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Project Consistency Team Policies for Environmental Restoration

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Project Consistency Team Policy Memos

Procedure Number	Title	Dated
(1995 Tab)		
EM/ER:95-PCT-001	**Project Consistency Team**	02/14/95
EM/ER:95-PCT-009	**Documenting Telephone Communications with the Environmental Protection Agency (EPA)**	03/24/95
EM/ER:95-PCT-010	**Documenting Telephone Communications with the New Mexico Environment Department (NMED)**	03/24/95
EM/ER:95PCT-012	**The Environmental Restoration (ER) Project Health and Safety Plan (HASP) and Site-Specific Health and Safety Plan (SSHASP)**	04/13/95
EM/ER:95-PCT-013	**Permit Modification Requests**	03/28/95
EM/ER:95-PCT-015	**No Further Action Criteria Policy**	03/28/95
EM/ER:95-PCT-016,R1	**Accelerated Cleanup Process**	04/12/96
EM/ER:95-PCT-022	**Unexpected Encounter of Groundwater During Environmental Restoration (ER) Activities**	07/20/95
EM/ER:95-PCT-025	**Management of Investigation Derived Waste**	07/20/95
EM/ER:95-PCT-029,R1	**Final Reports for Voluntary Corrective Actions and Expedited Cleanups**	04/12/96
EM/ER:95-PCT-030	**Short Form Site-Specific Health and Safety Plan (SSHSP) for Voluntary Corrective Actions and Expedited Cleanups**	08/09/95

13003

(1996 TAB)

EM/ER:96-PCT-002	**Management of Samples Returned from Analytical Laboratories**	04/12/96
EM/ER:96-PCT-003	**Environmental Restoration (ER) Project Interaction with Waste Management**	04/12/96
EM/ER:96-PCT-004	**Reconsidering and/or Stopping Work on Accelerated Cleanups**	04/12/96
EM/ER:96-PCT-005	**Interim Action Process**	04/12/96
EM/ER:96-PCT-006	**Accelerated Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) Process Policy**	04/12/96
EM/ER:96-PCT-007	**Preparation of Final Resource Conservation and Recovery Act Facility Investigation (RFI) and Other Deliverable Documents**	04/10/96
EM/ER:96-PCT-008	**Policy for the Evaluation and Cleanup of Total Petroleum Hydrocarbons (TPHs) in Soil**	03/29/96
EM/ER:96-PCT-010	**Use of Background Data for the Environmental Restoration (ER) Project Decision Making Policy**	03/29/96
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EM/ER:96-PCT-013	**Policy for the Derivation and Use of Radionuclide Soil Cleanup Guidelines**	04/12/96
EM/ER:96-PCT-014	**Resource Conservation and Recovery Act Facility Investigation (RFI) Report Framework Policy**	08/19/96

LOS ALAMOS NATIONAL LABORATORY
ENVIRONMENTAL RESTORATION
PROJECT CONSISTENCY TEAM POLICY NOTEBOOK

General Instructions

Please perform the following:

1. Return your signed Receipt Acknowledgment form by the date indicated on the form.

2. Read the purpose and scope of each appropriate policy to determine if the employees you supervise need to implement them.

3. Ensure that the personnel you supervise have access to your manual.

4. **Please return your manual to the Controlled Document Custodian,** RPF MS M707, if you leave the program. **Do not** transfer your controlled manual without first contacting the CDC.

Los Alamos National Laboratory

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U. S. Department of Energy
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Los Alamos, New Mexico 87544
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To/MS: Distribution
Date. February 14, 1995
Refer to: EM/ER:PCT-001

SUBJECT: PROJECT CONSISTENCY TEAM

The current budgetary climate has necessitated changes to the way that environmental restoration activities are conducted at the Los Alamos National Laboratory (the Laboratory). These changes require that environmental restoration be conducted faster, better, and cheaper than it has been done in the past. Work must be done more efficiently with an ever shrinking budget.

In order for the University of California (UC) to have a successful Environmental Restoration (ER) Project and meet the demands imposed on the Project by the Department of Energy (DOE), UC and the DOE Los Alamos Area Office (LAAO) have jointly created the Project Consistency Team (PCT). The PCT consists primarily of the UC ER Project Consistency Manager (Tracy Glatzmaier), the UC Regulatory Manager (Dave McInroy), the LAAO Regulatory Manager (Court Fesmire) and Bonnie Koch of LAAO. Also, Pat Shanley of ESH-19 has been named as a permanent member of the team in order to provide input and consistency to regulatory issues around the Laboratory. Periodically, other members of the UC/LAAO ER staff will be asked to participate in the meetings and/or provide specific technical expertise or input to the team. The team is co-chaired by Tracy and Court.

As the name implies, the primary purpose of the PCT is to provide consistency throughout the ER Project, coordinating and integrating UC and DOE activities. This coordination has been lacking in the past and has caused confusion and delay in dealings with the regulators. In order to provide this internal consistency, the PCT will develop and implement technical policy and direction for the ER Project. It will also function as the focal point for project issues raised by the Field Project Leaders (FPLs) or Field Project Coordinators (FPCs), regulatory issues, coordination with waste management, ER-related health or safety issues, technical issues, resolution of differences between individual Field Unit (FU) approaches, and overall coordination for the Project. Issues that may affect the Project should be raised to the PCT for resolution.

Any member of the ER Project staff may submit items/issues for consideration by the PCT. These items should be submitted first to the FPL, FPC, or Council Leaders for

review and submittal to the PCT. Items for the PCT will be submitted in writing (e-mail is acceptable) and should be submitted to either Tracy or Court.

The mechanism that the PCT will use in order to accomplish its mission will be the issuance of formal written policies to the Project on an as needed basis. The policies will be issued to the FPLS, FPCs, and all UC Council Leaders as controlled documents. Each of these people will be responsible for maintaining a current policy notebook (provided with this memo) at an accessible location within their area. Each of these people is responsible for ensuring that all members of their team are familiar with the policies and for briefing their team members about new policies.

Future policy memos will be issued using the following format under the joint signature of the co-chairs.

- Statement of issue
- Summary of policy
- Brief discussion
- Policy contact person
- Signatures

Policy statements issued under the signature of the co-chairs will be considered as being issued under the joint signature of the UC ER Project Manager and the LAAO ER Program Manager.

If you have any questions regarding this memo or the function of the Project Consistency Team, plase contact Tracy Glatzmaier at 5-2613 or Court Fesmire at 5-4718.

Sincerely,

Jorg Jansen, Project Manager
Environmental Restoration

Sincerely,

Theodore J. Taylor, Program Manager
Los Alamos Area Office

JJ/bp

Environmental
Restoration

Attachment: Policy Notebook

Distribution:
T. Glatzmaier, DD EES/ER, MS M992
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B. Koch, FPC, LAAO, MS A316
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J. Jansen, Project Manager, ER, MS M992
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To/MS: Distribution
Date: March 24, 1995
Refer to: EM/ER:PCT-95-009

SUBJECT: DOCUMENTING TELEPHONE COMMUNICATIONS WITH THE ENVIRONMENTAL PROTECTION AGENCY (EPA)

STATEMENT OF ISSUE

Telephone communications, relating to specific technical issues, between Los Alamos National Laboratory's (Laboratory's) Environmental Restoration (ER) Project staff and the EPA Region 6 Resource Conservation and Recovery Act Permits Branch must be coordinated through the ER Project Office and the ESH Division.

SUMMARY OF POLICY

Field Project Leaders (FPLs) and/or Field Project Counterparts (FPCs) may contact the EPA (Barbara Driscoll) directly for questions which pertain only to their Field Unit (FU). Any question which **may** have broader implications beyond the limits of the FU must be brought to the attention of the Regulatory Manager, who will contact the EPA. In keeping with Laboratory Policy, those communications with the EPA that are broader in scope will also be coordinated with the ESH Division by the Regulatory Manager.

If an FPL/FPC contacts the EPA, the conversation must be documented using the attached format and may be sent via e-mail or hard copy. Bonnie Koch, Court Fesmire, Dave McInroy, Pat Shanley, and Tracy Glatzmaier must always receive a copy of the form. Any other interested or affected party will also be supplied a copy of the record of the conversation.

DISCUSSION

The roles and responsibilities for each member of the ER Project Team have been set jointly by the ER Project Manager and the US Department of Energy. These roles and responsibilities created the position of the Regulatory Manager, part of whose function it is to establish and maintain communications with the regulatory agencies. The Regulatory Manager is the ER Project's designated point of contact with the regulators. With this coordination, implementation of regulator guidance and directives will be consistent and communication will be enhanced throughout the Project. The Regulatory Manager will also coordinate with the ESH Division.

CONTACT PERSON: Court Fesmire (5-4718).

Sincerely,

Tracy Glatzmaier
ER Project Consistency Manager

Sincerely,

for Courtland Fesmire
DOE/LAAO Regulatory Manager

TG/CF/bp

Attachments: Teleconference Notes

Distribution:
G. Allen, FPL, CST-18, MS E525
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D. Griswold, AL-ERD, MS A906
K. Hargis, EM/P&PI, MS J591
E. Merrill, EM-453, HQ

ER PROJECT
TELECONFERENCE NOTES

TO: FROM: DATE:

ORGANIZATION: ORGANIZATION: TIME:

PHONE: PHONE:

OTHER PARTIES: _____

_____

_____

DISCUSSION:*

ACTION ITEMS:

1.

2.

3.

DISTRIBUTION:

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Others:

* use additional blank pages as necessary

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To/MS: Distribution
Date: March 24, 1995
Refer to: EM/ER:PCT-95-010

SUBJECT: DOCUMENTING TELEPHONE COMMUNICATIONS WITH THE NEW MEXICO ENVIRONMENT DEPARTMENT (NMED)

STATEMENT OF ISSUE

Telephone communications, relating to specific technical issues, between Los Alamos National Laboratory's (Laboratory's) Environmental Restoration (ER) Project staff and the NMED, Hazardous and Radioactive Materials Bureau (HRMB), Resource Conservation and Recovery Act Permits Program must be coordinated through the ER Project Office and the Laboratory's ESH Division.

SUMMARY OF POLICY

Field Project Leaders (FPLs) and/or Field Project Counterparts (FPCs) may contact the NMED directly if necessary for specific questions pertaining only to their Field Unit (FU). As the primary regulatory agency for the ER Project is currently the EPA, such contacts are not routinely expected, however, when the corrective action program has an impact or is effected by the HRMB or other bureaus at the State, coordination must occur. These communications are expected to become more routine when the State receives total Hazardous and Solid Waste Amendments authority.

Any question which **may** have broader implications beyond the limits of the FU must be brought to the attention of the Regulatory Manager, who will contact the NMED. In keeping with Laboratory Policy, those communications with NMED that are broader in scope will also be coordinated with the ESH Division by the Regulatory Manager.

If an FPL/FPC contacts the NMED, the conversation must be documented using the attached format and may be sent via e-mail or hard copy. Bonnie Koch, Court Fesmire, Dave McInroy, Pat Shanley and Tracy Glatzmaier must always receive a copy. Any other interested or affected party will also be supplied a copy of the record of the conversation.

DISCUSSION

The roles and responsibilities for each member of the ER Project Team have been set jointly by the ER Project Manager and the US Department of Energy. These roles and responsibilities created the position of the Regulatory Manager, part of whose function it is to establish and maintain communications with the regulatory agencies. The Regulatory Manager is the ER Project's designated point of contact with the regulators. With this coordination, implementation of

regulator guidance and directives will be consistent and communication will be enhanced throughout the Project. The Regulatory Manager will also coordinate with the ESH Division.

CONTACT PERSON: Court Fesmire (5-4718).

Sincerely,

Tracy Glatzmaier
ER Project Consistency Manager

Sincerely,

for Courtland Fesmire
DOE/LAAO Regulatory Manager

TG/CF/bp

Attachments: Teleconference Notes

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E. Merrill, EM-453, HQ

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ER PROJECT
TELECONFERENCE NOTES

TO: FROM: DATE:

ORGANIZATION: ORGANIZATION: TIME:

PHONE: PHONE:

OTHER PARTIES: _____

_____

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DISCUSSION:*

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Others:

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To/MS: Distribution
Date: April 13, 1995
Refer to: EM/ER:95-PCT-012

SUBJECT: THE ENVIRONMENTAL RESTORATION (ER) PROJECT HEALTH AND SAFETY PLAN (HASP) AND SITE-SPECIFIC HEALTH AND SAFETY PLAN (SSHASP)

STATEMENT OF ISSUE

Because potential hazards are inherent to the performance of ER field operations, Los Alamos National Laboratory (the Laboratory) expects that work conducted under the ER Project be performed in a safe and healthful manner which minimizes the threat and occurrence of hazards to health, property, and the environment to levels as low as reasonably achievable.

