, COPPER ALLOYS
 ALUMINUM
 CORRODES STEEL
 DO NOT ALLOW WATER TO ENTER CONTAINER BECAUSE OF VIOLENT REACTION.
 HAZARDOUS COMBUSTION OR DECOMPOSITION PRODUCTS
 TOXIC FUMES OF:
 HYDROGEN CHLORIDE GAS

----- SPILL OR LEAK PROCEDURES -----

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED
 EVACUATE AREA.
 WEAR SELF-CONTAINED BREATHING APPARATUS, RUBBER BOOTS AND HEAVY
 RUBBER GLOVES.
 COVER WITH DRY-LIME, SAND, OR SOCA ASH. PLACE IN COVERED CONTAINERS
 USING NON-SPARKING TOOLS AND TRANSPORT OUTDOORS.
 VENTILATE AREA AND WASH SPILL SITE AFTER MATERIAL PICKUP IS COMPLETE.
 WASTE DISPOSAL METHOD
 FOR SMALL QUANTITIES: CAUTIOUSLY ADD TO A LARGE STIRRED EXCESS OF
 WATER. ADJUST THE PH TO NEUTRAL, SEPARATE ANY INSOLUBLE SOLIDS OR
 LIQUIDS AND PACKAGE THEM FOR HAZARDOUS-WASTE DISPOSAL. FLUSH THE
 AQUEOUS SOLUTION DOWN THE DRAIN WITH PLENTY OF WATER. THE HYDROLYSIS
 AND NEUTRALIZATION REACTIONS MAY GENERATE HEAT AND FUMES WHICH CAN BE
 CONTROLLED BY THE RATE OF ADDITION.

OBSERVE ALL FEDERAL, STATE & LOCAL LAWS.

--- PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE ---

CHEMICAL SAFETY GOGGLES.
 SAFETY SHOWER AND EYE BATH.
 FACESHIELD (8-INCH MINIMUM).
 NIOSH/MSHA-APPROVED RESPIRATOR IN NONVENTILATED AREAS AND/OR FOR
 EXPOSURE ABOVE THE ACGIH TLV.
 MECHANICAL EXHAUST REQUIRED.
 RUBBER GLOVES
 DO NOT PIPET BY MOUTH.
 AVOID BREATHING VAPOR.
 DO NOT GET IN EYES, ON SKIN, ON CLOTHING.
 AVOID PROLONGED OR REPEATED EXPOSURE.
 WASH THOROUGHLY AFTER HANDLING.
 CORROSIVE.
 POISON
 KEEP TIGHTLY CLOSED.
 STORE IN A COOL DRY PLACE.

USA
 Aldrich Chemical Co., Inc.
 940 West Saint Paul Avenue
 Milwaukee, Wisconsin 53233
 Telephone: (414) 273-3850

Belgium
 Aldrich Chemie N.V./S.A.
 6 Rue Caporal Class
 B-1030 Brussels
 Telephone: (02) 2438730

France
 Aldrich-Chemie S.A./L.
 27, Fosse des Treize
 F-67000 Strasbourg
 Telephone: (88) 327010

Japan
 Aldrich Japan
 Kyodo Bldg. Shinkanda
 10 Kanda-Mitsuricho
 Chiyoda-Ku, Tokyo

United Kingdom
 Aldrich Chemical Co., Ltd.
 The Old Brickyard, New Road
 Gillingham, Dorset SP6 4JL
 Telephone: (07428) 2211

West Germany
 Aldrich-Chemie GmbH & Co. KG
 D-7884 Steinhelm
 Telephone: (07328) 67-4
 Telex: 714828 Aldch D



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aldrich chemical co.

P.O. Box 355, Milwaukee, Wisconsin 53201 USA • (414) 273-3850

M A T E R I A L S A F E T Y C A T A S H E E T

PAGE:

CATALOG # 25814-8

NAME: HYDROCHLORIC ACID, A.C.S. REAGENT

----- ADDITIONAL PRECAUTIONS AND COMMENTS -----

NOT APPLICABLE

THE ABOVE INFORMATION IS BELIEVED TO BE CORRECT BUT DOES NOT PURPORT TO BE ALL INCLUSIVE AND SHALL BE USED ONLY AS A GUIDE. ALDRICH SHALL NOT BE HELD LIABLE FOR ANY DAMAGE RESULTING FROM HANDLING OR FROM CONTACT WITH THE ABOVE PRODUCT. SEE REVERSE SIDE OF INVOICE OR PACKING SLIP FOR ADDITIONAL TERMS AND CONDITIONS OF SALE.

USA
Aldrich Chemical Co., Inc.
940 West Saint Paul Avenue
Milwaukee, Wisconsin 53233
Telephone: (414) 273-3850
TWX: (918) 262-3052 Aldrichem MI

Belgium
Aldrich Chemie N.V./S.A.
6 Rue Caporal Class
B-1030 Brussels
Telephone: (32) 2438750
Telex: 62302 Alchem B

France
Aldrich-Chemie S.A./L.
27, Fossé des Troues
F-67000 Strasbourg
Telephone: (88) 327010
Telex: 880076 Aldrich F

Japan
Aldrich Japan
Kyodo Bldg. Shinjuku
1-9 Kanda-Mitsuricho
Chiyoda-Ku, Tokyo
Telephone: (03) 258-0156

United Kingdom
Aldrich Chemical Co., Ltd.
The Old Brickyard, New Road
Gillingham, Dorset SP8 4JL
Telephone: (07478) 2211
Telex: 41778 Aldchem G

West Germany
Aldrich-Chemie GmbH & Co. KG
D-7824 Steinhelm
Telephone: (07328) 87-0
Telex: 71-8238 Aldri D

Occupational Health Guideline for Methyl Alcohol

INTRODUCTION

This guideline is intended as a source of information for employees, employers, physicians, industrial hygienists, and other occupational health professionals who may have a need for such information. It does not attempt to present all data; rather, it presents pertinent information and data in summary form.

SUBSTANCE IDENTIFICATION

- Formula: CH₃OH
- Synonyms: Methanol; wood alcohol; Columbian spirits; carbinol
- Appearance and odor: Colorless liquid with a characteristic, pungent odor.

PERMISSIBLE EXPOSURE LIMIT (PEL)

The current OSHA standard for methyl alcohol is 200 parts of methyl alcohol per million parts of air (ppm) averaged over an eight-hour work shift. This may also be expressed as 260 milligrams of methyl alcohol per cubic meter of air (mg/m³). NIOSH has recommended that the permissible exposure limit be changed to 200 ppm averaged over a work shift of up to 10 hours per day, 40 hours per week, with a ceiling of 800 ppm averaged over a 15-minute period. The NIOSH Criteria Document for Methyl Alcohol should be consulted for more detailed information.

HEALTH HAZARD INFORMATION

- Routes of exposure
Methyl alcohol can affect the body if it is swallowed, is inhaled, or comes in contact with the skin or eyes.
- Effects of overexposure
1. Short-term Exposure: Swallowing methyl alcohol or breathing very high concentrations of methyl alcohol may produce headache, weakness, drowsiness, lightheadedness, nausea, vomiting, drunkenness, and irritation of the eyes, blurred vision, blindness, and death. A

person may get better and then worse again up to 30 hours later.

2. Long-term Exposure: Prolonged exposure to higher concentrations of methyl alcohol may result in headaches, burning of the eyes, dizziness, sleep problems, digestive disturbances, and failure of vision. Repeated or prolonged skin exposure may cause skin irritation.

3. Reporting Signs and Symptoms: A physician should be contacted if anyone develops any signs or symptoms and suspects that they are caused by exposure to methyl alcohol.

• Recommended medical surveillance

The following medical procedures should be made available to each employee who is exposed to methyl alcohol at potentially hazardous levels:

1. Initial Medical Examination:

—A complete history and physical examination: The purpose is to detect pre-existing conditions that might place the employee at increased risk, and to establish a baseline for future health monitoring. Examination of the skin, liver, kidneys, and eyes should be stressed.

—Skin disease: Methyl alcohol is a defatting agent and can cause dermatitis on prolonged exposure. Persons with pre-existing skin disorders may be susceptible to the effects of this agent.

—Liver function tests: Methyl alcohol may cause liver damage. A profile of liver function should be obtained by utilizing a medically acceptable array of biochemical tests.

—Kidney disease: Although methyl alcohol has not been proven to be kidney toxin in humans, the importance of this organ in the elimination of toxic substances justifies special consideration in those with impaired renal function.

—Eye disease: Because methyl alcohol may cause optic atrophy and blindness, those with pre-existing eye diseases may be at increased risk from exposure.

2. Periodic Medical Examination: The aforementioned medical examinations should be repeated on an annual basis. In addition, anyone developing the above-listed conditions or who has been splashed in the eyes with

These recommendations reflect good industrial hygiene and medical surveillance practices and their implementation will assist in achieving an effective occupational health program. However, they may not be sufficient to achieve compliance with all requirements of OSHA regulations.

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service Centers for Disease Control
National Institute for Occupational Safety and Health

U.S. DEPARTMENT OF LABOR
Occupational Safety and Health Administration

has ingested, or otherwise has been exposed to methyl alcohol should be placed under medical surveillance.

• **Summary of toxicology**

Ingestion of methyl alcohol is a well-known cause of optic neuropathy and may be lethal. Severe acidosis may result from ingestion or high exposures. Animals exposed to vapor concentrations above 8000 to 10,000 ppm show narcotic effects progressing from lethargy, to ataxia, to prostration and death in a state of profound acidosis due in part to the metabolic formation of formaldehyde and formic acid. Occupational exposure to high concentrations of methyl alcohol vapor has been reported to cause death or blindness, usually from working in a confined space. A woman died after exposure for 12 hours to vapor concentrations calculated at 4000 to 13,000 ppm. Chronic poisoning manifested by marked diminution of vision and enlargement of the liver has been reported in a workman exposed at levels of 1200 to 8000 ppm for a period of 4 years. Direct skin contact with methyl alcohol may cause dermatitis, erythema, and scaling.

CHEMICAL AND PHYSICAL PROPERTIES

• **Physical data**

1. Molecular weight: 32
2. Boiling point (760 mm Hg): 64.5 C (148 F)
3. Specific gravity (water = 1): 0.8
4. Vapor density (air = 1 at boiling point of methyl alcohol): 1.1
5. Melting point: -98 C (-144 F)
6. Vapor pressure at 20 C (68 F): 97 mm Hg
7. Solubility in water, g/100 g water at 20 C (68 F): Miscible in all proportions

8. Evaporation rate (butyl acetate = 1): 5.9

• **Reactivity**

1. Conditions contributing to instability: Heat
2. Incompatibilities: Contact with strong oxidizers may cause fires and explosions.
3. Hazardous decomposition products: Toxic gases and vapors (such as carbon monoxide and formaldehyde) may be released in a fire involving methyl alcohol.

4. Special precautions: Methyl alcohol will attack some forms of plastics, rubber, and coatings. It may also react with metallic aluminum at high temperatures.

• **Flammability**

1. Flash point: 11 C (52 F) (closed cup)
2. Autoignition temperature: 385 C (725 F)
3. Flammable limits in air, % by volume: Lower: 6.7; Upper: 36

4. Extinguishant: Dry chemical, alcohol foam, carbon dioxide

• **Warning properties**

1. Odor Threshold: May and Summer report that the odor threshold of methyl alcohol (methanol) is 5900 ppm. The AIHA *Hygienic Guide* states that the odor is faint at 2000 ppm.
2. Eye Irritation Level: The *Hygienic Guide* states

that irritation occurs only at high concentrations. Grant states that "external contact of methanol with the eye has been alleged to have caused corneal opacities, but this must be far from the rule. . . . By exposure of cats to methanol vapors an attempt has been made to induce vacuoles in the corneal epithelium similar to those produced by other solvents, but this has been unsuccessful."

Browning reports that concentrations ranging from 7500 ppm to 69,000 ppm irritate mucous membranes.

3. Evaluation of Warning Properties: Methyl alcohol (methanol) has poor warning properties.

MONITORING AND MEASUREMENT PROCEDURES

• **Eight-Hour Exposure Evaluation**

Measurements to determine employee exposure are best taken so that the average eight-hour exposure is based on a single eight-hour sample or on two four-hour samples. Several short-time interval samples (up to 30 minutes) may also be used to determine the average exposure level. Air samples should be taken in the employee's breathing zone (air that would most nearly represent that inhaled by the employee).

• **Ceiling Evaluation**

Measurements to determine employee ceiling exposure are best taken during periods of maximum expected airborne concentrations of methyl alcohol. Each measurement should consist of a fifteen (15) minute sample or series of consecutive samples totalling fifteen (15) minutes in the employee's breathing zone (air that would most nearly represent that inhaled by the employee). A minimum of three (3) measurements should be taken on one work shift and the highest of all measurements taken is an estimate of the employee's exposure.

• **Method**

Sampling and analyses may be performed by collection of methyl alcohol in an adsorption tube containing silica gel, followed by desorption with water, and gas chromatographic analysis. Also, detector tubes certified by NIOSH under 42 CFR Part 84 or other direct-reading devices calibrated to measure methyl alcohol may be used. An analytical method for methyl alcohol is in the *NIOSH Manual of Analytical Methods*, 2nd Ed., Vol. 2, 1977, available from the Government Printing Office, Washington, D.C. 20402 (GPO No. 017-033-00260-01).

RESPIRATORS

• Good industrial hygiene practices recommend that engineering controls be used to reduce environmental concentrations to the permissible exposure level. However, there are some exceptions where respirators may be used to control exposure. Respirators may be used when engineering and work practice controls are not technically feasible, when such controls are in the

process of being installed, or when they fail and need to be supplemented. Respirators may also be used for operations which require entry into tanks or closed vessels, and in emergency situations. If the use of respirators is necessary, the only respirators permitted are those that have been approved by the Mine Safety and Health Administration (formerly Mining Enforcement and Safety Administration) or by the National Institute for Occupational Safety and Health.

- In addition to respirator selection, a complete respiratory protection program should be instituted which includes regular training, maintenance, inspection, cleaning, and evaluation.

PERSONAL PROTECTIVE EQUIPMENT

- Employees should be provided with and required to use impervious clothing, gloves, face shields (eight-inch minimum), and other appropriate protective clothing necessary to prevent repeated or prolonged skin contact with liquid methyl alcohol.
- Clothing wet with liquid methyl alcohol should be placed in closed containers for storage until it can be discarded or until provision is made for the removal of methyl alcohol from the clothing. If the clothing is to be laundered or otherwise cleaned to remove the methyl alcohol, the person performing the operation should be informed of methyl alcohol's hazardous properties.
- Any clothing which becomes wet with liquid methyl alcohol should be removed immediately and not re worn until the methyl alcohol is removed from the clothing.
- Employees should be provided with and required to use splash-proof safety goggles where liquid methyl alcohol may contact the eyes.

SANITATION

- Skin that becomes wet with liquid methyl alcohol should be promptly washed or showered to remove any methyl alcohol.
- Eating and smoking should not be permitted in areas where liquid methyl alcohol is handled, processed, or stored.

COMMON OPERATIONS AND CONTROLS

The following list includes some common operations in which exposure to methyl alcohol may occur and control methods which may be effective in each case:

Operation	Controls
Liberation during application of surface coatings such as shellac, wood dyes, nitrocellulose lacquers, water-proofing formulations, and phenolic resins	Local exhaust ventilation; general dilution ventilation; personal protective equipment
Use as a solvent for rotogravure inks, aniline dyes, and duplicator fluids	General dilution ventilation
Liberation during manual application of methanol as a cleaner for coated surfaces, leather, gloves, and metal and resins surfaces prior to further treatment	General dilution ventilation; personal protective equipment
Liberation during manufacture of formaldehyde by oxidation or dehydrogenation	Local exhaust ventilation; general dilution ventilation
Use in plastics industry to produce plasticizers, softening agents, and acrylic resins	Local exhaust ventilation; general dilution ventilation; personal protective equipment
Liberation during use as an intermediate in the preparation of methacrylates, methyl chlorides, methyl ethers, dimethyl sulfate, methyl formate, and methyl bromide	Local exhaust ventilation; general dilution ventilation; personal protective equipment
Liberation during application as an extractant in industrial chemical processes such as refinery gasoline and oils and purifying pharmaceuticals such as steroids and hormones	Local exhaust ventilation; general dilution ventilation
Use as a solvent in rubber industry	Local exhaust ventilation; general dilution ventilation; personal protective equipment

EMERGENCY FIRST AID PROCEDURES

In the event of an emergency, institute first aid procedures and send for first aid or medical assistance.

• Eye Exposure

If methyl alcohol gets into the eyes, wash eyes immediately with large amounts of water, lifting the lower and upper lids occasionally. Get medical attention as soon as possible. Contact lenses should not be worn when working with this chemical.

• Skin Exposure

If methyl alcohol gets on the skin, promptly flush the contaminated skin with water. If methyl alcohol soaks through the clothing, remove the clothing immediately and flush the skin with water. If there is skin irritation, get medical attention.

• Breathing

If a person breathes in large amounts of methyl alcohol, move the exposed person to fresh air at once. If breathing has stopped, perform artificial respiration. Keep the affected person warm and at rest. Get medical attention as soon as possible.

• Swallowing

When methyl alcohol has been swallowed, get medical attention immediately. If medical attention is not immediately available, get the afflicted person to vomit by having him touch the back of his throat with his finger or by giving him syrup of ipecac as directed on the package. This non-prescription drug is available at most drug stores and drug counters and should be kept with emergency medical supplies in the workplace. Do not make an unconscious person vomit.

• Rescue

Move the affected person from the hazardous exposure. If the exposed person has been overcome, notify someone else and put into effect the established emergency rescue procedures. Do not become a casualty. Understand the facility's emergency rescue procedures and know the locations of rescue equipment before the need arises.

SPILL, LEAK, AND DISPOSAL PROCEDURES

• Persons not wearing protective equipment and clothing should be restricted from areas of spills or leaks until cleanup has been completed.

• If methyl alcohol is spilled or leaked, the following steps should be taken:

1. Remove all ignition sources.
2. Ventilate area of spill or leak.
3. For small quantities, absorb on paper towels. Evaporate in a safe place (such as a fume hood). Allow sufficient time for evaporating vapors to completely clear the hood ductwork. Burn the paper in a suitable location away from combustible materials. Large quantities can be collected and atomized in a suitable combustion chamber. Methyl alcohol should not be allowed

to enter a confined space, such as a sewer, because of the possibility of an explosion.

• Waste disposal methods:

Methyl alcohol may be disposed of:

1. By absorbing it in vermiculite, dry sand, earth or a similar material and disposing in a secured sanitary landfill.
2. By atomizing in a suitable combustion chamber.

REFERENCES

- American Conference of Governmental Industrial Hygienists: "Methyl Alcohol," *Documentation of the Threshold Limit Values for Substances in Workroom Air* (3rd ed., 2nd printing), Cincinnati, 1974.
- American Industrial Hygiene Association: "Methyl Alcohol," *Hygienic Guide Series*, Detroit, Michigan, 1964.
- Browning, E.: *Toxicity and Metabolism of Industrial Solvents*, Elsevier, New York, 1965.
- Grant, W. M.: *Toxicology of the Eye* (2nd ed.), C. C. Thomas, Springfield, Illinois, 1974.
- Manufacturing Chemists Association, Inc.: *Chemical Safety Data Sheet SD-22, Methyl Alcohol*, Washington, D.C., 1970.
- May, J.: "Solvent Odor Thresholds for the Evaluation of Solvent Odors in the Atmosphere," *Staub-Reinhalt*, 26:9, 385-389, 1966.
- National Institute for Occupational Safety and Health, U.S. Department of Health, Education, and Welfare: *Criteria for a Recommended Standard . . . Occupational Exposure to Methyl Alcohol*, HEW Publication No. (NIOSH) 76-148, GPO No. 017-033-00191-0, U.S. Government Printing Office, Washington, D.C., 1976.
- Patty, F. A. (ed.): *Toxicology*, Vol. II of *Industrial Hygiene and Toxicology* (2nd ed. rev.), Interscience, New York, 1963.
- Summer, W.: *Odor Pollution of Air: Causes and Control*, L. Hill, London, 1975.
- Union Carbide Corporation, Industrial Medicine and Toxicology Department: *Toxicology Studies - Methyl Alcohol*, New York, 1970.

RESPIRATORY PROTECTION FOR METHYL ALCOHOL

Condition	Minimum Respiratory Protection* Required Above 200 ppm
Vapor Concentration	
2000 ppm or less	Any supplied-air respirator. Any self-contained breathing apparatus.
10,000 ppm or less	Any supplied-air respirator with a full facepiece, helmet, or hood. Any self-contained breathing apparatus with a full facepiece.
25,000 ppm or less	A Type C supplied-air respirator with a full facepiece operated in pressure-demand or other positive pressure mode or with a full facepiece, helmet, or hood operated in continuous-flow mode.
Greater than 25,000 ppm or entry and escape from unknown concentrations	Self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode. A combination respirator which includes a Type C supplied-air respirator with a full facepiece operated in pressure-demand or other positive pressure or continuous-flow mode and an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.
Fire Fighting	Self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode.
Escape	Any escape self-contained breathing apparatus.

*Only NIOSH-approved or MSHA-approved equipment should be used.



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aldrich chemical co.

P.O. Box 355, Milwaukee, Wisconsin 53201 USA

Telephone: (414) 273-3850
TWX: (910) 262-3052 Aldrichem MI
Telex: 26 843 Aldrich MI
FAX: (414) 273-4979

ATTN: SAFETY DIRECTOR
RADIAN CORPORATION

ATTN MR JOHN T CARGILL-DIR
ENVIRONMENTAL HEALTH & SAFETY
8501 MOPAC BOULEVARD
AUSTIN TX 78759

SEP 23 1991

DATE: 09/17/91
CUST#: 410071
PO#: 134869

M A T E R I A L S A F E T Y D A T A S H E E T PAGE 1

IDENTIFICATION

PRODUCT #: 25811-3
CAS #: 7697-37-2
MF: HNO3

NAME: NITRIC ACID, A.C.S. REAGENT (70%)

SYNONYMS

ACIDE NITRIQUE (FRENCH) * ACIDO NITRICO (ITALIAN) * AQUA FORTIS *
AZOTIC ACID * AZOTOWY KWAS (POLISH) * HYDROGEN NITRATE * KYSELINA
DUSICNE (CZECH) * NA 1760 (DOT) * NITRIC ACID (ACGIH, DOT, OSHA) *
SALPETERSAURE (GERMAN) * SALPETERZUUROPPLOSSINGEN (DUTCH) * UN 2031
(DOT) *

TOXICITY HAZARDS

RTECS NO: QU5775000

TOXICITY DATA

ORL-HMN LDLO: 430 MG/KG
UNR-MAN LDLO: 110 MG/KG

YAKUD5 22,651,80
85DCAI 2,73,70

LEWS, STANDARDS, AND REGULATIONS

ACGIH TLV-TWA 2 PPM; STEL 4 PPM 85INAB 5,428,86
MSHA STANDARD-AIR-TWA 2 PPM (5 MG/M3) DTLVS* 3,181,71
OSHA PEL: 8H TWA 2 PPM (5 MG/M3) FEREAC 54,2923,89
OSHA PEL FINAL: 8H TWA 2 PPM (5 MG/M3); STEL 4 PPM (10 MG/M3) FEREAC 54,
2923,89
NIOSH REL TO NITRIC ACID-AIR: 10H TWA 2 PPM MMWR** 37(S-7), 21,88
NHS 1974: HZD 50742; NIS 197; TNF 18088; NOS 101; TNE 132401
NOS 1983: HZD 50742000; TNF 201; NIS 18239; NOS 120; TNE 297627; TFE
76316
EPA GENETOX PROGRAM 1988, NEGATIVE: CELL TRANSFORM.-SA7/SHE
EPA TSCA CHEMICAL INVENTORY, JUNE 1990
EPA TSCA TEST SUBMISSION (TSCATS) DATA BASE, MARCH 1991
NIOSH ANALYTICAL METHODS: SEE ACIDS, INORGANIC, 7903
OSHA ANALYTICAL METHOD #ID-127

ONLY SELECTED REGISTRY OF TOXIC EFFECTS OF CHEMICAL SUBSTANCES (RTECS)
DATA IS PRESENTED HERE. SEE ACTUAL ENTRY IN RTECS FOR COMPLETE INFORMATION.

HEALTH HAZARD DATA

ACUTE EFFECTS

MAY BE FATAL IF INHALED, SWALLOWED, OR ABSORBED THROUGH SKIN.
CAUSES BURNS.
MATERIAL IS EXTREMELY DESTRUCTIVE TO TISSUE OF THE MUCOUS MEMBRANES
AND UPPER RESPIRATORY TRACT, EYES AND SKIN.
INHALATION MAY BE FATAL AS A RESULT OF SPASM, INFLAMMATION AND EDEMA

CONTINUED ON NEXT PAGE

Belgium/Holland
Aldrich Chemie
Boulevard Lambert 140 b5
Bd. Lambert 140 b5
B-1000 Brussels/Bruxelles
Telephone:
Belgium 114747
Holland 060224746
Telex: 62302 Alchem B
FAX: 022428216

France
Aldrich-Chimie S.r.l.
27, Fosse des Treize
F-67000 Strasbourg
Telephone: 88327010
Telex: 890078 Aldrich F
FAX: 88751283

Italy
Aldrich Chimica S.r.l.
Via Pietro Toselli, 4
20127 Milano
Telephone: 022813668
Telex: 330862 Aldrich I
FAX: 022896301

Japan
Aldrich Japan
Kyodo Bldg. Shinkanda
10 Kanda-Mikuracho
Chiyoda-Ku, Tokyo
Telephone: 032580155
FAX: 032580157

Spain
Aldrich Quimica
Apt. de Correos 181
28100 Alcobendas (Madrid)
Telephone: 916639977
Telex: 22189 SAQS-E
FAX: 916638064

United Kingdom
Aldrich Chemical Co., Ltd.
The Old Brickyard, New Road
Gillingham, Dorset SP8 4JL
Telephone: 0747822211
Telex: 417236 Aldrich G
FAX: 0747823779

West Germany
Aldrich-Chemie GmbH & Co. KG
D-7924 Steinheim
Telephone: 7329870
Telex: 714838 Aldr D
FAX: 0732987139/239



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aldrich chemical co.

P.O. Box 355, Milwaukee, Wisconsin 53201 USA

Telephone: (414) 273-3850
TWX: (910) 262-3052 Aldrichem MI
Telex: 26 843 Aldrich MI
FAX: (414) 273-4979

M A T E R I A L S A F E T Y D A T A S H E E T P A G E 2

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NAME: NITRIC ACID, A.C.S. REAGENT (70%)

HEALTH HAZARD DATA

OF THE LARYNX AND BRONCHI, CHEMICAL PNEUMONITIS AND PULMONARY EDEMA. SYMPTOMS OF EXPOSURE MAY INCLUDE BURNING SENSATION, COUGHING, WHEEZING, LARYNGITIS, SHORTNESS OF BREATH, HEADACHE, NAUSEA AND VOMITING.

FIRST AID

IN CASE OF CONTACT, IMMEDIATELY FLUSH EYES OR SKIN WITH COPIOUS AMOUNTS OF WATER FOR AT LEAST 15 MINUTES WHILE REMOVING CONTAMINATED CLOTHING AND SHOES. ASSURE ADEQUATE FLUSHING OF THE EYES BY SEPARATING THE EYELIDS WITH FINGERS. IF INHALED, REMOVE TO FRESH AIR. IF NOT BREATHING GIVE ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT, GIVE OXYGEN. IF SWALLOWED, WASH OUT MOUTH WITH WATER PROVIDED PERSON IS CONSCIOUS. CALL A PHYSICIAN IMMEDIATELY. DISCARD CONTAMINATED CLOTHING AND SHOES.

PHYSICAL DATA

SPECIFIC GRAVITY: 1.400
VAPOR DENSITY: 1
VAPOR PRESSURE: 8 MM @ 20 C
APPEARANCE AND ODOR
CLEAR COLORLESS LIQUID

FIRE AND EXPLOSION HAZARD DATA

FLASHPOINT: NONE
EXTINGUISHING MEDIA
NONCOMBUSTIBLE.
USE EXTINGUISHING MEDIA APPROPRIATE TO SURROUNDING FIRE CONDITIONS.
SPECIAL FIREFIGHTING PROCEDURES
WEAR SELF-CONTAINED BREATHING APPARATUS AND PROTECTIVE CLOTHING TO PREVENT CONTACT WITH SKIN AND EYES.
UNUSUAL FIRE AND EXPLOSIONS HAZARDS
STRONG OXIDIZER.
CONTACT WITH OTHER MATERIAL MAY CAUSE FIRE.
EMITS TOXIC FUMES UNDER FIRE CONDITIONS.

REACTIVITY DATA

INCOMPATIBILITIES
BASES

CONTINUED ON NEXT PAGE

Belgium/Holland
Aldrich Chemie
Boulevard Lambertson 140 b6
Bd. Lambertson 140 b6
B-1030 Bruxelles/Brussel
Telephone:
Belgium 114747
Holland 060224748
Telex: 62302 Alchem B
FAX: 022428216

France
Aldrich-Chimie S.r.l.
27, Fosse' des Treize
F-67000 Strasbourg
Telephone: 88327010
Telex: 890078 Aldrich F
FAX: 88751263

Italy
Aldrich Chimica S.r.l.
Via Pietro Toselli, 4
20127 Milano
Telephone: 022613689
Telex: 330862 Aldrich I
FAX: 022696301

Japan
Aldrich Japan
Kyodo Bldg. Shinkanda
10 Kanda-Mitsuracho
Chiyoda-Ku, Tokyo
Telephone: 032580155
FAX: 032580157

Spain
Aldrich Quimica
Apt. de Correas 161
28100 Alcobendas (Madrid)
Telephone: 916639977
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Telephone: 7329870
Telex: 714835 Aldri D
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P.O. Box 355, Milwaukee, Wisconsin 53201 USA

Telephone: (414) 273-3850
TWX: (910) 262-3052 Aldrichem MI
Telex: 26 843 Aldrich MI
FAX: (414) 273-4979

M A T E R I A L S A F E T Y D A T A S H E E T **P A G E 3**

CUST#: 410071
PO#: 134869

PRODUCT #: 25811-3
CAS #: 7697-37-2
MF: HNO3

NAME: NITRIC ACID, A.C.S. REAGENT (70%)

REACTIVITY DATA

REDUCING AGENTS

ALCOHOLS
ALKALI METALS
BRASS
COPPER, COPPER ALLOYS
GALVANIZED IRON
ALUMINUM
CORRODES STEEL
AMINES

MAY DISCOLOR ON EXPOSURE TO LIGHT.

HAZARDOUS COMBUSTION OR DECOMPOSITION PRODUCTS

TOXIC FUMES OF:
NITROGEN OXIDES

SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED

WEAR SELF-CONTAINED BREATHING APPARATUS, RUBBER BOOTS AND HEAVY RUBBER GLOVES.
ABSORB ON SAND OR VERMICULITE AND PLACE IN CLOSED CONTAINERS FOR DISPOSAL.