SUMMARY OF POLICY

The HASP establishes the generic health and safety (HS) information and requirements applicable to ER field operations. The SSHASPs supplement this document and provide additional, specific HS information required at individual project sites.

The primary objectives of the ER Project's two plans are to ensure that health and safety criteria are followed consistently, project-wide, during investigation, remediation, or decommissioning activities to promote a safe and healthful workplace for ER Project personnel. The Project Consistency Team (PCT) policy requires that all ER Project personnel are responsible for conducting work in accordance with applicable regulations and must follow the Project's HASP and utilize the SSHASP on all site-specific field activities. These two documents must be signed by participating employees indicating that they have read and understood them.

DISCUSSION

The ER Project HASP and SSHASP were developed for the ER Project in compliance with applicable federal and state occupational safety and health requirements, including those of the US Department of Energy (DOE). The DOE requires the Laboratory to comply with the federal Occupational Safety and Health Administration (OSHA) requirements, although operations at the Laboratory are not subject to the jurisdiction of OSHA.

The two documents are maintained by the Site Safety Officer (SSO) and kept on-site, accessible for reference by individuals performing ER field operations. The HASP is a stand-alone document included in the ER Project Installation Work Plan (IWP). It is reviewed by appropriate technical groups and subsequently changed only with approval from the PCT.

The development and implementation of the SSHASP is the responsibility of the Field Project Leader (FPL) who has the authority to delegate its preparation. It can be obtained electronically from the health and safety representative assigned to each field unit.

Prior to initiation of work, SSHASP documentation shall be submitted to the Field Unit HS Representative for review and approval by Laboratory representatives. It must be signed by an authorized representative of each ER participant-employer having an employee subject to the terms of the SSHASP. The signature serves as certification of conformance to stated requirements in the HASP and SSHASP. Upon approval, a copy of the SSHASP shall be returned to each employer with the signature of the FPL.

Annual updates to the HASP will incorporate new HS information as it becomes available or as requirements change. Minor revisions that could make a SSHASP more responsive to the implementation of ER activities at a particular site can be accommodated as necessary using appropriate forms. Broader modification involving scope or contract requires notification of the Contract Administrator and Field Unit HS Representative.

CONTACT PERSON: Oliver Wilton (5-7221 or 5-2950).

Sincerely,

Tracy Glatzmaier
ER Project Consistency Manager

Sincerely,

for Courtland Fesmire
DOE/LAAO Regulatory Manager

TG/CF/bp

Distribution:
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LOS ALAMOS NATIONAL LABORATORY (LANL)
ENVIRONMENTAL RESTORATION (ER) PROJECT

HEALTH AND SAFETY PLAN

(HASP)

	(Print Name)	(Title)	(Signature)	(Date)
Prepared by	O. C. Wilton	ER/HS Team Leader		3/27/95
ESH-1 Review & Approval by	J. L. McAtee	Group Leader		3-27-95
ESH-2 Review & Approval by	J. D. Williams	Group Leader		3/27/95
ESH-5 Review & Approval by	B. C. Hargis	Group Leader	Barbara Hargis	3-30-95
ESH-10 Review & Approval by	T. C. Hower	Group Leader		3/28/95
ESH-12 Review & Approval by	R. F. Smale	Group Leader (Acting)		3/28/95
ESH-13 Review & Approval by	M. M. Cox	Group Leader		3/29/95
LC/GL Approval by	G. L. Bergman	Staff Attorney		3/28/95
ER Project Leader	J. Jansen	ER Project Manager		3-28-95

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LIST OF ACRONYMS AND ABBREVIATIONS

ABHP ..... American Board of Health Physics
ABIH ..... American Board of Industrial Hygiene
ACGIH ..... American Conference of Governmental Industrial Hygienists
AIHA ..... American Industrial Hygiene Association
ALARA ..... As Low As Reasonably Achievable
AL ..... Action Level
ANSI ..... American National Standard Institute
AR ..... Administrative Requirements
ASL ..... Above Sea Level
CFR ..... Code of Federal Regulations
CPR ..... Cardiopulmonary Resuscitation
CRZ ..... Contamination Reduction Zone
dBA ..... Decibels (A-Weighted Scale)
DOE ..... U.S. Department of Energy
DOL ..... U.S. Department of Labor
DOT ..... U.S. Department of Transportation
DPL ..... Decommissioning Project Leader
EPA ..... U.S. Environmental Protection Agency
ER ..... Environmental Restoration
ER/HS ..... Environmental Restoration Health and Safety
ESH ..... Environmental, Safety and Health
ESH-1 ..... Health Physics Operations Group
ESH-2 ..... Occupational Medicine Group
ESH-4 ..... Health Physics Measurements Group
ESH-5 ..... Industrial Hygiene and Safety Group
ESH-10 ..... Emergency Management and Response Group
ESH-12 ..... Policy and Program Analysis Group
ESH-13 ..... ES&H Training Group
EZ ..... Exclusion Zone
FPL ..... Field Project Leader
FTL ..... Field Team Leader
FTM ..... Field Team Manager
GET ..... General Employee Training
HASP ..... Health and Safety Plan
HAZMAT TEAM ..... Hazardous Materials Response Team
HAZWOPER ..... Hazardous Waste Operations and Emergency Response
HPT ..... Health Protection Technician
HS ..... Health and Safety
IDLH ..... Immediately Dangerous to Life or Health
IWP ..... Installation Workplan

JS ..... Job Superintendent
LAMC ..... Los Alamos Medical Center
LANL ..... Los Alamos National Laboratory
LP ..... Laboratory Procedure
MPH ..... Miles Per Hour
MSHA ..... Mine Safety and Health Administration
MSDS ..... Material Safety Data Sheet
NIOSH ..... National Institute for Occupational Safety and Health
OSHA ..... Occupational Safety and Health Administration
PEL ..... Permissible Exposure Limit (OSHA)
PPE ..... Personal Protective Equipment
PRS ..... Potential Release Site
RCA ..... Radiological Control Area
RCRA ..... Resource Conservation and Recovery Act
RCT ..... Radiological Control Technician
RPF ..... Records Processing Facility
RSP ..... Radiological Screening Personnel
RWP ..... Radiological Work Permit
SOP ..... Standard Operating Procedures
SPCC ..... Spill Prevention Control and Countermeasures
SSHASP ..... Site-Specific Health and Safety Plan
SSO ..... Site Safety Officer
SWP ..... Special Work Permit
SZ ..... Support Zone
TA ..... Technical Area (LANL)
TLV ..... Threshold Limit Value (ACGIH)

1 Introduction

1.1 Purpose and Applicability

This health and safety plan (HASP) has been developed by the University of California (herein "LANL") for the Environmental Restoration (ER) Project at the Los Alamos National Laboratory to comply with applicable federal and state occupational safety and health requirements, including those of the U.S. Department of Energy (DOE). The DOE requires LANL to comply with the federal Occupational Safety and Health Administration (OSHA) requirements, although operations at LANL are not subject to the jurisdiction of OSHA. This HASP establishes generic health and safety (HS) information and requirements applicable to ER field operations projectwide. In addition to the generic guidance published in this document, a Site-Specific Health and Safety Plan (SSHASP) shall be prepared for each field project. The Field Project Leader (FPL), who is the LANL representative having authority and responsibility for SSHASP development and implementation, will delegate the responsibility for preparation of the SSHASP. As used in this document, "field project" refers to investigation or cleanup of a potential release site (PRS) or group of PRSs and decommissioning projects. Each SSHASP supplements this document by providing additional HS information and requirements indicated by the operations and conditions at individual project sites.

LANL acknowledges that potential hazards are inherent to the performance of ER field operations. Accordingly, LANL expects that work conducted under the ER Project will be performed in a safe and healthful manner, that minimizes the threat and occurrence of hazards to health, property, and the environment to levels as low as reasonably achievable (ALARA). In the interest of protecting health and property (LANL's personnel and property, the local public and their interests, and the personnel and equipment involved in conducting ER work); programs, plans, and procedures associated with the performance of ER field projects are subject to approval by designated LANL representatives prior to implementation. However, such approval in no way relieves ER participants from compliance with specific regulatory requirements pertaining to HS programs, plans, procedures, or work practices; nor does such approval relieve ER participants from their responsibility to maintain a safe and healthful work environment. The term "ER participants" refers to anyone performing ER work, including LANL, subcontractors to LANL and their lower-tier contractors, consultants, and agents.

Furthermore, ER participants are responsible for conducting work in accordance with applicable federal, state, and local regulations. In some cases, in this document and as indicated in the SSHASP, LANL has chosen to invoke OSHA and LANL requirements which ordinarily may not apply to ER field operations (e.g., OSHA's general industry standards in Part 1910 of Title 29 of the Code of Federal Regulations [29 CFR 1910]). These choices were made on a case-by-case basis to maintain consistency with LANL's ALARA policy and to clarify LANL's expectations with regard to interpretable requirements of the multiple agencies governing ER work.

Where there is concern that implementation of work orders or HS requirements would conflict with contract terms, or could unreasonably compromise the safety or health of an individual or the environment, such concerns should be brought to the attention of the Contract Administrator and the Field Unit HS Representative (Section 3.3.2) immediately. Failure to comply with terms of HS plans may constitute cause to stop activity or for issuance of a stop work order as specified in Section 3.4.2 without cost or penalty to LANL.

The ER Project has provided this document and a model SSHASP to ER participants. It also has incorporated this document without the appendices into the ER Project Installation Workplan (IWP) as Appendix 6. Both this document and the completed SSHASP for each project shall be kept readily available for reference by individuals performing ER field operations and shall govern the conduct of work at the applicable site(s).

1.2 Review and Approval of Health and Safety Documents

Prior to initiation of any work, a completed SSHASP document shall be submitted to the Field Unit HS Representative, in draft form, for review and approval by LANL representatives. Each SSHASP submitted (or provided where a SSHASP document exists) must be signed by an authorized representative of each

ER participant-employer having an employee subject to the terms of the SSHASP by reason of his/her performance of work at a covered site. Such signature, which shall be affixed to the signature page, shall serve as a certification that the employer(s) have reviewed, concur with and will conform their employees' conduct to requirements stated in the HASP and SSHASP. Upon approval, a copy of the SSHASP shall be returned to each employer with the signature of the FPL.

Additionally, each individual, who will enter an area of a site where access has been limited in accordance with the SSHASP, shall sign an acknowledgment form (Appendix A) to acknowledge that he/she has read or been briefed on, and understands the contents of, the HASP and applicable SSHASP and agrees to abide by terms of these documents.

1.3 Updating and Numbering Health and Safety Documents

Evolutionary changes in HS information or requirements, which apply projectwide, will be incorporated in the annual updates of this document. Any exceptions or deviations from this document must be described along with the rationale in the applicable SSHASP.

SSHASPs may be revised at any time to include new information and changes that make the SSHASP more useful (e.g., new site data based on contaminant sampling and monitoring, recent survey information, and changes in site conditions or work practices). Once the SSHASP has been approved, revisions will be tracked using a SSHASP modification form (Appendix B). Modifications to a SSHASP may require a change to the terms or scope of a subcontract. Completion of a SSHASP modification form is <u>not</u> the means for modifying the scope or terms of the project contract. To modify a contract, the Subcontractor shall notify the Contract Administrator and Field Unit HS Representative (Section 3.3.2) under the changes clause and shall not proceed with the change until a change order has been mutually agreed between the parties, or unless unilateral direction is given by the Contract Administrator.

Generally, SSHASP modifications are completed by the Site Safety Officer (SSO). Modifications to the SSHASP must be signed by a duly authorized representative of each party (including subcontractors, and lower-tier subcontractors, consultants or agents) affected by the modification(s) having authority to approve of or concur with the terms of the modification(s). Changes to the SSHASP shall be communicated to affected individuals prior to implementation during tailgate HS meetings (Section 10.1.4).

When a draft SSHASP is submitted for LANL review, ESH-5 will issue a unique document control number, which shall appear on the title page and in the footer of each page of the final document. Each modification form shall be consecutively numbered using the SSHASP number (X), followed by a decimal point and a numeric suffix (e.g., X.01 or X.02) indicating the modification number sequentially.

2 Background Information

Background information specific to the project is provided in the SSHASP (Section 2), including the project scope of work and descriptions of the PRS(s). In accordance with requirements of 29 CFR 1926.65(l)(3)(i)(A), included in this section is general information about the location and climate of Los Alamos. Information about the location and climate of Los Alamos was provided by the LANL's Environmental Management Air Quality and Meteorology Section (Bowen).