VENTILATE AREA AND WASH SPILL SITE AFTER MATERIAL PICKUP IS COMPLETE.

WASTE DISPOSAL METHOD

FOR SMALL QUANTITIES: CAUTIOUSLY ADD TO A LARGE STIRRED EXCESS OF WATER. ADJUST THE PH TO NEUTRAL, SEPARATE ANY INSOLUBLE SOLIDS OR LIQUIDS AND PACKAGE THEM FOR HAZARDOUS WASTE DISPOSAL. FLUSH THE AQUEOUS SOLUTION DOWN THE DRAIN WITH PLENTY OF WATER. THE HYDROLYSIS AND NEUTRALIZATION REACTIONS MAY GENERATE HEAT AND FUMES WHICH CAN BE CONTROLLED BY THE RATE OF ADDITION.
OBSERVE ALL FEDERAL, STATE AND LOCAL ENVIRONMENTAL REGULATIONS.

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE

CHEMICAL SAFETY GOGGLES.
SAFETY SHOWER AND EYE BATH.
RUBBER APRON.
NIOSH/MSHA-APPROVED RESPIRATOR.
WEAR HEAVY RUBBER GLOVES.
MECHANICAL EXHAUST REQUIRED.
FACESHIELD (8-INCH MINIMUM).
AVOID CONTACT AND INHALATION.

CONTINUED ON NEXT PAGE

Belgium/Holland
Aldrich Chemie
Boulevard Lambertmont 140 b6
Bd. Lambertmontaan 140 b6
B-1030 Bruxelles/Brussel
Telephone:
Belgium 114747
Holland 060224748
Telex: 62302 Alchem B
FAX: 022426216

France
Aldrich-Chimie S.r.l.
27, Fosse des Treize
F-67000 Strasbourg
Telephone: 88327010
Telex: 890076 Aldrich F
FAX: 88751263

Italy
Aldrich Chimica S.r.l.
Via Pietro Toselli, 4
20127 Milano
Telephone: 022613689
Telex: 330862 Aldrich I
FAX: 022896301

Japan
Aldrich Japan
Kyodo Bldg, Shinjuku
10 Kanda-Miturocho
Chiyoda-Ku, Tokyo
Telephone: 032590155
FAX: 032590157

Spain
Aldrich Quimica
Apt. de Corraos 161
28100 Alcobendas (Madrid)
Telephone: 916639977
Telex: 22189 SAQS-E
FAX: 916638084

United Kingdom
Aldrich Chemical Co., Ltd.
The Old Brickyard, New Road
Gillingham, Dorset SP6 4JL
Telephone: 0747822211
Telex: 417238 Aldrich G
FAX: 0747823778

West Germany
Aldrich-Chemie GmbH & Co. KG
D-7824 Steinheim
Telephone: 7329870
Telex: 714836 Aldr D
FAX: 0732987139/239



chemists helping chemists in research & industry

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P.O. Box 355, Milwaukee, Wisconsin 53201 USA

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M A T E R I A L S A F E T Y D A T A S H E E T P A G E 4

CUST#: 410071
PO#: 134869

PRODUCT #: 25811-3
CAS #: 7697-37-2
MF: HNO₃

NAME: NITRIC ACID, A.C.S. REAGENT (70%)

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE

AVOID PROLONGED OR REPEATED EXPOSURE.
WASH THOROUGHLY AFTER HANDLING.

POISON

CORROSIVE.

KEEP TIGHTLY CLOSED.

DO NOT STORE NEAR, NOR ALLOW CONTACT WITH, CLOTHING AND OTHER
COMBUSTIBLE MATERIAL.

HYGROSCOPIC

STORE IN A COOL DRY PLACE.

REGULATORY INFORMATION

70.0% NITRIC ACID 7697-37-2

THIS PRODUCT IS SUBJECT TO SARA SECTION 313 REPORTING REQUIREMENTS.

THE ABOVE INFORMATION IS BELIEVED TO BE CORRECT BUT DOES NOT PURPORT TO BE
ALL INCLUSIVE AND SHALL BE USED ONLY AS A GUIDE. ALDRICH SHALL NOT BE HELD
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Belgium/Holland
Aldrich Chemie
Boulevard Lambertson 140 b6
Bd. Lambertson 140 b6
B-1000 Bruxelles/Brussel
Telephone:
Belgium 114747
Holland 060224746
Telex: 62302 Alchem B
FAX: 022428216

France
Aldrich-Chimie S.r.l.
27, Fosse des Treize
F-67000 Strasbourg
Telephone: 88327010
Telex: 890076 Aldrich F
FAX: 88751283

Italy
Aldrich Chimica S.r.l.
Via Pietro Toeselli, 4
20127 Milano
Telephone: 022613689
Telex: 330682 Aldrich I
FAX: 022896301

Japan
Aldrich Japan
Kyodo Bldg. Shinkanda
10 Kanda-Mikuracho
Chiyoda-Ku, Tokyo
Telephone: 032580155
FAX: 032580157

Spain
Aldrich Química
Apt. de Correos 161
28100 Alcobendas (Madrid)
Telephone: 916639977
Telex: 22189 SAOS-E
FAX: 916636064

United Kingdom
Aldrich Chemical Co., Ltd.
The Old Brickyard, New Road
Gillingham, Dorset SP6 4JL
Telephone: 0747822211
Telex: 417236 Aldrich G
FAX: 0747823779

West Germany
Aldrich-Chemie GmbH & Co. KG
D-7824 Steinheim
Telephone: 7325870
Telex: 714838 Aldri D
FAX: 0732987139/239

Occupational Health Guideline for Nitric Acid

INTRODUCTION

This guideline is intended as a source of information for employees, employers, physicians, industrial hygienists, and other occupational health professionals who may have a need for such information. It does not attempt to present all data; rather, it presents pertinent information and data in summary form.

SUBSTANCE IDENTIFICATION

- Formula: HNO_3
- Synonyms: Aqua fortis; white fuming nitric acid (WFNA); red fuming nitric acid (RFNA); hydrogen nitrate
- Appearance and odor: Colorless, yellow, or red fuming liquid with a suffocating, acrid odor.

PERMISSIBLE EXPOSURE LIMIT (PEL)

The current OSHA standard for nitric acid is 2 parts of nitric acid per million parts of air (ppm) averaged over an eight-hour work shift. This may also be expressed as 5 milligrams of nitric acid per cubic meter of air (mg/m^3). NIOSH has recommended a permissible exposure limit of 2 ppm averaged over a work shift of up to ten hours per day, forty hours per week. The NIOSH Criteria Document for Nitric Acid should be consulted for more detailed information.

HEALTH HAZARD INFORMATION

• Routes of exposure

Nitric acid can affect the body if it is inhaled or if it comes in contact with the eyes or skin. It can also affect the body if it is swallowed.

• Effects of overexposure

1. *Short-term Exposure:* Nitric acid vapor or mist is an irritant of the eyes, nose, throat, and skin. Liquid nitric acid or high concentrations of nitric acid vapor may cause severe burns of the eyes with permanent damage. Liquid nitric acid or high concentrations of nitric acid

vapor may produce skin burns and ulcers. Nitric acid may stain the skin a bright yellow. Exposure to high concentrations of nitric acid vapor may cause severe breathing difficulties which may be delayed in onset and may also cause pneumonia. Swallowing nitric acid may cause burns of the mouth, throat, and stomach.

2. *Long-term Exposure:* Repeated or prolonged exposure to nitric acid mists or strong concentrations of nitric acid vapors may cause erosion of the exposed teeth.

3. *Reporting Signs and Symptoms:* A physician should be contacted if anyone develops any signs or symptoms and suspects that they are caused by exposure to nitric acid.

• Recommended medical surveillance

The following medical procedures should be made available to each employee who is exposed to nitric acid at potentially hazardous levels:

1. *Initial Medical Examination:*

—A complete history and physical examination: The purpose is to detect pre-existing conditions that might place the exposed employee at increased risk, and to establish a baseline for future health monitoring. Examination of the eyes, respiratory tract, skin, and teeth should be stressed. The skin should be examined for evidence of chronic disorders.

—14" x 17" chest roentgenogram: Nitric acid causes human lung damage. Surveillance of the lungs is indicated.

—FVC and FEV (1 sec): Nitric acid is a respiratory irritant. Persons with impaired pulmonary function may be at increased risk from exposure. Periodic surveillance is indicated.

—Eye disease: Nitric acid is a severe eye irritant and may cause tissue damage. Those with pre-existing eye problems may be at increased risk from exposure.

—Skin disease: Weak nitric acid is a defatting agent and can cause dermatitis on prolonged exposure. Persons with pre-existing skin disorders may be more susceptible to the effects of this agent.

These recommendations reflect good industrial hygiene and medical surveillance practices and their implementation will assist in achieving an effective occupational health program. However, they may not be sufficient to achieve compliance with all requirements of OSHA regulations.

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service Centers for Disease Control
National Institute for Occupational Safety and Health

U.S. DEPARTMENT OF LABOR
Occupational Safety and Health Administration

2. *Periodic Medical Examination:* The aforementioned medical examinations should be repeated on an annual basis or at some other frequency to be determined by the responsible physician.

• **Summary of toxicology**

Nitric acid vapor or mist is an irritant of the eyes, mucous membranes, and skin. When nitric acid is exposed to air or comes in contact with organic matter it decomposes to yield a mixture of toxic oxides of nitrogen, including nitric oxide and nitrogen dioxide. Exposure to high concentrations of nitric acid vapor or mist causes pneumonitis and pulmonary edema which may be fatal; onset of symptoms may be delayed for 4 to 30 hours. In contact with the eyes, the liquid produces severe burns which may result in permanent damage and visual impairment. On the skin, the liquid or concentrated vapor produces immediate, severe and penetrating burns; concentrated solutions cause deep ulcers and stain the skin a bright yellow or yellowish-brown color. The vapor and mist may erode the exposed teeth. Ingestion of the liquid will cause immediate pain and burns of the mouth, esophagus, and gastrointestinal tract.

CHEMICAL AND PHYSICAL PROPERTIES

• **Physical data**

1. Molecular weight: 63 (solute)
2. Boiling point (760 mm Hg): 121.6 C (251 F) (for "constant boiling," 68%); 84 C (183 F) (white fuming nitric acid); 60 C (140 F) (red fuming nitric acid)
3. Specific gravity (water = 1): 1.41 (constant boiling); 1.5 (white fuming); 1.55 (red fuming)
4. Vapor density (air = 1 at boiling point of nitric acid): 2 - 3 approximately
5. Melting point: -41 C (-42 F) (for "constant boiling," 68%); -41.6 C (-43 F) (white fuming); -52 C (-61 F) (red fuming)
6. Vapor pressure at 20 C (68 F): 2.9 mm Hg (HNO₃) (constant boiling), 2.6 mm Hg (H₂O) (constant boiling); 62 mm Hg (white fuming); 103 mm Hg (red fuming)
7. Solubility in water, g/100 g water at 20 C (68 F): Miscible in all proportions
8. Evaporation rate (butyl acetate = 1): Data not available

• **Reactivity**

1. Conditions contributing to instability: Elevated temperatures may cause containers to burst and liberate toxic oxides of nitrogen.
2. Incompatibilities: Reacts explosively with combustible organic or readily oxidizable materials such as wood, turpentine, metal powders, hydrogen sulfide, etc. Contact with strong bases may cause violent spattering.
3. Hazardous decomposition products: Toxic gases and vapors (such as oxides of nitrogen) may be released when nitric acid decomposes.
4. Special precautions: Nitric acid will attack some forms of plastics, rubber, and coatings.

• **Flammability**

1. Not combustible, but is a strong oxidizer.

• **Warning properties**

1. Odor Threshold: No quantitative information is available concerning the odor threshold of nitric acid.

2. Eye Irritation Level: The AIHA *Hygienic Guide*, concerning eye contact with nitric acid, states that "nitric acid produces very severe immediate damage which may result in permanent damage and visual impairment."

3. Other Information: The AIHA *Hygienic Guide* notes that "'nitrous fumes,' expressed in terms of nitrogen dioxide, may cause immediate irritation of the throat at concentrations as low as 62 ppm."

4. Evaluation of Warning Properties: Patty points out that "nitric acid manufacture is more hazardous than hydrochloric acid manufacture in that . . . the oxides of nitrogen have inadequate warning properties in low, toxic concentrations." For the purposes of this guideline, nitric acid is treated as a material with poor warning properties.

MONITORING AND MEASUREMENT PROCEDURES

• **General**

Measurements to determine employee exposure are best taken so that the average eight-hour exposure is based on a single eight-hour sample or on two four-hour samples. Several short-time interval samples (up to 30 minutes) may also be used to determine the average exposure level. Air samples should be taken in the employee's breathing zone (air that would most nearly represent that inhaled by the employee).

• **Method**

Nitric acid may be measured by collection of nitric acid in a midget impinger, followed by ultraviolet spectrophotometric analysis. An analytical method for nitric acid is in the *NIOSH Manual of Analytical Methods*, 2nd

RESPIRATORS

• Good industrial hygiene practices recommend that engineering controls be used to reduce environmental concentrations to the permissible exposure level. However, there are some exceptions where respirators may be used to control exposure. Respirators may be used when engineering and work practice controls are not technically feasible, when such controls are in the process of being installed, or when they fail and need to be supplemented. Respirators may also be used for operations which require entry into tanks or closed vessels, and in emergency situations. If the use of respirators is necessary, the only respirators permitted are those that have been approved by the Mine Safety and Health Administration (formerly Mining Enforcement and Safety Administration) or by the National Institute for Occupational Safety and Health.

- In addition to respirator selection, a complete respiratory protection program should be instituted which includes regular training, maintenance, inspection, cleaning, and evaluation.

PERSONAL PROTECTIVE EQUIPMENT

- Employees should be provided with and required to use impervious clothing, gloves, face shields (eight-inch minimum), and other appropriate protective clothing necessary to prevent any possibility of skin contact with liquid nitric acid or liquids containing nitric acids having a pH equal to or less than 2.5.
- Employees should be provided with and required to use impervious clothing, gloves, face shields (eight-inch minimum), and other appropriate protective clothing necessary to prevent repeated or prolonged skin contact with solutions containing nitric acid having a pH greater than 2.5.
- Clothing contaminated with nitric acid should be placed in closed containers for storage until it can be discarded or until provision is made for the removal of nitric acid from the clothing. If the clothing is to be laundered or otherwise cleaned to remove the nitric acid, the person performing the operation should be informed of nitric acid's hazardous properties.
- Where there is any possibility of exposure of an employee's body to liquid nitric acid or solutions containing nitric acid having a pH equal to or less than 2.5, facilities for quick drenching of the body should be provided within the immediate work area for emergency use.
- Non-impervious clothing which becomes contaminated with nitric acid should be removed immediately and not worn until the nitric acid is removed from the clothing.
- Employees should be provided with and required to use splash-proof safety goggles where there is any possibility of liquid nitric acid or solutions containing nitric acid contacting the eyes.
- Where there is any possibility that employees' eyes may be exposed to liquid nitric acid or solutions containing nitric acid having a pH equal to or less than 2.5, an eye-wash fountain should be provided within the immediate work area for emergency use.

SANITATION

- Skin that becomes contaminated with nitric acid should be immediately washed or showered to remove any nitric acid.

COMMON OPERATIONS AND CONTROLS

The following list includes some common operations in which exposure to nitric acid may occur and control methods which may be effective in each case:

Operation

Use in metallurgy as a pickling agent; in metal refining, ore recovery, metal etching, and photoengraving

Use in acidulation of phosphate rock and manufacture of nitrogen solutions for use in fertilizer industry

Use as a laboratory reagent; in wood pulping industry

Use during inorganic synthesis in manufacture of fertilizers, explosives, herbicides, antibiotics, meat-curing, pickling, ceramics, and pharmaceuticals

Use during organic synthesis in manufacture of nitrating and oxidizing agents, nylons, foams, lubricants, insecticides, dyes, explosives, photographic films, lacquers, and celluloids

Controls

Local exhaust ventilation; general dilution ventilation; personal protective equipment

Local exhaust ventilation; general dilution ventilation; personal protective equipment

Process enclosure; local exhaust ventilation; general dilution ventilation; personal protective equipment

Process enclosure; local exhaust ventilation; general dilution ventilation; personal protective equipment

Process enclosure; local exhaust ventilation; general dilution ventilation; personal protective equipment

EMERGENCY FIRST AID PROCEDURES

In the event of an emergency, institute first aid procedures and send for first aid or medical assistance.

• Eye Exposure

If nitric acid or strong concentrations of nitric acid vapors get into the eyes, wash eyes immediately with large amounts of water, lifting the lower and upper lids occasionally. If irritation is present after washing, get medical attention. Contact lenses should not be worn when working with this chemical.

• Skin Exposure

If nitric acid or strong concentrations of nitric acid vapors get on the skin, immediately flush the contaminated skin with water. If nitric acid soaks through the clothing, remove the clothing immediately and flush the skin with water. Get medical attention immediately.

• Breathing

If a person breathes in large amounts of nitric acid, move the exposed person to fresh air at once. If breathing has stopped, perform artificial respiration.

Keep the affected person warm and at rest. Get medical attention as soon as possible.

- **Swallowing**

When nitric acid has been swallowed and the person is conscious, give the person large quantities of water immediately to dilute the nitric acid. Do not attempt to make the exposed person vomit. Do not make an unconscious person vomit. Get medical attention immediately.

- **Rescue**

Move the affected person from the hazardous exposure. If the exposed person has been overcome, notify someone else and put into effect the established emergency rescue procedures. Do not become a casualty. Understand the facility's emergency rescue procedures and know the locations of rescue equipment before the need arises.

SPILL, LEAK, AND DISPOSAL PROCEDURES

- Persons not wearing protective equipment and clothing should be restricted from areas of spills or leaks until cleanup has been completed.

- If nitric acid is spilled or leaked, the following steps should be taken:

1. Ventilate area of spill or leak.
2. Flush with copious quantities of water and neutralize with alkaline material (such as soda ash, lime, etc)..

- **Waste disposal method:**

Nitric acid may be disposed of by neutralizing with water and alkaline material (such as soda ash, lime, etc.) and disposing in a secured sanitary landfill.

REFERENCES

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- American Industrial Hygiene Association: "Nitric Acid," *Hygienic Guide Series*, Detroit, Michigan, 1964.
- Gleason, M. N., Gosselin, R. E., Hodge, H. C., and Smith, R. P.: *Clinical Toxicology of Commercial Products* (3rd ed.), Williams and Wilkins, Baltimore, 1969.
- Grant, W. M.: *Toxicology of the Eye* (2nd ed.), C. C. Thomas, Springfield, Illinois, 1974.
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- International Labour Office: *Encyclopedia of Occupational Health and Safety*, McGraw-Hill, New York, 1971.
- Manufacturing Chemists Association, Inc.: *Chemical Safety Data Sheet SD-5, Nitric Acid*, Washington, D.C., 1961.
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- Patty, F. A. (ed.): *Toxicology*, Vol. II of *Industrial Hygiene and Toxicology* (2nd ed. rev.), Interscience, New York, 1963.
- Stauden, A. (exec. ed.): *Kirk-Othmer Encyclopedia of Chemical Technology* (2nd ed.), Interscience, New York, 1972.
- von Oettingen, W. F.: *Poisoning: A Guide to Clinical Diagnosis and Treatment* (2nd ed.), Saunders, Philadelphia, 1958.

RESPIRATORY PROTECTION FOR NITRIC ACID

Condition	Minimum Respiratory Protection* Required Above 5 mg/m ³
Particulate or Vapor Concentration	
250 mg/m ³ or less	<p>A chemical cartridge respirator with a full facepiece providing protection against nitric acid.**</p> <p>A gas mask with a chin-style or a front- or back-mounted organic vapor canister providing protection against nitric acid.</p> <p>Any supplied-air respirator with a full facepiece, helmet, or hood.</p> <p>Any self-contained breathing apparatus with a full facepiece.</p> <p>A Type C supplied-air respirator operated in pressure-demand or other positive pressure or continuous-flow mode.</p>
Greater than 250 mg/m ³ *** or entry and escape from unknown concentrations	<p>Self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode.</p> <p>A combination respirator which includes a Type C supplied-air respirator with a full facepiece operated in pressure-demand or other positive pressure or continuous-flow mode and an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.</p>
Fire Fighting	Self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode.
Escape	<p>Any gas mask containing non-oxidizable sorbents and providing protection against nitric acid.</p> <p>Any escape self-contained breathing apparatus.</p>

*Only NIOSH-approved or MSHA-approved equipment should be used.

**Nitric acid is an oxidizer and should not come in contact with oxidizable materials. Some cartridges and canisters may contain oxidizable materials, such as activated charcoal, and therefore should not be used to provide protection against nitric acid. Only non-oxidizable sorbents are allowed.

***Use of supplied-air suits may be necessary to prevent skin contact while providing respiratory protection from airborne concentrations of nitric acid; however, this equipment should be selected, used, and maintained under the immediate supervision of trained personnel. Where supplied-air suits are used above a concentration of 250 mg/m³, an auxiliary self-contained breathing apparatus operated in positive pressure mode should also be worn.

DATE: 06/05/90
INDEX: 11901520+22

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VDR

XXXXXXXXXXXXXXXXXXXX DRY SOLID, FLAKE, BEAD, OR GRANULARXX
XXXXXXXXXXXXXXXXXXXX DRY SOLID, FLAKE, BEAD, OR GRANULARXX
XXXXXXXXXXXXXXXXXXXX DRY SOLID, FLAKE, BEAD, OR GRANULARXX

pure

MATERIAL SAFETY DATA SHEET

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

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

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SUBSTANCE IDENTIFICATION

CAS-NUMBER 1310-73-2

SUBSTANCE: SODIUM HYDROXIDE, DRY SOLID, FLAKE, BEAD, OR GRANULARXX

TRADE NAMES/SYNONYMS:

CAUSTIC SODA; SODA LYE; LYE; WHITE CAUSTIC; CAUSTIC SODA, BEAD;
CAUSTIC SODA, DRY; CAUSTIC SODA, FLAKE; CAUSTIC SODA, GRANULAR;
CAUSTIC SODA, SOLID; SODIUM HYDRATE; SODIUM HYDROXIDE (NAOH);
SODIUM HYDROXIDE, FLAKE; SODIUM HYDROXIDE, DRY; SODIUM HYDROXIDE, SOLID;
ASCARITE; SODIUM HYDROXIDE; STCC 4935235; UN 1823;
S-318; S-318; S-320; S-612; NAOH; ACC21300

CHEMICAL FAMILY:
INORGANIC BASE

MOLECULAR FORMULA: NA-O-H

MOLECULAR WEIGHT: 40.00

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

COMPONENTS AND CONTAMINANTS

COMPONENT: SODIUM HYDROXIDE PERCENT: 100

OTHER CONTAMINANTS: NONE

EXPOSURE LIMITS:

SODIUM HYDROXIDE:
2 MG/M3 OSHA CEILING
2 MG/M3 ACGIH CEILING
2 MG/M3 NIOSH RECOMMENDED 15 MINUTE CEILING

1000 POUNDS CERCLA SECTION 103 REPORTABLE QUANTITY
SUBJECT TO SARA SECTION 313 ANNUAL TOXIC CHEMICAL RELEASE
REPORTING (SOLUTION)

PHYSICAL DATA

DESCRIPTION: ODORLESS, WHITE OR OFF-WHITE HYGROSCOPIC SOLID.

BOILING POINT: 2534 F (1390 C) MELTING POINT: 604 F (318 C)

SPECIFIC GRAVITY: 2.130 VAPOR PRESSURE: 100 MMHG @ 1111 C

PH: 14 @ 5% SOLUTION SOLUBILITY IN WATER: 111 %

SOLVENT SOLUBILITY: SOLUBLE IN ALCOHOL, GLYCEROL; INSOLUBLE ACETONE, ETHER.

FIRE AND EXPLOSION DATA

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

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

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

FIREFIGHTING:
MOVE CONTAINERS FROM FIRE AREA IF POSSIBLE. COOL CONTAINERS EXPOSED TO FLAMES. JUN 28 1990

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WITH WATER FROM SIDE UNTIL WELL AFTER FIRE IS OUT. STAY AWAY FROM STORAGE TANK
MSDS (1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4, GUIDE PAGE 60).

USE AGENT SUITABLE FOR TYPE OF FIRE. USE WATER IN FLOODING QUANTITIES AS FOG.
APPLY WATER FROM AS FAR A DISTANCE AS POSSIBLE.

TRANSPORTATION DATA

DEPARTMENT OF TRANSPORTATION HAZARD CLASSIFICATION 49CFR172.101:
CORROSIVE MATERIAL

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

DEPARTMENT OF TRANSPORTATION PACKAGING REQUIREMENTS: 49CFR173.245B
EXCEPTIONS: 49CFR173.244

TOXICITY

SODIUM HYDROXIDE:

IRRITATION DATA: 1%/24 HOURS EYE-MONKEY SEVERE; 500 MG/24 HOURS SKIN-RABBIT
SEVERE; 1% EYE-RABBIT SEVERE; 50 UG/24 HOURS EYE-RABBIT SEVERE; 1 MG/24 HOUR
EYE-RABBIT SEVERE; 400 UG EYE-RABBIT MILD; 100 MG RINSED EYE-RABBIT SEVERE.
TOXICITY DATA: 140-340 MG/KG ORAL-RAT LD50 (VAN WATERS & ROGERS INC. MSDS);
500 MG/KG ORAL-RABBIT LDLO; 1350 MG/KG SKIN-RABBIT LD50 (VAN WATERS & ROGERS
INC. MSDS); 40 MG/KG INTRAPERITONEAL-MOUSE LD50; MUTAGENIC DATA (RTECS).
CARCINOGEN STATUS: NONE.
LOCAL EFFECTS: CORROSIVE- EYE, SKIN, MUCOUS MEMBRANES.
ACUTE TOXICITY LEVEL: TOXIC BY INGESTION; MODERATELY TOXIC BY DERMAL
ABSORPTION.
TARGET EFFECTS: NO DATA AVAILABLE.

HEALTH EFFECTS AND FIRST AID

INHALATION:

SODIUM HYDROXIDE:

CORROSIVE. 250 MG/M3 IMMEDIATELY DANGEROUS TO LIFE OR HEALTH.
ACUTE EXPOSURE- EFFECTS DUE TO INHALATION OF DUSTS OR MIST MAY VARY FROM
MILD IRRITATION OF THE NOSE AT 2 MG/M3 TO SEVERE PNEUMONITIS DEPENDING
ON THE SEVERITY OF EXPOSURE. LOW CONCENTRATIONS MAY CAUSE MUCOUS MEMBRANE
IRRITATION WITH SORE THROAT, COUGHING, AND DYSPNEA. INTENSE EXPOSURES MAY
RESULT IN DESTRUCTION OF MUCOUS MEMBRANES AND DELAYED PULMONARY EDEMA
OR PNEUMONITIS. SHOCK MAY OCCUR.
CHRONIC EXPOSURE- REPEATED EXPOSURES OF 5000 MG/L WERE HARMLESS TO RATS,
BUT 10,000 MG/L LED TO NERVOUSNESS, SORE EYES, DIARRHEA AND RETARDED
GROWTH. PROLONGED EXPOSURE TO HIGH CONCENTRATIONS OF DUSTS OR MISTS
MAY CAUSE DISCOMFORT AND ULCERATION OF NASAL PASSAGES. RATS EXPOSED
30 MINUTES/DAY TO UNMEASURED CONCENTRATIONS OF SODIUM HYDROXIDE AEROSOLS
SUFFERED PULMONARY DAMAGE AFTER 2-3 MONTHS. DEATH OCCURRED IN 2 OF 10 RATS
EXPOSED TO AN AEROSOL OF 40% AQUEOUS SODIUM HYDROXIDE FOR 30 MINUTES,
TWICE A WEEK FOR 3 WEEKS. HISTOPATHOLOGICAL EXAMINATION SHOWED MOSTLY
NORMAL LUNG TISSUE WITH FOCI OF ENLARGED ALVEOLAR SEPTAE, EMPHYSEMA,
BRONCHIAL ULCERATION, AND ENLARGED LYMPH ADENOIDAL TISSUES. AN
EPIDEMIOLOGIC STUDY OF 291 WORKERS CHRONICALLY EXPOSED TO CAUSTIC DUSTS
FOR 30 YEARS OR MORE FOUND NO SIGNIFICANT INCREASE IN MORTALITY IN
RELATION TO DURATION OR INTENSITY OF SUCH EXPOSURES.

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

SKIN CONTACT:

SODIUM HYDROXIDE:

CORROSIVE.

ACUTE EXPOSURE- UPON CONTACT WITH THE SKIN, DAMAGE INCLUDING REDNESS,
CUTANEOUS BURNS, SKIN FISSURES AND WHITE ESCHARS MAY OCCUR WITHOUT
IMMEDIATE PAIN. EXPOSURE TO SOLUTIONS AS WEAK AS 0.03 N (0.12%) FOR 1
HOUR HAS CAUSED INJURY TO HEALTHY SKIN. SOLUTIONS OF 25-50% CAUSED NO
SENSATION OF IRRITATION WITHIN 3 MINUTES IN HUMAN SUBJECTS. WITH
SOLUTIONS OF 0.4-4%, IRRITATION DOES NOT OCCUR UNTIL AFTER SEVERAL HOURS.
SKIN BIOPSIES FROM HUMAN SUBJECTS HAVING 1 N SODIUM HYDROXIDE APPLIED TO
THEIR ARMS FOR 15 TO 180 MINUTES SHOWED PROGRESSIVE CHANGES BEGINNING
WITH DISSOLUTION OF THE CELLS IN THE HORNY LAYER AND PROGRESSING
THROUGH EDEMA TO TOTAL DESTRUCTION OF THE EPIDERMIS IN 60 MINUTES.
A 5% AQUEOUS SOLUTION CAUSED SEVERE NECROSIS TO THE SKIN OF RABBITS
WHEN APPLIED FOR 4 HOURS. ALKALIES PENETRATE THE SKIN SLOWLY. THE EXTENT
OF INJURY DEPENDS ON THE DURATION OF CONTACT. IF SODIUM HYDROXIDE IS NOT
REMOVED FROM THE SKIN, SEVERE BURNS WITH DEEP ULCERATION MAY OCCUR.
EXPOSURE TO THE DUST OR MIST MAY CAUSE MULTIPLE SMALL BURNS AND TEMPORARY
LOSS OF HAIR. PATHOLOGIC FINDINGS DUE TO ALKALIES MAY INCLUDE GELATINOUS,
NECROTIC AREAS AT THE SITE OF CONTACT.
CHRONIC EXPOSURE- EFFECTS ARE DEPENDENT UPON CONCENTRATION AND DURATION
OF EXPOSURE. DERMATITIS OR EFFECTS SIMILAR TO THOSE FOR ACUTE EXPOSURE

MAY OCCUR.