2.1 Location

LANL and the communities of Los Alamos and White Rock are located in the County of Los Alamos in north-central New Mexico. The population of Los Alamos County according to the 1990 U.S. Census was 18,115 (University of New Mexico). By air LANL is located approximately 60 miles north-northeast of the City of Albuquerque and 25 miles northwest of the City of Santa Fe. Much of Los Alamos is located on the Pajarito Plateau on the eastern flanks of the Jemez Mountains. The plateau slopes downward to the east-southeast, covering a distance of more than 15 miles from the base of the Jemez Mountains (approximately 7,800 feet above sea level [ASL]) to a location just above the Rio Grande River Valley

(approximately 6,200 feet ASL). Numerous alternating "finger" mesas and canyons run along the plateau slope line. The canyons are 150 to 300 feet deep and 300 to 600 feet wide. The Sangre de Cristo Mountains lie nearly 40 miles to the east. The Rio Grande Valley runs north-northeast to south-southwest between the two mountain ranges.

2.2 Prevailing Weather Conditions

Los Alamos has a semiarid, temperate mountain climate that is characterized by the prevailing weather conditions described in the subsections below.

2.2.1 Large-Scale Atmospheric Flow

Moisture is transported to north-central New Mexico from the Gulf of Mexico (800 miles to the southeast) and from the Pacific Ocean (800 miles west). Los Alamos is located on the southern edge of the usual storm track or jet stream. During the cold season (autumn through spring), west-to-east moving storms often bring clouds and precipitation. Occasionally, the jet stream is directed due southward toward New Mexico during winter, bringing frigid arctic or even Siberian air masses to the state. The jet stream is displaced to the extreme northern United States during the summer, resulting in a weak southeasterly flow (monsoon pattern) from the Gulf of Mexico toward New Mexico. This provides Los Alamos with frequent thundershowers during the summer, especially during July and August.

2.2.2 Temperature

Mean temperatures vary with altitude, averaging 5°F higher in and near the Rio Grande Valley (6,500 feet ASL) and 5°F to 10°F lower in the nearby Jemez Mountains (8,500 to 10,00 feet ASL). The elevation of central Los Alamos is nearly 7,400 feet ASL.

Summers have moderately warm days and cool nights. Afternoon temperatures are in the 70s and 80s (°F) and infrequently reach 90°F. Temperatures usually drop to the 50s (°F) at night. Extreme heat in Los Alamos is very rare. Los Alamos averages only 2 days per year with temperatures exceeding 90°F. Temperatures at White Rock reach 90°F more often than at Los Alamos and occasionally climb above 95°F.

Winter temperatures typically range from 15°F to 25°F during the night and from 30°F to 50°F during the day. Occasionally, Los Alamos temperatures drop to 0°F or below. Cold-air drainage gives more sub-0°F days and lower temperatures at White Rock than at Los Alamos. However, when clouds or moderate winds are present, temperatures are colder at Los Alamos than at White Rock. The coldest nights occur with a cold-air mass over the area, fresh snow on the ground, light winds, and clear skies. During these conditions, temperatures are even lower in the canyons and toward the valley. Extremely low wind chills are rare because strong winds usually do not occur at the same time as very cold temperatures. A table of wind chill factors is provided in the cold stress subsection under the physical agents section of the *Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices* (American Conference of Governmental Industrial Hygienists), which is published annually. Probably the most severe cold wave occurred during January 1971 when morning temperatures at Los Alamos plunged to -16°F, with highs only reaching 9°F, while low temperatures at White Rock reached -29°F.

Daily temperature ranges vary between 25°F in June and 21°F in December and January. A switch in wind direction can cause the temperature to rise or fall 5°F to 10°F, as southerly or easterly winds cool the air as it rises over the plateau, and westerly winds warm the air as the air descends.

2.2.3 Surface Winds

Los Alamos surface winds often vary dramatically with time of day, location, and height above ground because of the complex terrain. Surface winds are quite light in Los Alamos, averaging 7 miles per hour (mph). Wind speeds are strongest from March through June and weakest in December and January. Sustained winds exceeding 25 mph and peak gusts exceeding 50 mph (77 mph highest recorded mph)

are common during the spring. The strongest winds are generally southwesterly through northwesterly and occur in the afternoon or evening.

During days with sunshine, upslope winds develop over the Pajarito Plateau, which are generally less than 6 mph and usually more south-southwesterly and southerly. When the sky is clear and upper-level winds are light, local winds reverse at night. A shallow drainage, west-northwesterly wind often forms and flows down the plateau, reaching speeds of 6 to 8 mph.

2.2.4 Insolation (Sunshine)

Sunshine is plentiful in Los Alamos, where more than 75% of possible incoming solar radiation is received annually. (100% insolation assumes a perfectly cloud-free sky.) Sunshine is especially prevalent during January and February, when more than 80% of possible insolation is received, and almost as high in April and June with 79% occurring. Frequent thundershowers and clouds during the monsoon season decrease the percentage of insolation, with a minimum of 71% occurring during August. Although cloudiness is greater during July and August than during January and February, Los Alamos receives twice as much insolation during the summer because of the higher sun angle and longer periods of daylight.

2.2.5 Atmospheric Pressure

The atmospheric pressure at 7,380 feet ASL averages 22.91 inches of mercury, or 76% to 77% of the standard sea-level pressure. Similarly, the air density is about 75% of the standard sea-level air density. Pressure reaches a minimum during March, averaging 22.77 inches, and a maximum during the monsoon season, July and August, averaging 23.04 inches.

2.2.6 Humidity

Atmospheric humidity (moisture content) is relatively low in Los Alamos. The air is driest in the winter and wettest during the monsoon season (July and August). The months from August through March have nearly the same relative humidity, ranging between 52% and 57%. The late spring and early summer months have the lowest relative humidity, with the minimum of 39% occurring during June and occasionally dipping to 5% or less during warm afternoons. Relative humidities approaching 100% occur frequently on cold winter mornings and also in the summer during showers and during mornings following showers. Fog seldom occurs in Los Alamos. Over a 27-year period ending in 1988 the highest monthly mean number of fog days was 1.6 days, occurring during December.

2.2.7 Precipitation

Normal annual precipitation, including rainfall and water-equivalent snowfall, totals nearly 18 inches. Annual precipitation falls off rapidly toward the valley, with normal White Rock precipitation at 13 inches and more than 20 inches in the adjacent Jemez Mountains. Variations in precipitation from year to year are quite large in Los Alamos. For instance, the annual precipitation extremes range from 6.80 to 30.34 inches over a 69-year period.

Forty percent of the annual precipitation falls in July and August. Thundershowers develop over the Jemez Mountains during the afternoons and early evenings and drift out over the plateau causing brief, but frequently intense, rains. The rainfall is often accompanied by small hailstones.

Winter precipitation falls primarily as snow, with accumulations of about 51 inches seasonally. Rainfall occurs occasionally during the winter, but freezing rain rarely occurs. Snowfall varies considerably from season-to-season, with extremes ranging from 9.3 inches to the record 153.2 inches that fell in 1986-1987. Snowfall is greatest in December, followed by January and March. Snowstorms with accumulations exceeding 4 inches are common in Los Alamos. However, heavy snow cover seldom remains in exposed areas for lengthy periods because of strong sunshine and relatively mild temperatures. Some storms are associated with strong winds, frigid air, and dangerous wind chills, especially in the mountains. Many of the large snowstorms that have occurred in Los Alamos were caused by a persistent upslope (southerly or

southeasterly) wind, frequently over the top of a shallow arctic air mass. The preceding conditions were responsible for the largest single snowfall on record, 48 inches during January 15-17, 1987, with up to 70 inches falling in Los Alamos.

Extended periods of extreme dryness are uncommon in Los Alamos. The worst drought occurred during 1956 when only 6.80 inches fell during the entire year. More recently, very dry weather occurred during the summer of 1980 when rainfall totaled only 2.32 inches during the entire summer.

2.2.8 Severe Storms

Severe winter storms can cause heavy snows, strong winds, and dangerous wind chills. Heavy snow accumulations occasionally make roadways impassable. Heavy snowfall and strong winds also severely reduce visibility. Snowstorms can quickly develop over mountain areas, even when the weather is relatively clear over valley areas.

Lightning is very common over the Pajarito Plateau. Los Alamos is known to have the second highest number of lightning strike occurrences in the continental United States. During an average year there are 57 thunderstorm days, with most occurring during the summer. Brief downpours can cause local flash flooding, especially in canyons, streams, and other low spots.

Hail falls frequently during the summer, occasionally causing damage. Hailstones with diameters up to 0.25 inches are common, but hailstones larger than that fall less frequently.

No tornadoes have been reported to touch down in Los Alamos in recent history; however, funnel clouds have been spotted in nearby White Rock and Santa Fe. Only weak tornadoes are possible in Los Alamos, but strong dust devils can produce winds up to 75 mph at isolated spots in the county, especially at lower elevations.

2.2.9 Atmospheric Dispersion

The irregular terrain at Los Alamos favorably and unfavorably affects the consequences of an air-pollution release. Favorable effects occur because increased dispersion promotes greater dilution of contaminants released into the atmosphere. The complex terrain and forests create an aerodynamically rough surface, forcing increased horizontal and vertical turbulence and dispersion. The frequent clear skies and light winds cause good daytime vertical dispersion, especially during the warm season. Unfavorable effects occur because the generally light winds are limited in diluting contaminants horizontally. The same clear skies and light winds have a negative effect on dispersion at night, causing strong, shallow surface inversions to form. These inversions severely restrict near-surface vertical and, to a lesser extent, horizontal dispersion. The inversions are especially strong during the winter. Canyons also limit dispersion by channeling air flow.

Overall dispersion is generally the greatest in the spring when winds are the strongest. However, deep vertical mixing is the greatest during summer afternoons when the atmosphere is unstable up to 5,000 feet above ground level. Low-level dispersion is generally the least during summer and autumn evenings when winds are light. However, even though low-level dispersion is generally greater during the winter, intense surface inversions can cause low-level dispersive conditions during winter nights and early mornings.

3 Organization, Responsibilities, and Authority

The policies and personnel roles and responsibilities provided in this section have been established by LANL to clarify expectations of ER participants and to comply with requirements of 29 CFR 1926.65(b)(2).

3.1 Visitor Policy

A visitor (e.g., regulatory personnel, private property owners, field auditors, and the public) is anyone who arrives at the work site who is not identified as a field team member or in Table 3-1 of the SSHASP. When a visitor arrives, the SSO, Field Team Leader (FTL) or Job Superintendent (JS), or his/her delegate, should meet with him/her to ascertain the purpose of the visit.

Visitors are not permitted to enter controlled work zones where access has been limited unless absolutely necessary. In such cases, the visitor shall be briefed per Section 10.1.3, shall meet all applicable requirements of the HASP and SSHASP, and may need to be accompanied by an escort at the discretion of the FTL or JS. If a visitor does not comply with these requirements, the FTL or JS, or his/her delegate, shall request the visitor to leave the controlled zone immediately or shall limit site operations to minimize threat of harm to the visitor (e.g., have the field team take a break, reset the zone boundaries if appropriate, or temporarily discontinue any threatening task). Alternatively, if a visitor needs to observe work being performed in a controlled zone which is not readily visible from outside the zone(s), consider video taping or photographing the work.

3.2 Project Team Personnel

3.2.1 Line Managers

3.2.1.1 Field Project Leader

The Field Project Leader (FPL) is a member of LANL's staff and reports to the ER Project Manager. The FPL is the project manager as defined by *Construction Project Safety and Health Management* (DOE Order 5480.9A). The FPL is the line manager for his/her field unit and may direct one or more Field Team Managers (Section 3.2.1.2) or Field Team Leaders (Section 3.2.1.3).

The FPL is responsible for ensuring that provisions of the HASP, SSHASP, and other applicable HS regulations are observed for field operations under his/her management. In addition, specific HS responsibilities of the FPL, or his/her delegate, include:

- managing HS activities of his/her field unit;
- serving as the final authority for resolving HS issues concerning his/her field unit;
- ensuring that the necessary SSHASPs for his/her field unit are developed and that the comments of the Field Unit HS Representative and any other appropriate parties have been incorporated;
- ensuring that personnel performing ER work at his/her field unit are qualified in accordance with applicable HS requirements;
- ensuring that onsite personnel abide by applicable HS programs, procedures, plans, and applicable regulations;
- having the authority to ban personnel who do not abide by applicable HS requirements from performing field operations;
- conducting inspections as required by Section 12.1; and

- ensuring the submittal of appropriate field project HS records to LANL's Records-Processing Facility (RPF).