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

**EYE CONTACT:
SODIUM HYDROXIDE:
CORROSIVE.**

ACUTE EXPOSURE- CONTACT MAY CAUSE DISINTEGRATION AND SLOUGHING OF CONJUNCTIVAL AND CORNEAL EPITHELIUM, CORNEAL OPAFICATION, MARKED EDEMA AND ULCERATION. AFTER 7 TO 13 DAYS EITHER GRADUAL RECOVERY BEGINS OR THERE IS PROGRESSION OF ULCERATION AND CORNEAL OPAFICATION. COMPLICATIONS OF SEVERE EYE BURNS ARE SYMBLEPHARON WITH OVERGROWTH OF THE CORNEA BY A VASCULARIZED MEMBRANE, PROGRESSIVE OR RECURRENT CORNEAL ULCERATION AND PERMANENT CORNEAL OPAFICATION. BLINDNESS MAY OCCUR.

CHRONIC EXPOSURE- EFFECTS ARE DEPENDENT UPON CONCENTRATION AND DURATION OF EXPOSURE. CONJUNCTIVITIS OR EFFECTS SIMILAR TO THOSE FOR ACUTE EXPOSURE MAY OCCUR.

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

**INGESTION:
SODIUM HYDROXIDE:
CORROSIVE/TOXIC.**

ACUTE EXPOSURE- THE REPORTED LETHAL DOSE IN RATS IS 140-340 MG/KG. INGESTION MAY CAUSE A BURNING SENSATION IN THE MOUTH, CORROSION OF THE LIPS, MOUTH, TONGUE AND PHARYNX, AND SEVERE ESOPHAGEAL AND ABDOMINAL PAIN, VOMITING OF BLOOD AND LARGE PIECES OF MUCOSA, AND BLOODY DIARRHEA. ASPHYXIA CAN OCCUR FROM SWELLING OF THE THROAT. MEDIASTINITIS, ALKALEMIA, PALLOR, WEAK, SLOW PULSE, CARDIOVASCULAR COLLAPSE, SHOCK, COMA AND DEATH MAY OCCUR. PERFORATION OF THE ALIMENTARY TRACT AND CONSTRICTIVE SCARRING MAY RESULT. ESOPHAGEAL STRICTURE MAY OCCUR WEEKS, MONTHS, OR EVEN YEARS LATER TO MAKE SWALLOWING DIFFICULT. THE ESTIMATED FATAL DOSE IN MAN IS 5 GRAMS. CASES OF SQUAMOUS CELL CARCINOMA OF THE ESOPHAGUS HAVE OCCURRED WITH LATENT PERIODS OF 12 TO 42 YEARS AFTER INGESTION. THESE CANCERS WERE BELIEVED TO BE SEQUELA OF TISSUE DESTRUCTION AND POSSIBLY SCAR FORMATION RATHER THAN THE RESULT OF DIRECT CARCINOGENIC ACTION OF SODIUM HYDROXIDE.

CHRONIC EXPOSURE- DEPENDING ON THE CONCENTRATION, REPEATED INGESTION OF ALKALINE SUBSTANCES MAY RESULT IN INFLAMMATORY AND ULCERATIVE EFFECTS ON THE ORAL MUCOUS MEMBRANES AND OTHER EFFECTS AS WITH ACUTE INGESTION.

FIRST AID: DO NOT USE GASTRIC LAVAGE OR EMESIS. DILUTE THE ALKALI BY GIVING WATER OR MILK TO DRINK IMMEDIATELY AND ALLOWING VOMITING TO OCCUR. AS SOON AS POSSIBLE, HAVE QUALIFIED MEDICAL PERSONNEL DO ESOPHAGOSCOPY AND IRRIGATE INJURED AREAS WITH 1% ACETIC ACID UNTIL THE ALKALI IS COMPLETELY NEUTRALIZED. (DREISSBACH, HANDBOOK OF POISONING, 11TH EDITION). GET MEDICAL ATTENTION IMMEDIATELY.

**ANTIDOTE:
NO SPECIFIC ANTIDOTE. TREAT SYMPTOMATICALLY AND SUPPORTIVELY.**

REACTIVITY

**REACTIVITY:
REACTS EXOTHERMICALLY WITH WATER.**

**INCOMPATIBILITIES:
SODIUM HYDROXIDE:**

**ACETALDEHYDE: MAY RESULT IN VIOLENT POLYMERIZATION.
ACETIC ACID: MIXING IN CLOSED CONTAINER INCREASES TEMPERATURE AND PRESSURE.
ACETIC ANHYDRIDE: MIXING IN A CLOSED CONTAINER INCREASES TEMPERATURE AND PRESSURE.**

ACIDS: MAY REACT VIOLENTLY.

ACROLEIN: MAY RESULT IN AN EXTREMELY VIOLENT POLYMERIZATION.

ACRYLONITRILE: MAY CAUSE VIOLENT POLYMERIZATION.

ALLYL ALCOHOL + BENZENE SULFONYL CHLORIDE: POSSIBLE EXPLOSION HAZARD.

ALLYL CHLORIDE: HYDROLYZES.

ALUMINUM: VIGOROUS REACTION.

ALUMINUM, ARSENIC TRIOXIDE, SODIUM ARSENATE: MAY GENERATE FLAMMABLE HYDROGEN GAS.

AMMONIA AND SILVER NITRATE: PRECIPITATION OF EXPLOSIVE BIVLER NITRIDE MAY OCCUR.

AMMONIUM SALTS: MAY REACT VIOLENTLY EVOLVING AMMONIA GAS.

BENZENE-1,4-DIOL: EXOTHERMIC REACTION.

N,N'-BIS(TRINITROETHYL)UREA: FORMATION OF EXPLOSIVE COMPOUND.

BROMINE: POSSIBLE EXPLOSION IF NOT STIRRED CONTINUOUSLY.

CHLORINE TRIFLUORIDE: MAY CAUSE VIOLENT REACTION.

CHLOROFORM AND METHYL ALCOHOL: EXOTHERMIC REACTION.

CHLOROHYDRIN: MIXING IN A CLOSED CONTAINER CAUSES AN INCREASE IN TEMPERATURE AND PRESSURE.

4-CHLORO-2-METHYLPHENOL: POSSIBLE IGNITION.

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CHLORONITROTOLUENES: POSSIBLE EXPLOSION.
CHLOROPICRIN: MAY CAUSE VIOLENT REACTION.
CHLOROSULFONIC ACID: MIXING IN A CLOSED CONTAINER CAUSES AN INCREASE IN TEMPERATURE AND PRESSURE.
CINNAMALDEHYDE: EXOTHERMIC REACTION.
COATINGS: MAY BE ATTACKED.
CYANOGEN AZIDE: MAY FORM SODIUM 5-AZIDOTETRAZOLIDE, WHICH IS EXPLOSIVE IF ISOLATED.
2,2-DICHLORO-3,3-DIMETHYLBUTANE: HAZARDOUS REACTION.
1,2-DICHLOROETHYLENE: MAY FORM SPONTANEOUSLY FLAMMABLE MONOCHLOROACETYLENE.
DIBORANE AND OCTANAL OXIME: EXOTHERMIC REACTION.
ETHYLENE CYANOHYDRIN: MIXING IN A CLOSED CONTAINER CAUSES AN INCREASE IN TEMPERATURE AND PRESSURE.
FLAMMABLE LIQUIDS: FIRE AND EXPLOSION HAZARD.
GLYCOLS: MAY CAUSE EXOTHERMIC DECOMPOSITION WITH EVOLUTION OF HYDROGEN GAS.
GLYOXAL: MIXING IN A CLOSED CONTAINER INCREASES TEMPERATURE AND PRESSURE.
HALOGENATED HYDROCARBONS: VIOLENT REACTION.
HYDROCHLORIC ACID: MIXING IN A CLOSED CONTAINER CAUSES AN INCREASE IN TEMPERATURE AND PRESSURE.
HYDROFLUORIC ACID: MIXING IN A CLOSED CONTAINER CAUSES AN INCREASE IN TEMPERATURE AND PRESSURE.
HYDROQUINONE: RAPID DECOMPOSITION OF HYDROQUINONE WITH EVOLUTION OF HEAT.
LEAD: MAY BE ATTACKED; FLAMMABLE HYDROGEN GAS MAY BE LIBERATED.
LEATHER: MAY BE ATTACKED.
MALEIC ANHYDRIDE: EXPLOSIVE DECOMPOSITION.
METALS: CORRODES METALS, REACTING TO FORM FLAMMABLE HYDROGEN GAS.
4-METHYL-2-NITROPHENOL: EXOTHERMIC REACTION.
NITRIC ACID: MIXING IN CLOSED CONTAINER INCREASES TEMPERATURE AND PRESSURE.
NITROBENZENE: POSSIBLY EXPLOSIVE REACTION UPON HEATING IN PRESENCE OF WATER.
NITROETHANE: FORMS AN EXPLOSIVE SALT.
NITROMETHANE: FORMS AN EXPLOSIVE SALT.
NITROPARAFFINS: THE NITROPARAFFINS, IN THE PRESENCE OF WATER, FORM DRY SALTS WITH ORGANIC BASES. THE DRY SALTS ARE EXPLOSIVE.
NITROPROPANE: FORMS AN EXPLOSIVE SALT.
O-NITROTOLUENE: POSSIBLE EXPLOSION.
OLEUM: MIXING IN A CLOSED CONTAINER CAUSES AN INCREASE IN TEMPERATURE AND PRESSURE.
ORGANIC PEROXIDES: INCOMPATIBLE.
PENTOL (3-METHYL-2-PENTENE-4-YN-1-OL): POSSIBLE EXPLOSION.
PHOSPHORUS: MAY FORM MIXED PHOSPHINES WHICH MAY IGNITE SPONTANEOUSLY IN AIR.
PHOSPHORUS PENTOXIDE: MAY REACT VIOLENTLY WHEN HEATED.
PLASTICS: MAY BE ATTACKED.
B-PROPIOLACTONE: MIXING IN A CLOSED CONTAINER CAUSES AN INCREASE IN TEMPERATURE AND PRESSURE.
PROPYLENE OXIDE: IGNITION OR EXPLOSION MAY OCCUR.
RUBBER: MAY BE ATTACKED.
SODIUM TETRAHYDROBORATE: DRY MIXTURES WITH SODIUM HYDROXIDE CONTAINING 15-70% OF TETRAHYDROBORATE LIBERATE HYDROGEN EXPLOSIVELY AT 230-270 C.
SULFURIC ACID: MIXING IN A CLOSED CONTAINER CAUSES AN INCREASE IN TEMPERATURE AND PRESSURE.
1,2,4,5-TETRACHLOROBENZENE: VIOLENT REACTION.
TETRACHLOROBENZENE + METHYL ALCOHOL: POSSIBLE EXPLOSION.
TETRACHLOROETHYLENE: POSSIBLE EXPLOSION.
TETRAHYDROFURAN: SERIOUS EXPLOSIONS CAN OCCUR.
TIN: EVOLUTION OF HYDROGEN GAS WHICH MAY FORM AN EXPLOSIVE MIXTURE.
1,1,1-TRICHLOROETHANOL: EXPLOSION MAY OCCUR.
TRICHLOROETHYLENE: FORMATION OF EXPLOSIVE MIXTURES OF DICHLOROACETYLENE.
TRICHLORONITROMETHANE + METHANOL: MAY CAUSE VIOLENT REACTION.
WOOL: MAY BE ATTACKED.
ZINC (DUST): FIRE AND EXPLOSION HAZARD.
ZIRCONIUM: MAY CAUSE EXPLOSIVE REACTION UPON HEATING.

DECOMPOSITION:
THERMAL DECOMPOSITION MAY RELEASE TOXIC FUMES OF SODIUM OXIDE.

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

STORAGE AND DISPOSAL

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

XXXXXXXXXX

PROTECT AGAINST PHYSICAL DAMAGE. STORE IN A DRY PLACE; PROTECT AGAINST MOISTURE AND WATER. SEPARATE FROM ACIDS, METALS, EXPLOSIVES, ORGANIC PEROXIDES, AND EASILY IGNITABLE MATERIALS (NFPA 49, HAZARDOUS CHEMICALS DATA, 1975).

STORE AWAY FROM INCOMPATIBLE SUBSTANCES.

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

100 POUND CERCLA SECTION 103 REPORTABLE QUANTITY.

CONDITIONS TO AVOID

MAY BURN BUT DOES NOT IGNITE READILY. FLAMMABLE, POISONOUS GASES MAY ACCUMULATE IN TANKS AND HOPPER CARS. MAY IGNITE COMBUSTIBLES (WOOD, PAPER, OIL, ETC.).

SPILL AND LEAK PROCEDURES

SOIL SPILL:
DIG HOLDING AREA SUCH AS LAGOON, POND OR PIT FOR CONTAINMENT.

USE PROTECTIVE COVER SUCH AS A PLASTIC SHEET TO PREVENT MATERIAL FROM DISSOLVING IN FIRE EXTINGUISHING WATER OR RAIN.

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

OCCUPATIONAL SPILL:
DO NOT TOUCH SPILLED MATERIAL. STOP LEAK IF YOU CAN DO IT WITHOUT RISK. FOR SMALL SPILLS, TAKE UP WITH SAND OR OTHER ABSORBENT MATERIAL AND PLACE INTO CONTAINERS FOR LATER DISPOSAL. FOR SMALL DRY SPILLS, WITH CLEAN SHOVEL PLACE MATERIAL INTO CLEAN, DRY CONTAINER AND COVER. MOVE CONTAINERS FROM SPILL AREA. FOR LARGER SPILLS, DIKE FAR AHEAD OF SPILL FOR LATER DISPOSAL. KEEP UNNECESSARY PEOPLE AWAY. ISOLATE HAZARD AREA AND DENY ENTRY.

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

PROTECTIVE EQUIPMENT

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

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

SODIUM HYDROXIDE:

50 MG/M3- ANY POWERED AIR-PURIFYING RESPIRATOR WITH A DUST AND MIST FILTER.
ANY SUPPLIED-AIR RESPIRATOR OPERATED IN A CONTINUOUS FLOW MODE.

100 MG/M3- ANY SELF-CONTAINED BREATHING APPARATUS WITH A FULL FACEPIECE.
ANY SUPPLIED-AIR RESPIRATOR WITH A FULL FACEPIECE.
ANY AIR-PURIFYING FULL FACEPIECE RESPIRATOR WITH A HIGH EFFICIENCY PARTICULATE FILTER.

250 MG/M3- ANY SUPPLIED-AIR RESPIRATOR WITH A FULL FACEPIECE AND OPERATED IN A PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE.

ESCAPE- ANY AIR-PURIFYING FULL FACEPIECE RESPIRATOR WITH A HIGH EFFICIENCY PARTICULATE FILTER.
ANY APPROPRIATE ESCAPE-TYPE SELF-CONTAINED BREATHING APPARATUS.

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

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

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

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

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

EYE PROTECTION:

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

EMERGENCY WASH FACILITIES:

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

AUTHORIZED - FISHER SCIENTIFIC, INC.
CREATION DATE: 12/17/84 REVISION DATE: 09/06/89

-ADDITIONAL INFORMATION-

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aldrich chemical co.