3.2.1.2 Field Team Manager or Decommissioning Project Leader

Field Team Manager (FTM) is the title of this position for ER site investigation and cleanup activities. Decommissioning Project Leader (DPL) is the title for this position for decommissioning projects. The FTM or DPL, who may be either a LANL staff member or subcontractor, reports to the FPL and is the line manager of one or more field teams. This person is the construction manager as defined by *Construction Project Safety and Health Management* (DOE Order 5480.9A). Specific HS responsibilities of the FTM and DPL, or his/her delegate, include

- coordinating with the FPL to ensure that provisions of the HASP, SSHASP, and other applicable HS regulations are implemented for assigned field operations;
- ensuring that all known tasks and personnel have been identified sufficiently in the SSHASP;
- coordinating with the FPL to ensure that each concerned party has reviewed the SSHASP for accuracy and adequacy in accordance with Section 1.2; also ensuring that review comments are resolved and that the SSHASP is signed before any field activities are begun;
- coordinating with the FPL to ensure that only field team members and support personnel qualified in accordance with applicable HS requirements are used to perform ER Project work;
- coordinating with the FPL and the Field Unit HS Representative to select qualified HS and health physics personnel;
- coordinating with the FPL to ensure that necessary permits have been obtained before commencing field operations;
- conducting inspections as required by Section 12.1;
- coordinating with the FPL to ensure that necessary HS records are produced and kept in accordance with the SSHASP; and
- coordinating with the FPL to provide necessary HS records to the FPL at the close of the project.

3.2.1.3 Field Team Leader or Job Superintendent

Field Team Leader (FTL) is the title of this position for ER site investigation and cleanup activities. Job Superintendent (JS) is the title for this position for decommissioning projects. The FTL or JS, who may be either a LANL staff member or a Subcontractor, reports to the FTM or DPL (or in some cases directly to the FPL, in which case, responsibilities of the FTM or DPL should be delegated to the FTL or JS by and at the discretion of the FPL). This person is the line manager for his/her field team. He/she oversees the work of one or more supervisors assigned to the field teams, the field team members and the SSO. The FTL or JS and JS, or his/her delegate,

- coordinates with the FTM or DPL, and/or FPL to ensure that provisions of the HASP, SSHASP, and other applicable HS regulations are implemented for assigned field operations;
- coordinates with the FTM or DPL, and/or FPL to ensure that only field team members and support personnel qualified in accordance with applicable HS requirements are allowed to perform field operations;
- coordinates with the FTM or DPL, and/or FPL to ensure that field team members attend HS briefings and daily HS tailgate meetings before beginning field operations;

- coordinates with the FTM or DPL, and/or FPL to ensure that the necessary preventative planning and employee training for emergency situations has occurred before beginning field operations (Section 9);

- coordinates with the FTM or DPL, and/or FPL to ensure that site control measures and hazard prevention and mitigation controls are implemented accordingly (Sections 4.2 and 5);

- ensures that a log of field activities is maintained, especially noting site personnel and visitors who enter and exit the site;

- notifies appropriate parties when action levels are reached and when personnel exposures exceed occupational exposure levels (Section 6);

- in the event of an incident or emergency, functions as site incident/emergency coordinator; as necessary, arranges for immediate notification of LANL emergency response personnel to take control of the scene and/or arranges for immediate notification of appropriate authorities (Section 9); and

- coordinates with the FTM or DPL, and/or FPL to ensure that modifications to the SSHASP have been prepared and approved per Section 1.3 before initiating any operational changes.

3.2.1.4 Other Onsite Supervisory Personnel

For field teams involving multiple employers, each employer's onsite supervisory representative is responsible for ensuring that provisions of the HASP, SSHASP, and other applicable HS requirements are observed by his/her employees during field operations. These supervisors are responsible for cooperating with the FTL or JS and SSO, or as necessary the FTM or DPL or the FPL, to resolve HS matters that affect his/her site personnel and/or operations.

3.2.2 Field Team Members

Field team members are responsible for performing their work in a safe and healthful manner. They also are responsible for abiding by requirements of the HASP, SSHASP, and other applicable HS regulations and procedures, and for fulfilling and maintaining their individual training and medical surveillance requirements. If there is concern that implementation of work orders or HS requirements would unreasonably compromise the safety or health of an individual or the environment, such a concern should be brought to the attention of an immediate supervisor, the SSO, or the FTL or JS. When a HS concern is not resolved adequately by field supervisors, the matter should be brought to the attention of the FTM or DPL or the Field Unit HS Representative, and subsequently, the FPL if necessary. If adequate resolution still has not been achieved, team members are encouraged to call LANL's ESH hotline at 665-5010 or to contact the Los Alamos DOE Area Office at 667-5105 where they may file a complaint form (DOE F 5480.4). DOE has a policy that employees who report a health and safety problem are protected from reprisal.

3.2.3 HS Personnel

3.2.3.1 Site Safety Officer

The SSO assists the FTL or JS to see that provisions of the HASP, SSHASP, and other applicable HS requirements are observed in the field and serves as the primary contact in the field for HS matters. The SSO shall be qualified, on a project-specific basis, to recognize and evaluate hazards and to minimize and mitigate occupational HS hazards. The SSO may perform other duties on the field team, provided that these duties do not compromise performance of his/her SSO duties. The specific responsibilities of the SSO are to

- assist with development of the SSHASP;
- verify that onsite personnel have current certification of the applicable training and medical surveillance requirements of Sections 10 and 11 of the HASP and SSHASP;
- assist the FTL or JS in effectively implementing the HASP and SSHASP in accordance with applicable federal, state, and local HS regulatory requirements;
- notify the FTL or JS of any onsite personnel who are not abiding by applicable HS requirements and of potential or actual hazardous situations needing to be rectified in accordance with applicable HS requirements;
- notify the FTM or DPL and, subsequently, the Field Unit HS Representative when elements of the HASP and SSHASP are not being met and when HS hazards are not being minimized or mitigated sufficiently;
- watch for changes in site operations and conditions that warrant hazard mitigation and/or modifications to the SSHASP;
- ensure that copies of the HASP, SSHASP, and any modification forms are current and that these documents are readily accessible onsite and as needed for ER work occurring elsewhere;
- assess the necessity, and arrange, for monitoring of employee exposures to HS hazards and convey results and known implications to FTL or JS;
- notify the FTL or JS, the Field Unit HS Representative, and affected employee(s)' supervisors of results of employee exposure monitoring (Section 13.3);
- monitor levels and effectiveness of personal protective equipment (PPE) and verify proper storage and maintenance of equipment;
- perform and document inspections of site operations per Section 12.1; and
- maintain HS-related field project records, including a daily log of HS-related matters concerning site operations, and provide these records to the FTM or DPL as necessary before close-out of the project.

3.2.3.2 Industrial Hygiene Technician

The industrial hygiene technician is a designated team member who is capable of monitoring employee exposures to hazardous substances; and, to the extent necessary for the site-specific work, is capable of evaluating exposure monitoring results to determine actions necessary to protect individuals onsite. This person may be someone who is training to become an SSO, and, with approval of the FPL, someone to whom the SSO may delegate his/her responsibilities as this person is trained and qualified to perform such duties.

3.2.3.3 Trenching/Excavation Competent Person

This individual is a designated team member or support person, in accordance with 29 CFR 1910.146, who is capable of identifying existing and predictable hazards in the surroundings or working conditions involved in trenching or excavation that are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them (29 CFR 1926.650 [b]). This person shall have had specific training in and be knowledgeable about soils analysis, the use of protective systems, and the requirements of 29 CFR 1926 Subpart P - Excavations (29 CFR 1926.650 *et seq*).

3.2.3.4 Confined-Space Entry Supervisor

The confined-space entry supervisor is a designated team member or support person who is responsible for determining whether acceptable entry conditions exist at a confined-space where entry is planned, for authorizing and overseeing entry operations, and for terminating entry in accordance with regulatory and permit requirements (29 CFR 1910.146 [b]).

3.2.3.5 Other Competent or Qualified HS Personnel

Throughout 29 CFR 1926, and applicable standards of 29 CFR 1910 evoked by LANL, OSHA uses the terms "competent" and "qualified" to denote specially trained and knowledgeable individuals who are required to perform certain job functions. These specific standards are cited as applicable throughout the HASP and SSHASP. Wherever requirements exist in these standards for participation of a competent or qualified person, the person shall be trained and knowledgeable of the particular regulated subject matter in accordance with 29 CFR 1926.32(f) or (m), the applicable regulatory standard, and Section 10.3.

3.2.4 Health Physics Personnel

Health physics personnel include radiological screening personnel (RSPs), Health Protection Technicians (HPTs), and radiological control technicians (RCTs). These field team members are the primary source of information and guidance about radiation protection. They shall ensure compliance with the radiological requirements of the SSHASP and shall conduct monitoring per the radiological surveillance authorization agreement issued by ESH-1 and terms of the SSHASP. If non-ESH-1 personnel perform these roles, ESH-1 must preapprove personnel and issue a radiological surveillance authorization agreement before any work is performed.

3.2.4.1 Radiological Screening Personnel

RSPs are responsible for providing health physics monitoring support for the field team. Each RSP is responsible for performing health physics monitoring support in accordance with his/her radiological surveillance authorization agreement. Specific responsibilities include

- performing and documenting radiological surveys;
- performing conditional equipment release surveys;
- performing daily instrument response checks;
- ensuring that all radiation-monitoring equipment is in good working order;
- ensuring that radiological postings are maintained;
- immediately notifying ESH-1 when an employee has been contaminated above action levels;
- providing ESH-1 personnel who oversee the ER Project with a daily verbal summary of site radiological conditions and copies of all radiological survey documentation; and
- notifying ESH-1 when action levels defined in the SSHASP have been reached.

3.2.4.2 Health Protection Technician and Radiological Control Technician

In addition to the responsibilities of the RSP, the responsibilities of the HPT and the RCT include

- preparing, ensuring compliance with, and closing out radiological work permits (RWPs);
- stopping work activity and revising the site RWP when the radiological controls required do not provide adequate worker protection or contamination control;

- providing guidance on radiological decontamination of equipment and personnel; and

- performing "unconditional release" surveys for equipment (RCT only).

3.3 Project Support Personnel

3.3.1 Subcontractor Representative

A Subcontractor representative is a management or HS professional representing an employer affected by terms of the SSHASP. This individual must have the authority to approve the terms of the SSHASP and any modification forms and to see that employees of his/her employer abide by these terms. Additional responsibilities include

- interfacing with field project line managers, other employers' supervisory personnel, and support professionals, as necessary, to coordinate implementation of HASP, SSHASP and other applicable HS requirements; and

- assisting with resolving HS issues involving his/her employees performing ER work, particularly those involving discrepancies between policies of multiple employers represented onsite and site-specific HS requirements.

3.3.2 Field Unit HS Representative

The Field Unit HS Representative may be either a LANL employee or a contract employee who is assigned to one or two FPLs as a technical advisor. This person provides HS support to personnel performing ER work involving the assigned field unit(s). This person serves as liaison between the field unit personnel and the ESH Division of LANL and arranges for provision of technical assistance by ESH personnel concerning industrial hygiene, operational safety, and health physics matters. This person may also be responsible on behalf of LANL for implementing the ER/HS Oversight Program (Section 12.2) for field unit(s) as assigned by ESH-5 management. In addition to the responsibilities of the Subcontractor Representative, the Field Unit HS Representative has responsibilities that include

- ensuring that SSHASPs for his/her field unit(s) are reviewed by appropriate ESH groups;

- verifying that known hazards, preventive measures, and mitigation controls associated with the project scope of work and tasks have been adequately incorporated in the SSHASP;

- reviewing and approving SSHASPs and modification forms for ER work at his/her assigned field unit(s); and

- verifying that field operations associated with his/her field unit(s) are conducted in accordance with applicable HS programs, plans, and regulatory requirements.

3.3.3 Registered Professional Engineer

A registered professional engineer is a person who is registered as a professional engineer in the state where the excavation or trenching work is to be performed (29 CFR 1926.650 [b]).

3.3.4 ESH-1 Personnel

ESH-1 personnel will be designated to provide radiological control support to the ER Project and to conduct ER/HS oversight duties (Section 12.2). The Field Unit HS Representative will arrange for participation of ESH-1 personnel to support field operations. In cases requiring immediate involvement by ESH-1 personnel, the FTL or JS, or his/her delegate, may request ESH-1 participation directly. Such participation may include site visitation, the frequency of which will depend upon the specific operations and radiological conditions occurring at the site. The responsibilities of the ESH-1 representative include

- performing reviews to ensure that the radiological safety program is in compliance with LANL's Radiological Control Manual (LANL, LM 107-01.1) and applicable LANL requirements;
- ensuring that survey methods and equipment are appropriate for the type of radiological contamination expected and for current site conditions;
- providing direct support to field health physics personnel, when requested;
- ensuring that radiological controls are implemented in accordance with the RWP (if any), the SSHASP, LANL's Radiological Control Manual (LANL, LM 107-01.1), and any other applicable LANL requirements;
- ensuring that radiological surveys are performed and documented in accordance with required procedures;
- performing radiological surveys before the start and at the completion of field activities;
- providing guidance for radiological decontamination of equipment and personnel;
- taking the actions indicated in Tables 4-3 and Section 6 of the SSHASP upon notification that the action levels given in the table have been reached;
- reviewing RWPs for the site;
- determining, and in some cases providing, appropriate radiological postings; and
- meeting notification and reporting requirements as specified in "Occurrence Reporting and Processing of Operations Information" (DOE Order 5000.3B).