P.O. Box 355, Milwaukee, Wisconsin 53201 USA

Telephone: (414) 273-3850
TWX: (910) 262-3052 Aldrichem MI
Telex: 26 843 Aldrich MI
FAX: (414) 273-4979

JUN 14 1991

ATTN: SAFETY DIRECTOR
RADIAN CORPORATION
ATTN MR JOHN T CARGILL-DIR
ENVIRONMENTAL HEALTH & SAFETY
8501 MOPAC BOULEVARD
AUSTIN TX 78759

DATE: 06/0
CUST#: 410071
PO#: 127867

pure mfd

M A T E R I A L S A F E T Y D A T A S H E E T PAGE

IDENTIFICATION

PRODUCT #: 33974-1 NAME: SULFURIC ACID, 99.999%
CAS #: 7664-93-9
MF: H2O4S

SYNONYMS

ACIDE SULFURIQUE (FRENCH) * ACIDO SOLFORICO (ITALIAN) * BOV * DIPPING
ACID * HYDROGEN SULFATE (DOT) * MATTING ACID (DOT) * NORDHAUSEN ACID
(DOT) * OIL OF VITRIOL * OIL OF VITRIOL (DOT) * SPENT SULFURIC ACID
(DOT) * SULFURIC ACID (ACGIH, DOT, OSHA) * SULFURIC ACID, SPENT (DOT) *
SULPHURIC ACID * SCHWEFELSAEURELOESUNGEN (GERMAN) * UN 1830 (DOT) *
UN 1832 (DOT) * UN 2796 (DOT) * VITRIOL BROWN OIL * VITRIOL, OIL OF
(DOT) * ZWAVELZUROPLOSSINGEN (DUTCH) *

TOXICITY HAZARDS

RTECS NO: WS5600000

SULFURIC ACID

IDENTIFICATION DATA

EYE-RBT 1380 UG SEV
EYE-RBT 5 MG/30S RINSE SEV

AJOPAA 29,1363,46
TXCYAC 23,281,82

TOXICITY DATA

UNR-MAN LDLO:135 MG/KG
ORL-RAT LD50:2140 MG/KG
IHL-RAT LC50:510 MG/M3/2H
IHL-MUS LC50:320 MG/M3/2H
IHL-GPG LC50:18 MG/M3

85DCAI 2,73,70
AIHAAP 30,470,69
85GMAT -,107,82
85GMAT -,107,82
MELAAD 45,590,54

REVIEWS, STANDARDS, AND REGULATIONS

ACGIH TLV-TWA 1 MG/M3; STEL 3 MG/M3 85INAB 5,544(87),86
EPA FIFRA 1988 PESTICIDE SUBJECT TO REGISTRATION OR RE-REGISTRATION
FEREAC 54,4388,89
MSHA STANDARD-AIR:TWA 1 MG/M3 DTLVS* 3,239,71
OSHA PEL:8H TWA 1 MG/M3 FEREAC 54,2923,89
OSHA PEL FINAL:8H TWA 1 MG/M3 FEREAC 54,2923,89
NIOSH REL TO SULFURIC ACID-AIR:10H TWA 1 MG/M3 MMWR** 37(S-7),25,88
NOHS 1974: HZD 70870; NIS 313; TNF 54746; NOS 143; TNE 499446
NOES 1983: HZD 70870000; TNF 300; NIS 54516; NOS 182; TNE 775587; TFE
173653
EPA TSCA CHEMICAL INVENTORY, JUNE 1990
EPA TSCA SECTION 8(E) STATUS REPORT 8EHQ-0985-0566
EPA TSCA TEST SUBMISSION (TSCATS) DATA BASE, DECEMBER 1990
NIOSH ANALYTICAL METHODS: SEE ACIDS, INORGANIC, 7903
OSHA ANALYTICAL METHOD #ID-113

ONLY SELECTED REGISTRY OF TOXIC EFFECTS OF CHEMICAL SUBSTANCES (RTECS).
DATA IS PRESENTED HERE. SEE ACTUAL ENTRY IN RTECS FOR COMPLETE INFORMATION

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Berlin/Moscow
Aldrich Chemie
Boulevard Lambertoni 140 04
D-1030 Brussels/Bruxelles
Telephone
Belgium 114747
Moscow 040224744
Telex 62302 Aldchem S
FAX 022426214

France
Aldrich-Chemie S.A.
27, Fosse des Treves
F-47000 St-Jean-Pied-de-Port
Telephone 84327010
Telex 890078 Aldrich F
FAX 84751263

Italy
Aldrich Chimica S.r.l.
Via Piero Tozzi, 4
20127 Milano
Telephone 022613888
Telex 330642 Aldrich I
FAX 022694301

Japan
Aldrich Japan
Kyoko Bldg, Shinjuku
10 Karasumachi
Chiyoda-Ku, Tokyo
Telephone 032560154
FAX 032560137

Spain
Aldrich Quimica
Apt. de Correos 161
28100 Alcobendas (Madrid)
Telephone 81662877
Telex 22188 AQOB-E
FAX 816438084

United Kingdom
Aldrich Chemicals Co., Ltd.
The Old Brewery, New Road
Gillingham, Dorset SP9 6JA
Telephone 014752211
Telex 417236 Aldrich G
FAX 0147623779

West Germany
Aldrich-Chemie GmbH & Co. KG
D-7524 Stetten
Telephone 7329870
Telex 714838 Aldch D
FAX 0732967138/238



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aldrich chemical co.

P.O. Box 355, Milwaukee, Wisconsin 53201 USA

Telephone: (414) 273-3850
TWX: (910) 262-3052 Aldrichem MI
Telex: 26 843 Aldrich MI
FAX: (414) 273-4979

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CAS #: 7664-93-9
MF: H2O4S

NAME: SULFURIC ACID, 99.999%

----- HEALTH HAZARD DATA -----

ACUTE EFFECTS

MAY BE FATAL IF SWALLOWED.
HARMFUL IF INHALED OR ABSORBED THROUGH SKIN.
CAUSES BURNS.
MATERIAL IS EXTREMELY DESTRUCTIVE TO TISSUE OF THE MUCOUS MEMBRANES AND UPPER RESPIRATORY TRACT, EYES AND SKIN.
INHALATION MAY BE FATAL AS A RESULT OF SPASM, INFLAMMATION AND EDEMA OF THE LARYNX AND BRONCHI, CHEMICAL PNEUMONITIS AND PULMONARY EDEMA.
SYMPTOMS OF EXPOSURE MAY INCLUDE BURNING SENSATION, COUGHING, WHEEZING, LARYNGITIS, SHORTNESS OF BREATH, HEADACHE, NAUSEA AND VOMITING.

FIRST AID

IN CASE OF CONTACT, IMMEDIATELY FLUSH EYES OR SKIN WITH COPIOUS AMOUNTS OF WATER FOR AT LEAST 15 MINUTES WHILE REMOVING CONTAMINATED CLOTHING AND SHOES.
ASSURE ADEQUATE FLUSHING OF THE EYES BY SEPARATING THE EYELIDS WITH FINGERS.
IF INHALED, REMOVE TO FRESH AIR. IF NOT BREATHING GIVE ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT, GIVE OXYGEN.
IF SWALLOWED, WASH OUT MOUTH WITH WATER PROVIDED PERSON IS CONSCIOUS. CALL A PHYSICIAN IMMEDIATELY.
WASH CONTAMINATED CLOTHING BEFORE REUSE.
DISCARD CONTAMINATED SHOES.

----- PHYSICAL DATA -----

SPECIFIC GRAVITY: 1.840
VAPOR DENSITY: <.3 @ 25 C
VAPOR PRESSURE: 1 MM @ 146 C

APPEARANCE AND ODOR

VISCOUS COLORLESS LIQUID

----- FIRE AND EXPLOSION HAZARD DATA -----

FLASHPOINT: NONE

EXTINGUISHING MEDIA

NONCOMBUSTIBLE.

USE EXTINGUISHING MEDIA APPROPRIATE TO SURROUNDING FIRE CONDITIONS. DO NOT USE WATER.

SPECIAL FIREFIGHTING PROCEDURES

WEAR SELF-CONTAINED BREATHING APPARATUS AND PROTECTIVE CLOTHING TO

CONTINUED ON NEXT PAGE

Belgium/Holland
Aldrich Chemie
Souvereyn Lambertstraat 140 D6
B-1030 Brussels/Bruxelles
Telephone
Belgium 114747
Nederland 060224748
Telex 62302 Aldrich B
FAX 027378214

France
Aldrich-Chemie S.r.l.
27 Fosse des Treize
F-91000 Stenisbourg
Telephone 88327010
Telex 890076 Aldrich F
FAX 68751283

Italy
Aldrich Chimica S.r.l.
Via Pietro Tozzi, 4
20127 Milano
Telephone 022613688
Telex 330842 Aldrich I
FAX 022894301

Japan
Aldrich Japan
Kyoto Bldg. Shinkawa
10 Kanda-Akiyoshi
Chiyoda-Ku, Tokyo
Telephone 032580156
FAX 032580157

Spain
Aldrich Quimica
Apt. de Correo 161
28100 Alcorcones (Madrid)
Telephone 916639877
Telex 22188 SAQS-E
FAX 916638084

United Kingdom
Aldrich Chemicals Co., Ltd.
The Old Brewery, New Road
Gillingham, Dorset SP9 6LL
Telephone 0747822211
Telex 417236 Aldrich G
FAX 0747823778

West Germany
Aldrich-Chemie GmbH & Co. KG
D-7864 Steinhilber
Telephone: 7229870
Telex: 714638 Aldrich D
FAX 0732987130/230



chemists helping chemists in research & industry

aldrich chemical co.

P.O. Box 355, Milwaukee, Wisconsin 53201 USA

Telephone: (414) 27
TWX: (910) 262-305.
Telex: 26 843 Aldric
FAX: (414) 273-4975

M A T E R I A L S A F E T Y D A T A S H E E T

CUST#: 41
PO#: 12

PRODUCT #: 33974-1
CAS #: 7664-93-9
MF: H2O4S

NAME: SULFURIC ACID, 99.999%

----- FIRE AND EXPLOSION HAZARD DATA -----

PREVENT CONTACT WITH SKIN AND EYES.
STRONG OXIDIZER.
CONTACT WITH OTHER MATERIAL MAY CAUSE FIRE.
UNUSUAL FIRE AND EXPLOSIONS HAZARDS
EMITS TOXIC FUMES UNDER FIRE CONDITIONS.

----- REACTIVITY DATA -----

INCOMPATIBILITIES

BASES
HALIDES
AVOID CONTACT WITH METALS.
DO NOT ALLOW WATER TO ENTER CONTAINER BECAUSE OF VIOLENT REACTIO
HAZARDOUS COMBUSTION OR DECOMPOSITION PRODUCTS
SULFUR OXIDES

----- SPILL OR LEAK PROCEDURES -----

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED

EVACUATE AREA.
WEAR SELF-CONTAINED BREATHING APPARATUS, RUBBER BOOTS AND HEAVY
RUBBER GLOVES.
COVER WITH DRY-LIME, SAND, OR SODA ASH. PLACE IN COVERED CONTAIN
USING NON-SPARKING TOOLS AND TRANSPORT OUTDOORS.
VENTILATE AREA AND WASH SPILL SITE AFTER MATERIAL PICKUP IS COMP
WASTE DISPOSAL METHOD
FOR SMALL QUANTITIES: CAUTIOUSLY ADD TO A LARGE STIRRED EXCESS OF
WATER. ADJUST THE PH TO NEUTRAL, SEPARATE ANY INSOLUBLE SOLIDS OR
LIQUIDS AND PACKAGE THEM FOR HAZARDOUS-WASTE DISPOSAL. FLUSH THE
AQUEOUS SOLUTION DOWN THE DRAIN WITH PLENTY OF WATER. THE HYDROLYS
AND NEUTRALIZATION REACTIONS MAY GENERATE HEAT AND FUMES WHICH CAN
CONTROLLED BY THE RATE OF ADDITION.
OBSERVE ALL FEDERAL, STATE AND LOCAL ENVIRONMENTAL REGULATIONS.

----- PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE -----

WEAR APPROPRIATE NIOSH/MSHA-APPROVED RESPIRATOR, CHEMICAL-RESIST
GLOVES, SAFETY GOGGLES, OTHER PROTECTIVE CLOTHING.
MECHANICAL EXHAUST REQUIRED.
SAFETY SHOWER AND EYE BATH.
FACE SHIELD (8-INCH MINIMUM).

CONTINUED ON NEXT PAGE

Belgium/Holland
Aldrich Chemie
Souvereins Lambertweg 140 B4
B-1030 Brussels/Bruxelles
Telephone
Belgium 114747
Holland 060224748
Telex 82302 Aldrich B
FAX 072424216

France
Aldrich-Chemie S.A./I
27, Fosse des Treize
F-47000 Strasbourg
Telephone 88327010
Telex 80076 Aldrich F
FAX 88751283

Italy
Aldrich Chimica S.r.l.
Via Pietro Toletti, 4
20127 Milano
Telephone 022613688
Telex 320602 Aldrich I
FAX 022696301

Japan
Aldrich Japan
Kyodo Bldg. Shinjuku
10 Kanda-Mitsunaka
Chiyoda-Ku, Tokyo
Telephone 0325401154
FAX 032540187

Spain
Aldrich Quimica
Apt. de Correos 181
28100 Alcobendas (Madrid)
Telephone 916839877
Telex 32186 SAQS-E
FAX 916838064

United Kingdom
Aldrich Chemical Co., Ltd.
The Old Brewery, West Road
Gillingham, Dorset SP9 6JA
Telephone: 0747822211
Telex 41728 Aldrich G
FAX 0747823779

West Germany
Aldrich-Chemie GmbH & Co. KG
D-7024 Bismarck
Telephone: 7329870
Telex 714028 Aldrich D
FAX 0732987138728



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aldrich chemical co.

P.O. Box 355, Milwaukee, Wisconsin 53201 USA

Telephone: (414) 273-3850
TWX: (910) 262-3052 Aldrichem MI
Telex: 26 843 Aldrich MI
FAX: (414) 273-4979

M A T E R I A L S A F E T Y D A T A S H E E T

PAGE

CUST#: 410071
PO#: 127867

PRODUCT #: 33974-1
CAS #: 7664-93-9
MF: H2045

NAME: SULFURIC ACID, 99.999%

--- PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE ---

AVOID BREATHING VAPOR.
AVOID CONTACT WITH EYES, SKIN AND CLOTHING.
AVOID PROLONGED OR REPEATED EXPOSURE.
WASH THOROUGHLY AFTER HANDLING.
POISON
CORROSIVE.
KEEP TIGHTLY CLOSED.
REACTS VIOLENTLY WITH WATER.
DO NOT STORE NEAR, NOR ALLOW CONTACT WITH, CLOTHING AND OTHER
COMBUSTIBLE MATERIAL.
STORE IN A COOL DRY PLACE.

REGULATORY INFORMATION

THIS PRODUCT IS SUBJECT TO SARA SECTION 313 REPORTING REQUIREMENTS.

----- ADDITIONAL PRECAUTIONS AND COMMENTS -----

ADDITIONAL INFORMATION

INCOMPATIBLE WITH CARBIDES, CHLORATES, FULMINATES, NITRATES, PICRATES,
CYANIDES, ALKALI HALIDES, ZINC IODIDE, PERMANGANATES, HYDROGEN PEROXIDE,
AZIDES, PERCHLORATES, NITROMETHANE, PHOSPHOROUS, NITRITES, VIOLENT
REACTION WITH: CYCLOPENTADIENE, CYCLOPENTANONE OXIME, NITROARYL AMINES,
HEXALITHIUM DISILICIDE, PHOSPHOROUS (III) OXIDE.

THE ABOVE INFORMATION IS BELIEVED TO BE CORRECT BUT DOES NOT PURPORT TO BE
ALL INCLUSIVE AND SHALL BE USED ONLY AS A GUIDE. ALDRICH SHALL NOT BE HELD
LIABLE FOR ANY DAMAGE RESULTING FROM HANDLING OR FROM CONTACT WITH THE
ABOVE PRODUCT. SEE REVERSE SIDE OF INVOICE OR PACKING SLIP FOR ADDITIONAL
TERMS AND CONDITIONS OF SALE.

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Belgium/Netherlands
Aldrich Chemie
Boulevard Lambertmont 140 04
B-1030 Brussels/Bruxelles
Telephone
Belgium 114747
Netherlands 040224744
Telex 62302 Aldchem B
FAX 022424214

France
Aldrich-Chemie S a r l
27 Route des Tins
F-47000 Sarlat-la-Caneda
Telephone 04327010
Telex 890076 Aldrich F
FAX 84751283

Italy
Aldrich Chimica S r l
Via Poale Ticolet, 4
20127 Milano
Telephone 022613688
Telex 330862 Aldrich I
FAX 027694301

Japan
Aldrich Japan
Kyoto Bldg. Showa-cho
10 Karasuma-Mura-cho
Chiyoda-Ku, Tokyo
Telephone 032580156
FAX 032580157

Spain
Aldrich Quimica
Apt 94 Carrer 161
28100 Alcobendas (Madrid)
Telephone 916638977
Telex 22188 SAQS-E
FAX 916638964

United Kingdom
Aldrich Chemicals Co., Ltd.
The Old Brewery, New Road
Gillingham, Dorset SP9 4JL
Telephone 0747622211
Telex 417238 Aldrich G
FAX 0747622779

West Germany
Aldrich-Chemie GmbH & Co KG
D-7324 Starnberg
Telephone 7329670
Telex 714838 Aldrich D
FAX 0732967136/236

Section 10 LOGS AND RECORD KEEPING

This section identifies the health and safety logs, reports, and record keeping that must be maintained by the subcontractor's field personnel.

10.1 Logs

The following logs and records must be completed by each subcontractor's project leader and submitted to Enserch on request. Copies of the first three of these may be found in the indicated figures of this SSHP.

- Site Specific Training Record Form (see Figure 6-1);
- Safety Meeting Record Form (see Figure 6-2);
- Entry/Exit Log for Exclusion Zone (see Figure 8-1);

- Environmental monitoring and sampling results;
- Accident Report Form ENG 3394 (USACE); and
- Medical Surveillance/Physician's Approval.

At the conclusion of the field work, the subcontractors must submit the above records to Enserch, if requested.

10.2 Record Keeping

All record keeping will be in accordance with applicable OSHA and USACE regulations, and subcontractor policies and procedures, whichever are more stringent.

Appendix A

SUBCONTRACTOR SAFETY PLANS

**SUBCONTRACTOR SPECIFIC
HEALTH & SAFETY PLAN**

1.0 PROJECT

Subcontractor: Radian Corporation

Client: Enserch

Contract No.: DACW45-94-D-0003

Subcontractor Project Leader(s):

Field (HSO): Jim Rowe

Analytical: N/A

Office: Whitney Dulaney

2.0 SUBCONTRACTOR INFORMATION

Subcontractor: Name, address, phone number

Radian Corporation

8501 N. Mopac Blvd. (78759)

P.O. Box 201088

Austin, TX 78720-1088

512/454-4797 FAX 512/454-8807

3.0 PROJECT DESCRIPTION

3.1 Give a brief description of the project or attach project instructions.

Radian is responsible for oversight
during the field activities. Radian
personnel will not directly be sampling,
drilling or working in the field laboratory.
Also, see Table 2-1 of the SSHP.

5.0 ENVIRONMENTAL HAZARDS (Circle "YES" or "NO" and list controls, safe practices, protective equipment etc. to minimize risks on comment lines).

- a. Electrical? YES NO
During subsurface sampling - Locate underground electrical utilities before sampling begins at each site.
- b. Temperature extremes? YES NO
Monitor for thermal stress as described in SOPs (Appendix B).
- c. Heights? YES NO

- d. Noise? YES NO
Noise will only be a problem if field activities are near other base activity which have high noise levels. Use hearing protection.
- e. Explosion/Fire: YES NO
Keep open flames away from flammable liquids. Have a 2A:10B:C portable fire extinguisher immediately available.
- f. Radiation? YES NO

- g. Confined spaces? YES NO

- h. Trenches? YES NO

i. Haz. Ambient Concentrations? YES NO
Provide MSDS(s) if different/additional chemical exposures than those listed in Section 3.2 of the SSHP are of concern for subcontractor personnel.

Benzene as indicator; other VOCs; freon 113
in field laboratory.

j. Other Chemical Hazards? YES NO
If chemicals other than those identified in Appendix D of the SSHP (e.g. Solvents, reagents) brought on site, list below and provide MSDS(s).

k. Other: Snake Bite (SOP in Appendix D of SSHP)

6.0 MONITORING REQUIREMENTS

6.1 **Personal?** YES NO
Equipment: _____

6.2 **Environmental?** YES NO
Equipment: OVM - HNu Model PI-101, or equivalent

Comments: Benzene PEL = 1 ppm

Frequency: Continuous Hourly Daily Other: and when new soil is broken

7.0 PROTECTIVE EQUIPMENT [Complete this section or attach additional sheets as needed if supplemental PPE (i.e., other than that specified in Table 4-1 of the SSHP) is required for subcontractor personnel.]

X = required O = Optional, contingency equipment

Task/Site: Table 3 RFI / All sites PPE will be consistent with requirements in Table 4-1 of SSHP

7.1 Clothing

<input type="checkbox"/>	splash apron	<input type="checkbox"/>	coveralls
<input type="checkbox"/>	Tyvek		
<input type="checkbox"/>	coated Tyvek. Type: _____		
<input type="checkbox"/>	encapsulating suit		
<input type="checkbox"/>	Other: _____		

Rational for Selection: _____

7.2 Footwear

<input type="checkbox"/>	steel toed	<input type="checkbox"/>	chem. resist. steel toed
<input type="checkbox"/>	Other: _____		

Rational for Selection: _____

7.3 Eye Protection

<input type="checkbox"/>	goggles		
<input type="checkbox"/>	face shield		
<input type="checkbox"/>	safety glasses		
<input type="checkbox"/>	Other: _____		

Rational for Selection: _____

7.4 Gloves

Inner _____ Outer _____

Rational for Selection: _____

7.5 Respirator

_____ SCBA	_____ 5 min. escape pack
_____ air supplied	_____ powered air purifying
_____ air purifying (full face)	_____ air purifying (half face)
_____ dust mask	

Rational for Selection: _____

7.6 Cartridges/Filters

_____ organic vapor	_____ acid gas
_____ ammonia/amine	_____ mercury
_____ HEPA	_____ dust/mist
_____ combination:	_____
_____ other:	_____

Rational for Selection: _____

7.7 Other

_____ hardhat	_____ ear plugs
_____ ear muffs	_____ cooling vest
_____ walkie talkies	_____ lanyards

Rational for Selection: _____

10.2 Medical

a. Medical Monitoring Protocol same as described in Project SSHP?

YES NO¹

b. Medical Monitoring Requirements fulfilled by the following individuals:

<u>Name</u>	<u>Med Exam Data</u>	<u>Restrictions</u>
<u>Jim Rowe</u>	<u>2/1/94</u>	<u>None</u>
<u>Whitney Dulaney</u>	<u>6/94</u>	<u>Hearing Protection</u>
<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>

¹If you answered "NO", then attach a brief description of the 29 CFR 1910.120-required medical monitoring exam provided for your employees involved under this contract.

10.3 Signatures: (all crew members must sign that they have read and understand this H&S Plan prior to start of any field work)

<u>Crew</u>	<u>Date</u>
<u> </u>	<u> </u>

10.4 This section requires a signature from the subcontractor's Health and Safety Officer or the other subcontractor health and safety representative that certifies the above information is factual and the above individuals have fulfilled the training and medical examination requirements of 29 CFR 1910.120

Signature

Date

Title

11.0 ATTACHMENTS (circle if attachments supplied)

A = MSDS(s)

B = Client/Plant Safety Plan or Rules

C = Confined Spaces

D = Subcontractors Information

PROJECT DESCRIPTION

Radian is scoped to be the technical lead for a field investigation at Holloman AFB of 28 oil/water separators (O/WSs). These O/WSs are among the solid waste management units (SWMUs) on Table 3 of Holloman's Hazardous and Solid Waste Amendments (HSWA) permit. The investigation will include both Phase I (determination of release) and Phase II (determination of nature and extent) of an RFI in one field effort. The approach for the investigation utilizes a field screening technique to identify a release and to determine extent of the release if found.

The work plan (including the field operations plan, quality assurance project plan, and community relations plan) was prepared by Radian under a separate delivery order; it has been approved by the Corps of Engineers and the regulatory agencies.

Radian is working with the TERC team to conduct this investigation. Ebasco (the prime) is managing the project. Radian is subcontracted to them as are the other team members (their role is printed in bold):

- Ageiss Environmental, Inc. (Ageiss)--**field screening;**
- Target Environmental Services (Target)--**soil and groundwater sampling;**
- JH Carr and Associates, Inc. (JHCarr)--**laboratory analysis;**
- Zambrana Engineering, Inc. (Zambrana)--**data management and waste management;** and
- Southwest Engineering, Inc. (SEI)--**surveying.**

A detailed description of the role of each subcontractor is contained in Attachment A. Radian's responsibilities include:

- Preparation of project plans;
- Team leader for field work;
- Data validation and preparation of SQCSR;
- Performance of risk screen; and
- Preparation of RFI report.

10.4

This section requires a signature from the subcontractor's Health and Safety Officer or the other subcontractor health and safety representative that certifies the above information is factual and the above individuals have fulfilled the training and medical examination requirements of 29 CFR 1910.120

Stephanie Taylor
Signature

10/14/94
Date

Environmental Affairs Coord.
Title

11.0 ATTACHMENTS (circle if attachments supplied)

A = MSDS(s)

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- Target Environmental Services (Target)--**soil and groundwater sampling;**
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- Preparation of project plans;
- Team leader for field work;
- Data validation and preparation of SQCSR;
- Performance of risk screen; and
- Preparation of RFI report.

COPY
SUBCONTRACTOR SPECIFIC
HEALTH & SAFETY PLAN

1.0 PROJECT

Subcontractor: TARGET

Client: ENSEARCH

Contract No.: DALW45-94-D-0003

TABLE 3, RFI

Subcontractor Project Leader(s):

Field: ION MATTES

Analytical: LIZ TIERNEY

Office: LANNY HELMS

2.0 SUBCONTRACTOR INFORMATION

Subcontractor: Name, address, phone number

TARGET ENVIRONMENTAL

9180 RUMSEY ROAD

COLUMBIA, MD 21045

410/992-6622

FAX 410/992-0347

3.0 PROJECT DESCRIPTION

3.1 Give a brief description of the project or attach project instructions.

"ATTACHED"

TABLE 3 RFI
DESCRIPTION OF PROJECT

Objective

The specific objective of this survey is to collect soil and groundwater samples in the vicinity of 26 oil/water separators located at various sites at the base. As a member of the project team TARGET will provide a Geologist for each probe vehicle to supervise the work, log samples and to coordinate with Radian Corporation's on-site representative. The samples will be analyzed by Radian Corporation using an IR technique.

Sampling Procedures

Soil samples will be collected by hydraulically driving a 1.25" diameter piston-type sampler (400ml volume) to the top of the desired sample interval (conditions permitting). The piston within the sampler will then be released and the pipe will be advanced through the target interval. The soil core will enter the sampler, which contains a new non-reactive plastic liner. After the drive rod is removed from the soil, the liner containing the soil column can be removed. The liner may be capped at the ends or the soil may be extruded into 40 ml glass vials and sealed with teflon-lined caps. If a plastic liner is used, it may be opened longitudinally to expose the soil, and a specific section of the sample can be chosen for analysis. The samples will be refrigerated, pending analysis.

To collect ground water samples, TARGET's hydraulic probe will be used to drive 1.25" diameter steel pipe to the prescribed depth (conditions permitting) at each location. The bottom of the pipe will be opened or the pipe will be replaced with a slotted PVC pipe to allow water to enter from the soil. TARGET personnel will gauge the actual depth to ground water in the initial hole. Samples of ground water will be collected with a teflon sampling tube/peristaltic pump or a stainless steel mini-bailer lowered through the steel pipe. Each water sample will be stored in a 40ml EPA-clean amber glass VOA vial. Samples will be pH adjusted to inhibit microbial breakdown of contaminants and refrigerated, pending analysis.

3.2 List Activities (e.g., drilling, groundwater sampling, sample analysis):

- a. GROUNDWATER SAMPLING
- b. SOIL SAMPLING
- c. SOIL GAS SAMPLING
- d. _____
- e. _____
- f. _____

4.0 EMERGENCY MEDICAL INFORMATION

Client Safety Contact: _____ Phone: _____

Subcontractor Safety Contact (site): JOE MATTEO

Subcontractor Safety Contact Office): RANDY BRAUN 410/992-6622

4.1 First Aid

Available? (YES) NO

Location(s): FIRST AID KITS IN ALL VEHICLES

Phone or Ext.: _____

4.2 Hospital

Name: GERALD CHAMPION MEMORIAL HOSPITAL

Location: 1209 EAST 9th STREET ALAMOGORDO, NM

Distance: APPROXIMATELY 7 MILES Phone: 505/439-2100

4.3 Emergency Numbers

Service:	Phone Number:	MILITARY PHONE
<u>EMERGENCY (ALAMOGORDO)</u>	<u>911</u>	<u>9-911</u>
<u>BASE FIRE DEPT</u>	<u>479-7228</u>	<u>7228</u>
<u>BASE HOSPITAL</u>	<u>479-3260</u>	<u>3260</u>
<u>BASE ENVIRONMENTAL COORDINATOR</u>	<u>479-3931</u>	<u>3931</u>

DIRECTIONS TO BASE HOSPITAL

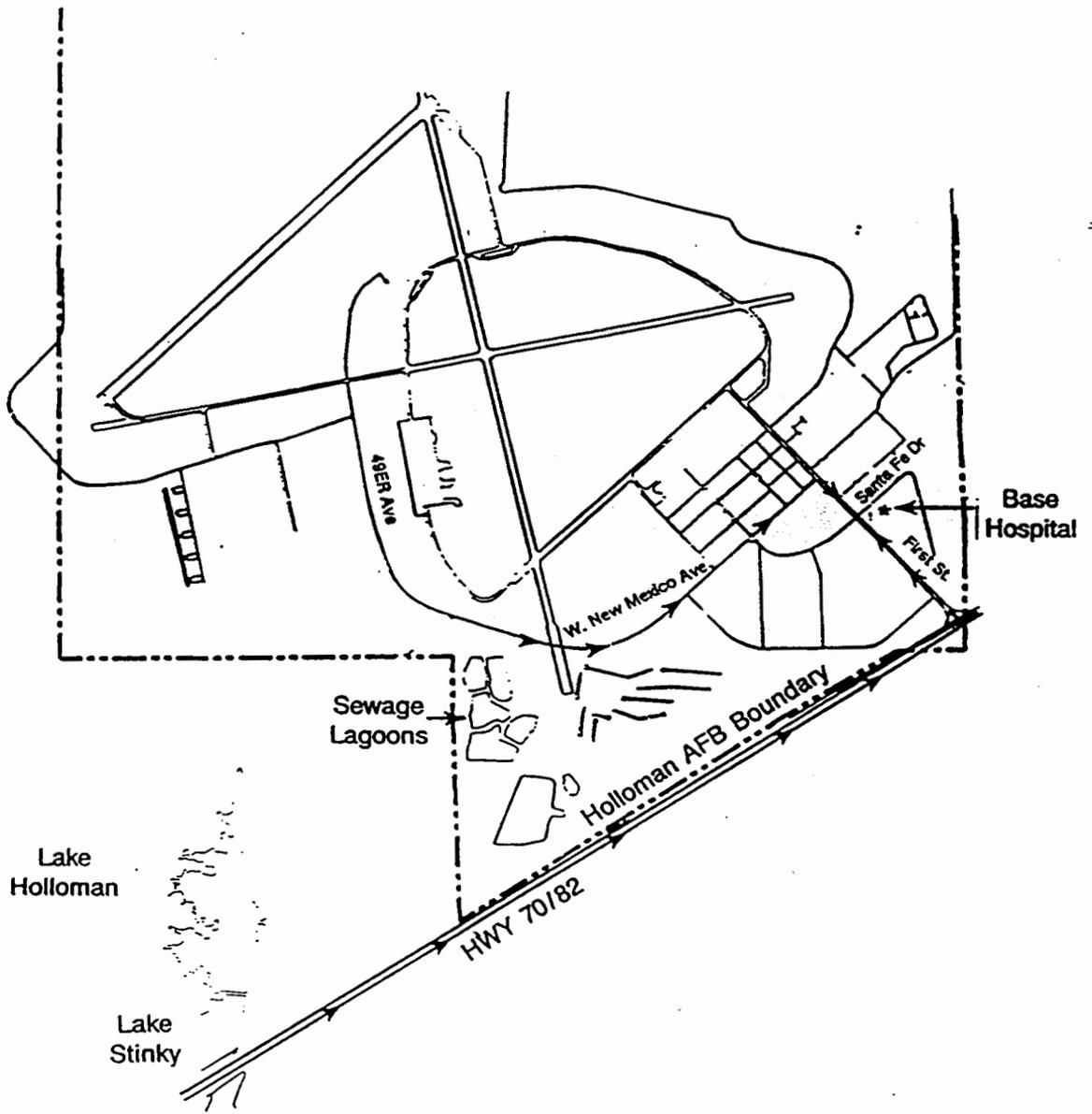
From Lagoons

Turn Right on 49ER Ave.
49ER Ave.name changes to
W. New Mexico Ave. Continue
on W. New Mexico, turn right
on First St. Hospital at
First St. and Santa Fe Dr.