These responsibilities may be performed by designated contract personnel, provided ESH-1 has approved the Subcontractor's radiological safety program to perform this work, which must be submitted to LANL for approval during the pre-bid qualification or contract negotiation period, as required, or according to applicable requirements of Section 4.2.2

3.4 Stop-Activity and Stop-Work Orders

Any individual observing an operation that presents a clear and imminent danger to the environment or to the HS of site personnel, visitors, or the public has the authority to immediately notify the individuals involved and the SSO, or the FTL or JS. In accordance with LANL's Radiological Control Manual (LANL, LM 107-01.1), RCTs have the responsibility and authority to stop work or to mitigate the effect of an activity if they suspect that the initiation or continued performance of the activity will result in a violation of radiological control standards or result in imminent danger or unacceptable risk.

3.4.1 Stop-Activity

The SSO, or the FTL or JS shall verbally notify supervisors and individuals on the site of the danger. Once it has been concluded that conditions or practices exist that pose a threat to personnel or environmental safety or health, the FTL or JS or other onsite supervisors or managers shall take action to diminish the immediate threat of harm. Operations shall be altered or discontinued to eliminate the immediate threat of harm, and individuals shall be directed to immediately leave an area of imminent danger. Authorization to begin the activity again shall be given by the FTL or JS only when it has been determined that the hazard(s) has/have been sufficiently abated and there is no further threat of harm. For example, a single activity, such as removing defective equipment or removing site personnel from a section of scaffolding that is defective, may be stopped without stopping the entire field operation. The FTL or JS is responsible for notifying the FPL and Field Unit HS Representative of any activity stoppage and to determine whether the incident is reportable per Section 9.4.

3.4.2 Stop-Work Order

A formal ("contractual") stop-work order can be issued only by a LANL Contract Administrator. Experts from ESH Division may provide recommendations regarding the need to issue a stop-work order by notifying the Field Unit HS Representative or the FPL, who will contact the Contract Administrator to arrange for review of the matter, and will proceed in accordance with applicable internal LANL procedures.

4. Task Hazard Analysis

DOE and OSHA (DOE Order 5480.9A and *Health and Safety Plan [HASP] Guidelines*; DOL, 29 CFR 1926.65[b][4][ii][A]) require that a hazard analysis be prepared for each task to be performed during the ER field project. The task hazard analysis must identify the likely radiological, safety, chemical, physical, and biological hazards and the affected personnel; so that determination can be made of the corresponding administrative and engineering controls (Section 4.2), site control measures (Section 5), exposure monitoring and response plans (Section 6), PPE (Section 7), decontamination (Section 8), emergency/incident response (Section 9), training (Section 10), and medical surveillance (Section 11) requirements to be implemented to minimize or mitigate the anticipated site hazards. Because of the configuration of the SSHASP, where administrative and engineering controls are identified within the same section as the hazards to which the controls correspond, required administrative and engineering controls are included within this task hazard analysis section of the HASP.

Each SSHASP shall include a task hazard analysis (Section 4 of the SSHASP) for each of the tasks described in the project scope of work (Table 2-2 of the SSHASP). Field team participants and key HS support personnel shall be identified in Table 4-1 of the SSHASP by the role (job title) and task(s) they are expected to perform. Then each anticipated task-specific hazard shall be assessed, as described in greater detail in this section, to determine the associated qualitative probability of occurrence of the hazard and the severity of injury/illness expected to result.

4.1 Hazard Assessment

According to DOE (DOE, *Health and Safety Plan [HASP] Guidelines*), hazard assessment is the process of identifying and evaluating the hazards associated with operational activities. Evaluation and identification of hazards should occur

- during pre-operational planning of ER field work;
- immediately after initiation of and during performance of tasks with potential hazards;
- prior to changes in tasks and/or operations;
- as required by changing site conditions; and
- continually as appropriate.

LANL has provided a method for evaluating and rating hazards (Appendix C). A list of several assessment methods are provided by DOE (DOE, *Health and Safety Plan [HASP] Guidelines*). It should be clearly stated in the SSHASP which hazard assessment method is being used.

Not all contaminants at a particular site or chemical products used during field operations pose an occupational health threat. The determination of which substances would be expected to pose an occupational health threat is made by the process of hazard assessment. DOE suggests that the following criteria be used to identify hazardous substances to be assessed:

- type, nature, form, quantity, and concentration of the hazardous substance(s)
- location of the substance(s);

- conditions under which exposure to the substance(s) may occur; and
- specific hazards associated with the substance(s).

Details of the site-specific hazard assessment of each known site contaminant and chemical product to be used shall be included in Appendix B of the SSHASP, unless there are none. Of the wide variety of potential chemicals of concern at each site, Table 4-2 of the SSHASP must include only the substances expected to pose an occupational health threat together with the resulting hazard assessment rating. The signs and symptoms of chemical exposure, if any, shall be provided in Appendix C of the SSHASP. Corresponding detection methods, protective measures, and response actions shall be provided in Section 6 of the SSHASP.

Assessment of site-specific hazards that could result from the unpredictable detonation of high explosives, exposure to radiological and safety hazards, and to chemical hazards by class of chemical shall be included in Table 4-3 of the SSHASP. This table also shall include the administrative and engineering controls to be implemented to prevent and/or mitigate occurrence of these hazards.

The likelihood of exposure to biological and physical hazards is fairly uniform for performance of ER tasks in and around Los Alamos. General biological hazards of concern include: tick bites, rodent flea bites, poison ivy, poisonous snake bites, insect bites or stings, and transmission of bloodborne pathogens when first-aid or cardiopulmonary resuscitation (CPR) are rendered. General physical hazards of concern include: lightning strikes; slips, trips, and falls from less than 4-foot elevations; heat and cold stress; altitude sickness; and animal attacks. These hazards have been assessed by ESH-5, with input from ESH-2, assuming variable exposure conditions on an ER Projectwide basis. Results of this assessment, together with the symptoms of exposure, detection methods, protective measures, and response actions are provided in Table 1.

4.2 Administrative and Engineering Controls

As a first line of defense, DOE and OSHA (DOE, *Health and Safety Plan [HASP] Guidelines*; DOL, 29 CFR 1910.100[e]) require that employers implement administrative and/or engineering controls to prevent and/or mitigate hazards and protect site personnel. Secondarily, employers may require employees to use personal protective equipment (Section 7). This section addresses the basic administrative and engineering control requirements with which ER participants are required to comply. Site-specific administrative and engineering requirements shall be included in Table 4-3 of the SSHASP.

4.2.1 General Administrative Controls

The general work practices and administrative controls in this section are to be implemented as applicable during ER field operations.

4.2.1.1 Drug and Alcohol Policy

- Personnel who are taking medications that may diminish their ability to perform their duties in a safe and healthful manner (e.g., medication that causes drowsiness or affects mental alertness or coordination), are encouraged to inform the SSO, or the FTL or JS so that alternate job duties may be assigned until the employee is no longer affected by the medication.
- Personnel who arrive at the field site intoxicated are not allowed to perform their job duties. The SSO, or the FTL or JS should be notified of such an event so that the person's supervisor may be notified and appropriate disciplinary action may be taken by the person's employer.

TABLE 1

GENERAL FIELD OPERATION HAZARDS

Hazard	Hazard Assessment	Signs/Symptoms of Exposure & Detection Methods	Response Actions & Protective Measures
BIOLOGICAL HAZARDS			
RODENT FLEA BITES			
Plague	Minor to Imminent	2 to 6 days after flea bite symptoms develop such as: fever, headache, muscle aches and possibly enlarged lymph nodes in armpit(s) or groin; death may occur unless early treatment with antibiotic medicine is obtained.	Plague is spread by infected fleas living on rodents (e.g., chipmunks, field mice, prairie dogs, ground squirrels, etc.) Avoid contact with wild rodents and their nests or burrows. Spray skin with insect repellent containing DEET. Seek medical attention if flea bite is detected during or immediately following field work or when symptoms are noticed, especially if a fever develops. **Report occupational exposure to flea bites to SSO, or the FTL or JS, and to employer within 24 hours of development of symptoms, and seek medical attention per Section 9.3.1.**
Hanta Virus	Minor to Imminent	Within 24 hours of exposure symptoms develop such as: fever, muscle aches and at least one of the following: cough, headache or pink-eye; and eventually difficulty breathing - which progressively gets worse. Death occurs soon after onset of pneumonia unless emergency treatment by a physician is obtained.	Hanta Virus is spread by contact with urine, saliva or feces of infected field mice (deer mice and possibly other types). Avoid contact with field mice and their nests, bedding, urine, saliva or feces. Seek medical attention if flea bite is detected during or immediately following field work or when symptoms are noticed, especially if a fever develops. **Report occupational exposure to flea bites to SSO, or the FTL or JS, and to employer within 24 hours of development of symptoms, and seek medical attention per Section 9.3.1.**

[1] Key to hazard assessment ratings:

Hazard Severity	Mishap Probability			
	Likely to Occur	Probably will Occur	Possibly could Occur	Unlikely to Occur
Catastrophic (i.e., death or life-threatening injury from a single encounter)	Imminent	Imminent	Serious	Minor
Major (i.e., significant, injury/illness - resulting in irreversible harm)	Imminent	Serious	Moderate	Minor
Minor (i.e., injury/illness resulting in reversible harm and not likely to threaten mobility or vision)	Serious	Moderate	Minor	Negligible
Negligible	Minor	Minor	Negligible	Negligible

Hazard	Hazard Association	Signs/Symptoms of Exposure & Reception Methods	Response Actions & Protective Measures
BLOODBORNE PATHOGENS & INFECTIOUS BODY FLUIDS			
Hepatitis B virus (HBV)	Serious	Hepatitis B is a viral infection, which can cause death in 1 to 2% of patients. Most people with Hepatitis B recover completely while others may become chronic carriers of the virus. Most carriers have no symptoms, while others may develop chronic active hepatitis and cirrhosis. HBV may also be a causative factor in development of liver cancer.	Anyone rendering first aid or CPR to someone may be at risk of exposure to Hepatitis B Virus (HBV), Human Immunodeficiency Virus (HIV), and other less common illnesses. These viruses (pathogens) are transmitted when blood or body fluid of an infected individual comes in direct contact with the aid provider by needle skin puncture, (e.g., needle stick) or by contact through an opening in the skin - eyes, nose, ears, mouth, skin lesion, or cracked, cut or abrased skin. Personnel should avoid contact with another person's blood or body fluids, unless they have been trained according to Section 4.2.2.2 and 9.3.1. **Report any occupational exposure incident to the SSO, or the FTL or JS, immediately, and seek medical attention per Section 9.3.1.**
Human Immunodeficiency Virus (HIV)	Serious	HIV attacks the body's immune system, causing Acquired Immune Deficiency Syndrome (AIDS). A person infected with HIV may carry the virus without developing symptoms for several years but will eventually develop AIDS. Some carriers may suffer from flu-like symptoms, fever, diarrhea, and fatigue and may develop AIDS-related illnesses including neurological problems, cancer and other opportunistic infections.	
INSECT OR SNAKE (e.g., spider) BITES or STINGS	Negligible to Moderate	To the extent possible, avoid contact with snakes and insects. Do not hike alone or at night. Walk on cleared trails. Avoid stepping or reaching into poorly visible or dark areas. Wear boots. If bitten or stung, stay calm. . . the majority of snake or insect bites are not life-threatening. Keep bitten extremity below heart level and avoid unnecessary movement of extremity. Provide victim with first aid and transport for medial attention immediately per Section 9.3.1.2. Have the victim avoid strenuous exertion which might increase spread of venom. Do not apply ice directly to wound. Do not apply tourniquet or construction bandage to extremity. **Report occupational exposure to bites to SSO, or the FTL or JS, and to employer within 24 hours of development of symptoms, and seek medical attention per Section 9.3.1.2.**	
POISON IVY	Negligible to Minor	A few hours to several days after exposure symptoms develop such as burning, itching skin rash, characterized by redness, blistering and swelling	To the extent possible, avoid contact with poison ivy. Keep skin covered (e.g., wear long pants and long sleeved shirts). If rash develops, the primary treatment is aimed at relief of itchiness; more harm is done by scratching irritated skin than by the actual rash. **Report occupational exposure to poison ivy to SSO, or the FTL or JS, and to employer within 24 hours of development of symptoms, and seek medical attention per Section 9.3.1.2.**

Hazard	Hazard Assessment	Signs/Symptoms of Exposure & Detection Methods	Response Actions & Protective Measures
TICK BITES			
Ticks are plentiful in the forests of Northern New Mexico and many may carry infectious bacteria/disease. Tick bites can result in human infection which could lead to the development of diseases such as those listed below. These diseases may be fatal or severely debilitating without proper antibiotic therapy.			
Lyme Disease	Minor (uncommon in NM)	Onset: rash (can appear several days to weeks after tick bite) appearing like a "bull's eye" - an expanding red circle around a light area, frequently with a small welt in the center; flulike chills, fever, headache, dizziness, fatigue, stiff neck, joint, or bone pain; can ultimately result in chronic debilitating illness	Wear clothing to cover skin. Ticks tend to crawl upwards. To make skin contact difficult - tuck pant legs into socks or boots, and tuck shirt into pants. Spray clothing with insect repellent containing permethrin or permanone; spray skin with insect repellent containing DEET. Tick-borne diseases can be avoided by searching body (especially joint areas) for ticks every 3 to 4 hours (after each shift) while moving through tick infested areas (areas with vegetation such as bushes, tall grass or brush). Shower as soon as possible after field work has concluded for the day.
Rocky Mountain Spotted Fever	Minor (uncommon in NM)	Onset of symptoms is abrupt appearing 3 to 10 days after bite, including inflammation/rash appearing like many red spots under the skin, severe headache, chills, exhaustion, and muscular pains; fever reaches 103°F to 104°F within several days and remains high, though morning remissions may occur; and unproductive, harassing cough develops Without early antibiotic therapy could result in death	Remove a tick using tweezers to gently and steadily pull it out of the skin so that its mouth/pincers do not remain in the skin. AVOID CRUSHING THE TICK WHILE REMOVING IT; DO NOT USE A MATCH OR CHEMICAL SUBSTANCE TO GET THE TICK TO BACK OUT OF THE SKIN OR TO KILL IT IN PLACE - THIS MAY CAUSE IT TO RELEASE THE TOXIC BACTERIA INTO THE SKIN. After removing tick, wash hands thoroughly with soap and water. Disinfect wound with antiseptic and bandage. Save the tick by placing in a sample jar; provide to physician if medical attention needed. Seek medical attention per Section 9.3.1.2 if tick observed imbedded in skin and symptoms occur such as: a peculiar rash, fever, muscle aches, flulike chills, headache, dizziness, fatigue, stiff neck, and/or bone pain; and in advanced cases may include: arthritis, heart rhythm problems and nervous system problems. **Report occupational exposure to tick bites to SSO, or the FTL or JS, and to employer within 24 hours of noticing bite or symptoms.**

Hazard	Hazard Assessment	Signs/Symptoms of Exposure & Detection Methods	Response Actions & Protective Measures
PHYSICAL HAZARDS			
LIGHTNING STRIKES	Serious to Potentially Imminent	In canyons, listen for thunder. Elsewhere, watch for lightning and listen for thunder; count the number of seconds between seeing lightning and hearing thunder	The occurrence of lightning strikes in Los Alamos is a very real likelihood, especially during summer months (Section 2.2.8). Plan to work earlier in the day during monsoon season, since most storms occur during the afternoon. If electrical storm is visible/audible within 3 miles (15 seconds) begin shutting down operations; within 2 miles (10 seconds) discontinue site operations, get away from any metal objects and grounding system components (e.g., electrical power substations and large buildings) and take cover in a vehicle or small dwelling. **Do not remain upright in an open area or seek shelter near a tall upright object, e.g., a tree. If someone is injured by lightning notify the SSO, or the FTL or JS, and take appropriate action per Section 9.3.**
HEAT STRESS Heat disorders are potentially significant hazards during the summer months. Each individual's capacity to deal with heat is very different; conditions that may be very tolerable for one person may not be tolerable to another. The high altitude and semiarid climate of Los Alamos places additional stress on a worker's body (Section 2.2.2), especially when impervious protective clothing and/or respirators are worn. People can pass from a minor stage of heat stress to a life-threatening stage without much notice of symptoms of interim stages of heat stress. Take steps to reduce the potential for heat disorders (e.g., allowing for acclimation, replacing lost body fluids, implementing work schedules with built-in rest periods, implementing buddy monitoring, and carefully selecting protective clothing). Administrative and engineering controls and monitoring methods shall be indicated in Table 4-3 and Section 6 of the SSHASP. Refer to the "Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities" or the "Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices" (Section 14) for further guidance.			
Heat Rash	Negligible to Minor	Reddish rash on skin surface	Limit exposure to heat or humid air
Heat Cramps	Minor to Moderate	Muscle spasms, pain in hands, feet, and/or abdomen	Limit exposure to heat or humid air, replace electrolytes by drinking Gatorade® or equivalent
Heat Exhaustion	Moderate to Serious	Pale, cool, moist skin, heavy sweating, dizziness, nausea, and fainting	Take shelter from sunlight and heat (e.g., in a cooler vehicle or structure, or under a tarp or canopy located in the SZ, or as needed in the EZ and/or CRZ). Loosen clothing, place victim in seated position with head between legs, and have victim drink cool (not cold) water (~8 oz. every 15-20 min); **notify the SSO, or the FTL or JS, immediately and seek medical attention per Section 9.3.1.2.**
Heat Stroke	Serious to Potentially Imminent	Red hot, usually dry skin, lack of or reduced perspiration, nausea, dizziness and confusion, strong, rapid pulse, and coma THIS IS A LIFE-THREATENING ILLNESS.	Take shelter from sunlight and heat (e.g., in a cooler vehicle or structure, or under a tarp or canopy located in the SZ, or as needed in the EZ and/or CRZ). Loosen constrictive clothing, and immediately cool victim's body by drenching in cool (not cold) water and fan the victim, since evaporation is the best means of cooling; **notify the SSO, or the FTL or JS, immediately and seek medical attention for life-threatening illness immediately per Section 9.3.1.1.**

Hazard	Hazard Assessment	Signs/Symptoms of Exposure & Detection Methods	Response Actions & Protective Measures
COLD STRESS Cold injuries are significant hazards during the winter months. The cold ambient temperatures and wind chill are significant risk factors during the winter months (Section 2.2.2 and 2.2.8), which place field workers at a high risk of exposure to cold injuries. Worker susceptibility to cold injuries is increased by dehydration; exhaustion, hunger, impaired consciousness, anemia, impaired circulation due to cardiovascular disease, and wet or inadequate clothing. Several steps can be taken to reduce the potential for cold injuries such as, careful selection of protective clothing i.e. insulated body covers, boots, gloves and head covering, keep protective clothing dry, protect workers against wetting and wind, consumption of ample fluids and food, implementing work schedules with built-in rest periods, and implementing buddy monitoring. Administrative and engineering controls and monitoring methods shall be indicated in Table 4-3 and Section 6 of the SSHASP. Refer to the "Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities" or the "Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices" (Section 14) for further guidance.			
Frostnip	Negligible to Minor	Frostnip occurs with exposures to damp cold temperatures (around freezing). Symptoms are firm, cold, white areas on face, ears or extremities. Peeling or blistering may occur in 24-72 hours, and occasionally mild hypersensitivity to cold persists.	Limit exposure to damp cold temperatures. Warm affected area with an unaffected hand or a warm object. **Notify the SSO, or the FTL or JS, of occupational occurrence of frostnip, and if appropriate, seek medical attention per Section 9.3.1.2.**
Immersion Foot ("Trench foot")	Minor to Moderate	Trench foot occurs with exposures to damp cold temperatures near freezing. Symptoms are pale swollen, clammy, cold, and numb extremity; tissue infection is likely. Increased sweating, pain and hypersensitivity to temperature change may persist for years.	Limit exposure to damp cold temperatures (e.g., put on dry socks when socks become damp). Warm affected area with an unaffected hand or a warm object. **Notify the SSO, or the FTL or JS, and immediately seek medical attention per Section 9.3.1.2.**
Frost bite	Moderate to Serious	Frost bite occurs with exposures to dry cold temperatures well below freezing. Symptoms are cold, hard, white, and numb areas, which on warming become blotchy red, swollen, and painful. Areas may recover normally or deteriorate to soft wet gangrene or black dry gangrene.	Take shelter from cold temperatures (e.g., in a heated vehicle or structure). Frostbitten extremities should be warmed rapidly by using warm not hot water (102°F - 108°F), snuggling with a warm companion, or warming hand or feet against a warm abdomen or armpit. Give victim warm drinks. **Notify the SSO, or the FTL or JS, and immediately seek medical attention per Section 9.3.1.2.**
Hypothermia	Serious to Potentially Imminent	Hypothermia occurs with exposures to dry cold temperatures well below freezing. The body cannot sustain normal temperature causing symptoms of lethargy, clumsiness, mental confusion, irritability, slowed or arrested respiration, and slowed, irregular, or stopped heartbeat. THIS IS A LIFE-THREATENING CONDITION.	Take shelter from cold temperatures (e.g., in a heated vehicle or structure). When shivering stops and lethargy and other symptoms increase, a major emergency is imminent. Further heat loss should be prevented by any means possible (E.G., wrap the victim in a blanket with a warm companion); **Notify the SSO, or the FTL or JS, and immediately seek medical attention for life-threatening illness per Section 9.3.1.1.**

Hazard	Hazard Assessment	Signs/Symptoms of Exposure & Detection Methods	Response Actions & Protective Measures
ALTITUDE SICKNESS	Negligible to Serious	Symptoms such as headache (mild to severe), fatigue, insomnia, drowsiness, and loss of appetite may occur usually within 2 to 3 days following rapid ascent to high altitude (e.g., Los Alamos @ ~7,400')	Prevent sickness by gradual acclimatization to altitude; this may take 3 weeks or more. Individuals from lower altitudes should spend a few days at 5,000 to 7,000 ft. before ascending to higher altitudes, and further ascent should not exceed 1,000' per day. Do not ascend to higher altitude until all symptoms have subsided. **Notify the SSO, or the FTL or JS, immediately of occurrence of symptoms of occupational exposure to altitude sickness; if appropriate, seek medical attention per Section 9.3.1.2.** Treatment may include: rest, increased fluid intake to avoid dehydration and use of pain reliever.
SUNBURN	Moderate to Imminent	Pink or red, warm or hot skin; in severe cases blistering may also occur; eyes may become swollen and/or blood-shot; corneal or retinal burns could result in blindness ("snowblindness")	Excessive solar ultraviolet radiation can be encountered, especially at higher altitudes. Use sunscreen with protection factor (SPF) of ≥15 on exposed skin. Reapply sunscreen every 4 hours and after experiencing heavy perspiration or wiping skin with a towel. Treatment may include: application of gel or cream containing aloe vera to burned skin; taking 2 aspirin initially and every 6 hours as needed; drinking fluids and rest. If eyes are swollen blood-shot or burned, or if blistering of skin occurs, **notify the SSO, or the FTL or JS, and immediately seek medical attention per Section 9.3.1.2.**
ANIMAL ATTACKS	Minor to Serious	Avoid contact with wild or stray animals. If bitten or scratched and skin surface is broken, **notify the SSO, or the FTL or JS, immediately and seek/provide appropriate medical attention per Section 9.3.**	

4.2.1.2 Housekeeping and Sanitation

- An adequate supply of potable water shall be provided in labeled container(s) that are equipped with a tap and capable of being tightly closed. Nonpotable water outlets shall be identified to indicate that the water is unsafe for drinking, washing, or cooking.

- No food, beverage, gum, cosmetic, or tobacco products shall be present, consumed, or used in the exclusion zone (EZ), contamination reduction zone (CRZ), or in any work zone where contamination is suspected; such products shall be used only in an appropriate break area (e.g., the support zone [SZ]) designated by the SSO, or the FTL or JS.

- Site personnel should be alert for dangerous situations, unusual odors, airborne dusts or vapors, and broken containers, and should report any potentially dangerous situations to the SSO, or the FTL or JS immediately.

4.2.1.3 Site Controls

Site personnel shall implement the following site controls as applicable:

- Eliminate hazards to the extent possible before actual field work at the site begins (e.g., removing unnecessary debris, guarding exposed electrical wiring or protruding objects, and appropriately securing combustible materials and objects situated on elevated surfaces).