**From Lakes Holloman
and Stinky**

U.S. HWY 70/82 to First St.
turn left, Hospital at
First St. and Santa Fe Dr.

NORTH



1-92-34538

Figure E-2. Location of Base Hospital

5.0 ENVIRONMENTAL HAZARDS (Circle "YES" or "NO" and list safeguards, safe practices, protective equipment on comment lines).

- a. Electrical? YES NO
 GROUND FAULT CIRCUIT INTERRUPTERS (GFCI)
- b. Temperature extremes? YES NO
 TRAINING
- c. Heights? YES NO
- d. Noise? YES NO
 HEARING PROTECTION WHILE DRILLING
- e. Explosion/Fire: YES NO
 FIRE EXTINGUISHER
- f. Radiation? YES NO
- g. Confined spaces? YES NO
- h. Trenches? YES NO

i. Haz. Ambient Concentrations? YES NO
(Provide MSDS(s))
MSDS SHEETS ON ALL VEHICLES

j. Other Chemical Hazards? YES NO
(e.g. Solvents, reagents - provide MSDS(s))

k. Other: HYDRAULIC PROBE - YES
OPERATOR TRAINING

6.0 MONITORING REQUIREMENTS

6.1 **Personal?** YES NO
Equipment: _____

6.2 **Environmental?** YES NO
Equipment: HNU BENZENE DETECTOR TUBES

Comments: HNU WILL BE CONTINUOUS

IF A RESPONSE ON THE HNU THEN USE DETECTOR TUBES

Frequency: Continuous Hourly Daily Other: AS NEEDED

7.0 PROTECTIVE EQUIPMENT (attach additional sheets as needed if equipment needs vary by task or site).

X = required O = Optional, contingency equipment

Task: GROUNDWATER SAMPLING / SOIL SAMPLING

7.1 Clothing

- splash apron coveralls
- Tyvek
- coated Tyvek. Type: _____
- encapsulating suit
- Other: _____

Rational for Selection: _____

7.2 Footwear

- steel toed chem. resist. steel toed
- Other: _____

Rational for Selection: _____

7.3 Eye Protection

- goggles
- face shield
- safety glasses
- Other: _____

Rational for Selection: _____

7.4 **Gloves**

Inner LATEX Outer _____

Rational for Selection: _____

7.5 **Respirator**

_____ SCBA _____ 5 min. escape pack
_____ air supplied _____ powered air purifying
○ air purifying (full face) _____ air purifying (half face)
_____ dust mask

Rational for Selection: POTENTIAL ROUTE OF EXPOSURE - INHALATION
UPGRADE AT ORGANIC VAPORS > 5 PPM

7.6 **Cartridges/Filters**

_____ organic vapor _____ acid gas
_____ ammonia/amine _____ mercury
_____ HEPA _____ dust/mist

X combination: MSA COMBO CARTRIDGE, GMC-H
_____ other: (PESTICIDES, ORGANIC VAPORS, ACID GAS & PARTICULATES)

Rational for Selection: IF UPGRADE TO LEVEL C
UPGRADE TO LEVEL C ORGANIC VAPORS > 5 PPM

7.7 **Other**

X hardhat _____ ear plugs
X ear muffs _____ cooling vest
_____ walkie talkies _____ lanyards

Rational for Selection: _____

7.0 PROTECTIVE EQUIPMENT (attach additional sheets as needed if equipment needs vary by task or site).

X = required O = Optional, contingency equipment

Task: SOIL GAS SAMPLING

7.1 Clothing

- splash apron 0 coveralls
- Tyvek
- coated Tyvek. Type: _____
- encapsulating suit
- Other: _____

Rational for Selection: _____

7.2 Footwear

- steel toed _____ chem. resist. steel toed
- Other: _____

Rational for Selection: _____

7.3 Eye Protection

- 0 goggles
- face shield
- 0 safety glasses
- Other: _____

Rational for Selection: _____

7.4 **Gloves**

Inner _____ Outer _____

Rational for Selection: _____

7.5 **Respirator**

_____ SCBA _____ 5 min. escape pack
_____ air supplied _____ powered air purifying
_____ air purifying (full face) _____ air purifying (half face)
_____ dust mask

Rational for Selection: _____

7.6 **Cartridges/Filters**

_____ organic vapor _____ acid gas
_____ ammonia/amine _____ mercury
_____ HEPA _____ dust/mist
_____ combination: _____
_____ other: _____

Rational for Selection: _____

7.7 **Other**

0 hardhat _____ ear plugs
X ear muffs (DALLING) _____ cooling vest
_____ walkie talkies _____ lanyards

Rational for Selection: _____

8.0 DECONTAMINATION REQUIREMENTS

(Designate decon steps by consecutive numbering)

<u>Decontamination Procedure</u>	<u>Protective Equipment</u>	<u>Field Equip</u>
High-pressure Water Spray	_____	_____
Steam Clean	_____	<u>2</u>
Detergent Wash	_____	_____
Trisodium Phosphate	_____	_____
Alconox (LIQUINEX) WASH.	_____	<u>1</u>
Other: _____	_____	_____
 <u>Solvent Rinse</u>		
Acetone	_____	_____
Methanol	_____	_____
Other: _____	_____	_____
 <u>Water Rinse</u>		
DI H ₂ O	_____	<u>3</u>
DI/Distilled H ₂ O	_____	_____
Analyte free H ₂ O	_____	_____
Other: _____	_____	_____

9.0 DISPOSAL PROCEDURES (list expendable clothing/equipment and method of disposal)

DISPOSABLE CLOTHING: LATEX GLOVES

DISPOSABLE EQUIPMENT; SOIL GAS EXPENDABLE POINTS (LEFT IN GROUND),
ACETATE LINERS (SOIL SAMPLING)

DRUMS PROVIDED BY RADIAN CORP. WILL BE USED FOR
DISPOSAL OF WASTE ITEMS

SUBCONTRACTOR SPECIFIC HEALTH & SAFETY PLAN

1.0 PROJECT

Subcontractor: AGEISS Environmental, Inc.

Client: EBASCO

Contract No.: DACW45-94-D-0003, D03, WA

Subcontractor Project Leader(s):

Field: ED KIELY

Analytical: ED KIELY

Office: ROGER WHEELLOCK

2.0 SUBCONTRACTOR INFORMATION

Subcontractor: Name, address, phone number

AGEISS ENVIRONMENTAL, INC.

1900 GRANT STREET, SUITE 1130

DENVER, CO 80203

PHONE: (303) 861-7558

FAX: (303) 861-7546

3.0 PROJECT DESCRIPTION

3.1 Give a brief description of the project or attach project instructions.

PROVIDE MOBILE LABORATORY ANALYTICAL
SERVICES FOR CHEMICAL TESTING OF
ENVIRONMENTAL SAMPLES FOR TOTAL
PETROLEUM HYDROCARBONS BY MODIFIED
EPA METHOD 418.1

3.2 List Activities (e.g., drilling, groundwater sampling, sample analysis):

- a. CHEMICAL TESTING (ON-SITE) d. _____
- b. _____ e. _____
- c. _____ f. _____

4.0 EMERGENCY MEDICAL INFORMATION

Client Safety Contact: _____ Phone: _____

Subcontractor Safety Contact (site): ED KIELY

Subcontractor Safety Contact Office: ROGER WHEELLOCK

4.1 First Aid

Available? YES NO

Location(s): IN MOBILE LABORATORY TRAILER

Phone or Ext.: TO BE DETERMINED

4.2 Hospital

Name: GERALD CHAMPION MEMORIAL HOSPITAL

Location: 1209 EAST 9TH STREET, ALAMOGORDO, NM

Distance: _____ Phone: 439-2100

4.3 Emergency Numbers

Service:	Phone Number:
<u>GENERAL</u>	<u>911</u>
<u>BASE FIRE DEPARTMENT</u>	<u>479-7228</u>
<u>SECURITY POLICE</u>	<u>479-7171</u>
<u>BASE HOSPITAL</u>	<u>479-3260</u>
<u>BASE ENVIRONMENTAL COORDINATOR</u>	<u>479-3931</u>

5.0 ENVIRONMENTAL HAZARDS (Circle "YES" or "NO" and list safeguards, safe practices, protective equipment on comment lines).

a. Electrical? YES NO

b. Temperature extremes? YES NO

c. Heights? YES NO

d. Noise? YES NO

e. Explosion/Fire: YES NO
FREON SOLVENT FOR CHEMICAL TESTING
IS COMBUSTIBLE

f. Radiation? YES NO

g. Confined spaces? YES NO

h. Trenches? YES NO

i Haz. Ambient Concentrations? YES **NO**

(Provide MSDS(s))

FUME HOOD IN MOBILE LABORATORY
MITIGATES EXPOSURE TO FREON SOLVENT.

j. Other Chemical Hazards? **YES** NO

(e.g. Solvents, reagents - provide MSDS(s))

- FREON 113 EXTRACTION SOLVENT
- MSDS TO BE FURNISHED BY MANUFACTURER.

k. Other: PHYSICAL HAZARDS LIMITED TO
CUTS, SLIPS, TRIPS, AND FALLS.

6.0 MONITORING REQUIREMENTS

6.1 **Personal?** YES **NO**

Equipment: _____

6.2 **Environmental?** YES **NO**

Equipment: _____

Comments: _____

Frequency: Continuous Hourly Daily Other: _____

7.0 **PROTECTIVE EQUIPMENT** (attach additional sheets as needed if equipment needs vary by task or site.)

X = required

O = Optional, contingency equipment

Task: _____

7.1 **Clothing**

_____ splash apron _____ coveralls

_____ Tyvek

_____ coated Tyvek. Type: _____

_____ encapsulating suit

X Other: LABORATORY COAT

Rational for Selection: PROTECTION FOR SMALL SPILLS OR
SPLASHING OF FREON SOLVENT

7.2 **Footwear**

X steel toed _____ chem. resist. steel toed

_____ Other: _____

Rational for Selection: GENERAL REQUIREMENT FOR
LEVEL D PPE.

7.3 **Eye Protection**

X goggles

_____ face shield

_____ safety glasses

_____ Other: _____

Rational for Selection: PROTECTION FOR SPLASHING
OF FREON SOLVENT

7.4 Gloves

Inner _____

Outer DISPOSABLE LATEX GLOVESRational for Selection: PROTECTION FOR SPLASHING
OF FREON SOLVENT**7.5 Respirator**

_____ SCBA

_____ 5 min. escape pack

_____ air supplied

_____ powered air purifying

_____ air purifying (full face)

_____ air purifying (half face)

_____ dust mask

Rational for Selection: NONE - FUME HOOD PROVIDES
ENGINEERING CONTROL TO MITIGATE
RESPIRATORY EXPOSURE TO FREON SOLVENT.**7.6 Cartridges/Filters**

_____ organic vapor

_____ acid gas

_____ ammonia/amine

_____ mercury

_____ HEPA

_____ dust/mist

_____ combination: _____

_____ other: _____

Rational for Selection: NONE - SEE 7.5 ABOVE**7.7 Other**

_____ hardhat

_____ ear plugs

_____ ear muffs

_____ cooling vest

_____ walkie talkies

_____ lanyards

Rational for Selection: NONE

8.0 DECONTAMINATION REQUIREMENTS NOT APPLICABLE

(Designate decon steps by consecutive numbering)

<u>Decontamination Procedure</u>	<u>Protective Equipment</u>	<u>Field Equip</u>
High-pressure Water Spray	_____	_____
Steam Clean	_____	_____
Detergent Wash	_____	_____
Trisodium Phosphate	_____	_____
Alconox	_____	_____
Other: _____	_____	_____
 <u>Solvent Rinse</u>		
Acetone	_____	_____
Methanol	_____	_____
Other: _____	_____	_____
 <u>Water Rinse</u>		
DI H ₂ O	_____	_____
DI/Distilled H ₂ O	_____	_____
Analyte free H ₂ O	_____	_____
Other: _____	_____	_____

9.0 DISPOSAL PROCEDURES (list expendable clothing/equipment and method of disposal)

DISPOSABLE LATEX GLOVES WILL BE DISPOSEDAS NONHAZARDOUS SOLID WASTE.FREON SOLVENT WILL BE MANAGED INACCORDANCE WITH APPLICABLE LOCAL,
STATE AND FEDERAL REGULATIONS.

10.0 PERSONNEL (Provide names of field crew and dates for training and respirator fit testing. Attach additional sheets if necessary.)

10.1 Training

Name	OSHA 40 hr.	8 Hr. Refresher	Rep. Fit Test	Yrs. Exp.
ED KIELY	10/12/90	4/24/94	6/21/93	5
DENNIS HEYER	7/20/91	4/29/94	5/2/94	4
ROGER WHEELOCK	1/27/87	1/14/94	*	14

* TO BE COMPLETED PRIOR TO FIELD ACTIVITIES

10.2 Medical

a. Medical Monitoring Protocol same as described in Project SSHP?

YES

NO¹

b. Medical Monitoring Requirements fulfilled by the following individuals:

Name	Med Exam Data	Restrictions
ED KIELY	10/21/93	NONE
DENNIS HEYER	4/21/94	NONE
ROGER WHEELOCK	5/12/94	NONE

¹If you answered "NO", then attach a brief description of the 29 CFR 1910.120-required medical monitoring exam provided for your employees involved under this contract.

10.3 Signatures: (all crew members must sign that they have read and understand this H&S Plan prior to start of any field work)

<u>Crew</u>	<u>Date</u>

10.4 This section requires a signature from the subcontractor's Health and Safety Officer or the other subcontractor health and safety representative that certifies the above information is factual and the above individuals have fulfilled the training and medical examination requirements of 29 CFR 1910.120

Ed Kiely / rww

Signature

10/14/94

Date

Health and Safety Manager

Title

11.0 ATTACHMENTS (circle if attachments supplied)

A = MSDS(s)

B = Client/Plant Safety Plan or Rules

C = Confined Spaces

D = Subcontractors Information