- Minimize contact with material that is or may be contaminated.

- Minimize dust generation.

- As practical, avoid or minimize exposure to contamination and work upwind of intrusive activities.

- Plan and review procedures before entering controlled work zones.

- Minimize the number of personnel and amount of equipment in the controlled work zones.

- Sign the exclusion entry/exit log upon entry to and exit from the EZ.

- Remain in line-of-sight or direct communication with the FTL or JS at all times, to the extent possible, while performing duties in the EZ.

- Use the "buddy system" so that rapid assistance can be provided in the event of an emergency.

- Keep ignition sources ≥50 ft from explosive or flammable environments and ≥35 ft from combustible liquids; use only nonsparking, explosion-proof equipment in the EZ when the potential for a flammable or explosive environment exists.

- Do not remove contamination from clothing or equipment by blowing, shaking, or any other means that disperses contaminants into the air.

- Be alert for potential hazards associated with moving equipment and to traffic patterns of support vehicles.

- Do not allow personnel underneath or immediately adjacent to suspended loads handled by digging or lifting equipment.

- Handle drums and containers in accordance with applicable requirements of 29 CFR 1926.65(j).

4.2.1.4 Packaging, Labeling, Handling, Transport, Storage, and Disposal of Hazardous Substances

- Requirements and procedures for packaging, labeling, handling, transport and/or disposal of hazardous materials and wastes shall be specified in Table 4-3 of the SSHASP and in the site-specific waste management plan required by LANL. For field operations where a site-specific waste management plan has not been prepared, these requirements and procedures shall be included in appropriate sections of the SSHASP (e.g., Table 4-3 and/or Section 8).

- Procedures shall meet applicable OSHA requirements of 29 CFR 1926.65(j), 1926.152, and applicable OSHA standard(s) in Subparts D and Z of 29 CFR 1926 for the substance(s) included in Table 2 (Section 4.2.2.4), which appear in Table 4-2 of the SSHASP.

- Procedures also shall meet applicable U.S. Department of Transportation (DOT) requirements (49 CFR Parts 106 , 107, 130, and 171 through 180).

- Hazardous materials and wastes shall be transported in accordance with relevant DOT requirements (49 CFR), including certification and registration of drivers (49 CFR 107 Subpart G).

- Hazardous wastes shall be labeled, stored, and inspected in accordance with 40 CFR Subtitle C.

4.2.2 Required Written Programs and Permit Systems

In addition to these general administrative controls and the site-specific administrative controls indicated in the SSHASP, DOE and OSHA have requirements (DOE Order 5480.1B; DOL, 29 CFR 1926 and 1910) that employers develop, implement, and maintain certain written programs and permit systems as a means for preventing or mitigating exposure to HS hazards in the workplace. The programs and permits required by these regulations are described in this section. Where the program or permit system has been addressed sufficiently in the employer's hazardous waste operations (HAZWOPER) program (Section 4.2.2.6), it need not be repeated elsewhere. ER Subcontractors are expected to maintain and implement these programs as they apply to the project work being performed.

Subcontractors are expected to submit their programs and permits to designated LANL representatives for review and approval prior to implementation. At least 30 days before the scheduled start date of an operation for which a written program is required, the program shall be submitted to the Field Unit HS Representative so that it can be reviewed and approved by appropriate LANL personnel. Similarly, unless indicated otherwise below, at least 30 days before the anticipated date of permit implementation; subcontractors shall initiate action to obtain LANL's approval of their permits, which may include a requirement that the Subcontractor submit project-specific standard operating procedures (SOPs).

As the host organization, LANL will provide subcontractors with the hazard assessment information necessary for permit preparation. In addition, LANL, as host organization, must be provided with a copy of the Subcontractor's terminated permit. This copy should be given to the Field Unit HS Representative for distribution to the appropriate ESH group(s).

4.2.2.1 Assured Equipment Grounding Conductor Program

Employers shall use ground fault circuit interrupters as specified in 29 CFR 1926.404(b)(1)(ii) or shall establish and implement a written assured equipment-grounding conductor program covering cord sets, receptacles that are not a part of a building or structure, and equipment connected by cord and plug, which are available for use by employees. This program must comply with 29 CFR 1926.404 and must be kept available at the job site for review and copying by affected employees. The program must include

- a description of the specific procedures adopted by the employer for compliance;
- designation of one or more competent persons to implement the program;
- requirement of visual inspection of equipment covered by this program before each day's use and disallowance of damaged or defective equipment until it is repaired;
- testing of equipment covered by this program according to 29 CFR 1926.404(b)(1)(iii)(D) ;
- commitment that only equipment meeting the requirements of 1926.404 shall be made available or used; and
- recordkeeping of the required tests performed under the program.

4.2.2.2 Bloodborne Pathogens Exposure Control Program

OSHA Standard 29 CFR 1910.1030 was enacted to protect workers who, during the course of performing their duties, could be exposed to hepatitis B virus, human immunodeficiency virus (HIV), and other blood-borne pathogens. Anyone rendering first aid or CPR may be at risk of exposure to illnesses transmitted by contact with another person's blood or body fluids. DOE and OSHA require employers covered by this regulation to establish a written exposure control program in compliance with this standard, which includes

- determining potential for exposure by identifying job titles and tasks that involve or may involve occupational exposure to blood or other potentially infectious materials;
- offering hepatitis B vaccination to employees at risk of exposure;
- defining schedule(s) and method(s) of employee training and implementation of required universal precautions, using associated PPE to prevent contact with infectious material, providing post exposure evaluation and follow-up including offering hepatitis B vaccination (at no cost to employees), communicating hazards to employees, and maintaining the required records;
- developing and implementing a procedure for evaluating circumstances of exposure incidents per (f)(3)(i) of the standard;
- ensuring that affected employees have access to the employer's program; and
- reviewing and updating the program at least annually or whenever necessary to reflect new or modified job titles, tasks, or procedures effected by the program.

4.2.2.3 Chemical Hazard Communication Program

In accordance with 29 CFR 1926.59(e), employers of employees who are occupationally exposed to hazardous chemicals are required to develop, implement, and maintain at the job site a written hazard communication program, which includes

- a list of the hazardous chemicals (excluding hazardous wastes) known to be present;
- a material safety data sheet (MSDS) for each hazardous chemical used by employees;
- means for ensuring that each container of hazardous chemicals in the workplace is labeled, tagged or marked with the identity of the chemical(s) contained therein and appropriate hazard warnings;

- employee training about the following:
  - the location and availability of the hazard communication program,
  - the required list of chemicals and the MSDSs
  - methods for detecting the presence or release of hazardous chemicals in the work area
  - the physical and health hazards of the chemicals
  - the measures employees should take to protect themselves
  - the details of the employer's hazard communication program
  - the requirements of 29 CFR 1926.59
- methods the employer will use to inform employees of the chemical hazards associated with non-routine tasks;
- methods the employer will use to make available to other employers at multi-employer work sites the employer's copy of the MSDSs for the chemicals used by the employer at the site;
- methods the employer will use to inform other employers at multi-employer work sites of the precautionary measures to be taken to protect employees during normal operating conditions and foreseeable emergencies; and
- methods the employer will use to inform other employers at multi-employer work sites of the employer's labeling system used at the work site.

4.2.2.4 Chemical-Specific Compliance Programs

At the time of this writing, OSHA regulates occupational exposure to the chemical substances listed in Table 2 (Subparts D and Z of 29 CFR 1926).

Table 2
OSHA's Chemical-Specific Standards

2-acetylaminofluorene (29 CFR 1926.1114)	**bis-chloromethyl ether** (29 CFR 1926.1108)	**methyl chloromethyl ether** (29 CFR 1926.1106)
acrylonitrile (29 CFR 1926.1145)	**1,2-dibromo-3-chloropropane** (29 CFR 1926.1144)	**methylenedianiline** (29 CFR 1926.60)
4-aminodiphenyl (29 CFR 1926.1111)	**3,3'-dichlorobenzidine** (and its salts) (29 CFR 1926.1107)	**alpha-naphthylamine** (29 CFR 1926.1104)
arsenic (inorganic) (29 CFR 1926.1118)	**4-dimethylamino- azobenzene** (29 CFR 1926.1115)	**beta-naphthylamine** (29 CFR 1926.1109)
asbestos (29 CFR 1926.1101)	**ethyleneimine** (29 CFR 1926.1112)	**4-nitrobiphenyl** (29 CFR 1926.1103)
benzene (29 CFR 1926.1128)	**ethylene oxide** (29 CFR 1926.1147)	**N-nitrosodimethylamine** (29 CFR 1926.1116)
benzidine (29 CFR 1926.1110)	**formaldehyde** (29 CFR 1926.1148)	**beta-propiolactone** (29 CFR 1926.1113)
cadmium (29 CFR 1926.1127)	**lead** (29 CFR 1926.62)	**vinyl chloride** (29 CFR 1926.1117)

Most of these standards have a requirement that employers of employees who may be occupationally exposed to these chemicals above their permissible exposure limits (PELs) must establish and implement a written compliance program before commencing a task involving exposure to the chemical. These programs must be revised and updated at a certain frequency indicated in the respective standard. Each compliance program must include the information required by the respective standard, which may include all or part of the following chemical-specific information:

- a description of each activity in which the chemical is emitted, which includes the equipment used, material involved, controls in place, crew size, employee job responsibilities, operating procedures, and maintenance practices;
- a description of the specific means that will be employed to achieve compliance with the applicable OSHA standard;
- a report of the technology considered in meeting the PEL;
- air monitoring data that documents the source of emissions of the hazardous chemical;
- a detailed schedule for implementation of the program, including documentation such as copies of purchase orders for equipment, construction, contracts, etc.;
- a work practice program which includes PPE training and use, housekeeping, and medical surveillance;
- a description of required work practices;
- an administrative control schedule as required by paragraph (e)(4) of the standard; and
- a description of arrangements made among employers on multi-employer sites with respect to informing affected individuals of potential exposure and means for preventing and protecting such individuals from over exposure.

4.2.2.5 Confined-Space Entry Program (Permit-Required)

Employers of employees who will enter a confined-space shall maintain and implement a written confined-space entry program, which complies with 29 CFR 1910.146. A task-specific permit shall be prepared and approval signatures obtained (per Section 4.2.2) before a confined-space is entered. This program must include

- the necessary measures to prevent unauthorized entry;
- a system for the preparation, issuance, use, and cancellation of confined-space entry permits;
- definition of responsibilities of persons who are to have active roles (e.g., authorized entrants, attendants, entry supervisors, and atmosphere-monitoring personnel) in entry operations and provision of such personnel;
- provision and definition of responsibilities of an attendant who will remain outside the confined-space into which entry is authorized for the duration of entry operations;
- provision of training required by 29 CFR 1910.146(g) for persons having active roles in entry operations;
- means for identifying and evaluating hazards of confined-spaces before employees enter them;
- means, procedures, and practices necessary for safe confined-space entry operations;

- procedures to coordinate entry operations when employees of more than one employer are performing entry operations simultaneously so that employees of one employer do not endanger employees of another;

- provision and maintenance of equipment specified in paragraphs (d)(4)(i) through (d)(4)(ix) of 29 CFR 1910.146 at no cost to employees;

- means for ensuring that employees use the equipment properly;

- means and methods for evaluating (testing and monitoring) environmental conditions of confined-spaces;

- procedures for summoning rescue and emergency services for rescuing and providing emergency services to entrants of confined-spaces, and for preventing unauthorized personnel from attempting rescue;

- procedures for canceling the permit and for concluding entry operations; and

- provisions for review and revision of the program, including review of canceled permits within one year after each entry and revision as necessary to ensure that employees participating in entry operations are protected from confined-space entry hazards.

4.2.2.6 Hazardous Waste Operations (HAZWOPER) Program

Employers of employees who perform ER Project work must maintain and implement a written HAZWOPER program, which complies with the requirements of 29 CFR 1926.65(b). This program does not have to repeat portions of the employer's program that are documented elsewhere, but the information should be sufficiently cross-referenced. This program must include

- an organizational structure establishing chain of command and overall responsibilities of supervisors and employees (per 1926.65[b][2]);

- a comprehensive workplan addressing the tasks and objectives of the site operations and the necessary logistics and resources to accomplish the tasks and objectives (per 1926.65[b][3]);

- a SSHASP (per 1926.65[b][4] and the HASP);

- the employer's medical surveillance program (Section 4.2.2.9);

- the employer's PPE program (Section 4.2.2.10);

- the employer's respiratory protection program (Section 4.2.2.11);

- the employer's HAZWOPER training program (Section 4.2.2.13);

- the employer's HS standard operating procedures;

- any necessary interface between the general and site-specific HAZWOPER programs, plans, and activities; and

- means and methods for notifying others employers at multi-employer work sites of HS hazards associated with their activities and the corresponding emergency response procedures, and for making available the employer's HAZWOPER program to other such employer's.

4.2.2.7 Hearing Conservation Program

DOE and OSHA, under 29 CFR 1910.95(c), require an employer to implement a hearing conservation program whenever employees are potentially or actually exposed to occupational noise levels at or exceeding the 8-hour time-weighted action level of 85 decibels measured on the A-weighted scale (85 dBA). The employer's program must address

- training of employees concerning the hazards of excessive noise exposure, occupational exposure limits, and the topics listed below; training shall be conducted at least annually for employees with the potential for exposure to noise at or above 85 dBA;
- means and methods for monitoring and reducing noise exposure (e.g., administrative and engineering controls);
- means for posting work areas where the occurrence of excessive noise levels necessitates the use of hearing protection;
- selection, fitting, use, care, and determination of effectiveness of hearing protection; and
- audiometric [hearing] testing performed at least annually by a licensed or certified audiologicst, otolaryngologist, or other physician, or by a technician who is certified by the Council of Accreditation in Occupational Hearing Conservation, and at no cost to the employee.

4.2.2.8 Lockout/Tagout for Control of Hazardous Energy Sources for Personnel Safety (Red Lock Procedure) Program

Employers of employees who perform ER work and perform servicing or maintenance of machines or equipment in which the unexpected energization or start up of the machine or equipment, or release of stored energy could cause injury to employees, must establish a written lockout/tagout program. This program shall include procedures that comply with the requirements of 29 CFR 1910.147 and with LANL's procedure for "Lockout/Tagout for Control of Hazardous Energy Sources for Personnel Safety (Red Lock Procedure)," LP 106-01.2. This program shall provide for:

- training to ensure that the purpose and function of the energy control program are understood by employees;
- at least annual inspection of the energy control procedure to ensure that it is being properly implemented; and
- provision of appropriate hardware and protective materials (e.g., locks, tags, and chains) by the employer for isolating, securing, or blocking of machines or equipment from energy sources.

The procedures shall cover elements and actions (in the stated sequence) including

- preparation for shutdown, including workers being knowledgeable of the type and magnitude of energy, the hazards of the energy to be controlled, and the method or means to control the energy;
- machine or equipment shutdown;
- machine or equipment isolation from the energy source(s);
- lockout/tagout device application;

- relief, disconnection, or restraint from stored energy, and the control of accumulated stored energy;

- machine verification of isolation from the energy source(s);

4.2.2.9 Medical Surveillance Program

Employers of employees who perform ER Project work must maintain and implement a written medical surveillance program, which complies with applicable OSHA and LANL requirements (Section 11).

4.2.2.10 Personal Protective Equipment

Employers of employees who perform ER Project work while using PPE must maintain and implement a written PPE program, which complies with applicable OSHA requirements (Section 7).

4.2.2.11 Respiratory Protection Program

Employers of employees who perform ER Project work while using respiratory protective equipment must maintain and implement a written respiratory protection program, which complies with applicable requirements (Section 7.1).

4.2.2.12 Spark/Flame-Producing Operations (Hot Work/Burn Permit)

The DOE Order for "General Operations Quality Assurance" (DOE AL5700.6C) requires process controls for special processes such as welding, heat treating, and steel welding. Accordingly, LANL's administrative requirement AR 8-4, "Welding, Cutting, and Other Spark/Flame-Producing Operations," requires a Special Work Permit for Spark/Flame-Producing Operations (Form ES&H 8-4A) for spark/flame-producing operations that constitute a fire hazard, unless such operations are covered by a LANL SOP or are conducted in areas designed for such operations (e.g., designated welding areas). To initiate LANL's permit process, the Field Unit HS Representative should be notified as soon as it is known that a spark or flame-producing operation will occur. This permit shall be prepared and approval signatures obtained before any spark or flame-producing activity is performed.

4.2.2.13 Training Program

Employers of employees who perform ER Project work must maintain and implement a written employee training program, which complies with applicable OSHA and LANL requirements (Section 10).

5 Site Control Measures

The primary site control measures include controlled zones (e.g., EZ, CRZ, and SZ) and support facilities (e.g., equipment-staging area, support trailer(s), equipment decontamination pad, temporary drum storage area, mobile laboratory, and wash facility). The primary objectives of site control measures during field operations are

- to prevent and limit employee exposures during ER field operations;

- to ensure that only trained and fully informed persons are able to enter controlled areas of the work site where operational hazards are of potential concern;

- to reduce the likelihood of spread of contamination by workers or equipment into uncontrolled areas of the site;

- to confine work activities to appropriate areas, thereby minimizing the likelihood of accidental exposures; and

- to facilitate the location and evacuation of personnel in case of an emergency.

For purposes of ER work, the DOE has identified the general equivalency of radiologically contaminated areas and hazardous substance contamination zones as shown in Table 3.

Table 3
General Equivalency of Work Zones

Radiological Contamination Areas	Hazardous Substance Contamination Zones
Controlled Area	Support Zone
Radiological Buffer Area	Contamination Reduction Zone
Radiological Area	Exclusion Zone or Regulated Area[1]

[1] The term, "regulated area", is used by OSHA in the chemical-specific standards in Subparts D and Z of 29 CFR 1926 (refer to Section 4.2.2.4).

The necessary site-specific control measures, some of which are required by applicable DOE and OSHA requirements, shall be provided in Section 5 of the SSHASP. Site maps required by OSHA shall be included in Appendix A of the SSHASP to show the intended locations of the specified controlled zones and support facilities. DOE states (DOE, *Health and Safety Plan [HASP] Guidelines*) that, among other items, site maps should include

- site perimeter;

- prevailing wind direction;

- site drainage points;

- natural and man-made features such as buildings, containers, impoundments, pits, ponds, and tanks; and

- locations of work zones.

Since some zone or facility locations may change as site work progresses, the SSO must explain current locations of zones and decontamination stations to field team members during daily HS tailgate meetings and shall document these locations in his/her daily logbook.

Section 5 of the SSHASP also shall indicate whether each zone or facility is restricted as a radiological control area, a radioactive materials management area, or a regulated area, and whether postings giving this information are required. Furthermore, whether the location of a facility is centralized onsite or localized at multiple work areas onsite, the means for demarcating each zone, and other posting requirements (per 29 CFR 1926.200 and 1910.145) shall be specified.

6 Exposure Monitoring and Responses

Guidance for monitoring and assessing occupational exposure to chemical, biological, physical, and radiological hazards has been provided by the DOE (DOE, *Health and Safety Plan [HASP] Guidelines*, *Handbook for Occupational Safety and Health*, and *Occupational Exposure Assessment Handbook*). According to the DOE, the exposure monitoring strategy should be developed cooperatively by the following professionals:

- an industrial hygienist who is certified by the American Board of Industrial Hygiene (ABIH), or otherwise Board-eligible, or who has a minimum of three years experience developing such strategies; and

- a health physicist who is certified by the American Board of Health Physics (ABHP), or otherwise Board-eligible, or who has a minimum of three years experience developing such strategies.

Site-specific exposure monitoring strategies, including action levels, that meet applicable DOE and OSHA requirements shall be specified in Section 6 of the SSHASP for each project task having different requirements. Exposure monitoring strategies, including establishment of action levels, should be determined based upon the hazards that can be monitored using analytical instrumentation and the published exposure limits and physical, chemical, and toxicological properties of the chemical and/or radioactive substances of concern. This information shall be included in Appendix C of the SSHASP for the chemical substances of occupational concern included in Table 4-2 of the SSHASP, and is included in LANL's Radiological Control Manual (LANL, LM 107-01.1) for radiological substances of concern. Guidance for setting action levels for exposure to chemical substances is provided by the DOE (DOE, *Handbook for Occupational Safety and Health*, and *Occupational Exposure Assessment Handbook*) and in a publication developed by the Chairman of the American Industrial Hygiene Association (AIHA) Hazardous Waste Committee (Marlowe). Action levels in Section 6 of the SSHASP for exposure monitoring of radiological hazards have been set by ESH-1, unless otherwise indicated, and approved by ESH-1.

Exposure monitoring shall include use of direct-reading instruments, personal dosimetry, and personal and area sampling, as necessary to evaluate the hazardous conditions posed by the chemical and radiological substances onsite. DOE and OSHA (DOE, *Health and Safety Plan [HASP] Guidelines*; *DOL, 29 CFR 1926.65[b][4][ii][E]*) require that the following information be specified in the SSHASP for each type of monitoring instrument to be used for exposure monitoring:

- procedure for calibration, maintenance, and use

- locations and frequencies of monitoring

- corresponding action level(s), response actions, and rationales

To promote greater consistency among the various ER Subcontractors and field teams, ESH-5 has developed exposure monitoring methods for the chemical exposure monitoring instruments most commonly used during ER field operations, which are included in the LANL ER Project *Manual for Site Health and Safety Activities*. These methods include procedures and forms for calibration, maintenance, and use of chemical exposure monitoring instruments. Where OSHA has mandated methods in the chemical-specific regulatory standards included in Subparts D and Z of 29 CFR 1926 (Section 4.2.2.4), such methods shall be specified in Section 6 of the SSHASP. Project managers choosing to use alternative methods must provide a copy of the methods with the SSHASP for review and approval per Section 1.2.

Site health physics personnel shall monitor for alpha and/or beta/gamma radiation as specified in the SSHASP and in accordance with their individual radiological surveillance authorization agreement and LANL's Radiological Control Manual (LANL, LM 107-01.1). Health physics personnel shall use radiological instrumentation calibrated and maintained by ESH-4, or by an alternative means approved by ESH-4.

Subcontractors shall abide by this requirement, unless the Subcontractor's radiological safety program, which includes identification of instruments and corresponding procedures, has been submitted to LANL for approval during the pre-bid qualification or contract negotiation period, as required, or according to applicable requirements of Section 4.2.2. All equipment leaving the site shall be monitored for release in accordance with the health physic person's radiological surveillance authorization agreement.

The results of exposure monitoring must be documented and affected personnel must be informed of these results in accordance with the requirements of Section 13.3. Forms for recording chemical exposure monitoring results are included with the respective monitoring instrument method in the LANL ER Project *Manual for Site Health and Safety Activities*.. Forms for recording radiological exposure monitoring results are provided in LANL's Radiological Control Manual (LANL, LM 107-01.1).

Analytical laboratories analyzing samples for chemical contamination should be accredited by the EPA and/or the AIHA. (Accreditation by the AIHA is necessary for samples collected using OSHA or National Institute for Occupational Safety and Health [NIOSH] methods). Samples being analyzed for radiological contamination should be analyzed by LANL's health physics analytical laboratory, a mobile extension thereof, or as indicated in the Subcontractor's radiological safety program which has been approved by LANL.

6.1 Personal Radiological Dosimetry Program

Requirements for personal radiological dosimetry or radiation exposure shall be determined by ESH-1 and ESH-12 personnel during review of the draft SSHASP. Subcontractors shall abide by requirements of the section, unless the Subcontractor's radiological safety program, which includes personal radiological dosimetry, has been submitted to LANL for approval during the pre-bid qualification or contractor negotiation period, as required, or according to applicable requirements of Section 4.2.2. All field personnel who are directly covered by the LANL radiation safety program shall complete a Health Physics (HP) checklist. Enrollment in personal radiological dosimetry programs (In Vivo and In Vitro) will be based on Table 6-2 as completed by ESH-1. Completion of the HP checklist will proceed as follows:

- Request a HP checklist form(s) by calling the ESH-12 HP checklist office at 667-5723.
- Complete the HP checklist with input from the supervisor and/or health physics personnel assigned to the project(s). Instructions are included with the HP checklist. In the "Personal Information" section of the form, the "group or sponsor group" shall be ESH-5, and the "Supervisor or LANL Contact" shall be the Field Unit HS Representative.
- Attach Table 6-2 (Personal Dosimetry Requirements as determined by ESH-1) to the HP checklist. If the individual will be working at multiple ER sites, attach Table 6-2 for all sites.
- Attend the HP checklist orientation (schedule attached to the HP checklist). An individual needs to attend the HP checklist orientation only once, but if the individual begins work at a new ER site(s), another HP checklist must be completed to ensure correct dosimetry monitoring for that site(s).

ESH-12 Radiation Information Management Team will provide reports of dosimetry results to individuals enrolled in this program by distributing the reports to ESH-5, in a confidential manner per Section 13.3.

7 Personal Protective Equipment (PPE)

The purpose of PPE is to shield, isolate, or secure individuals from hazards that may be encountered when administrative or engineering controls are not feasible or cannot provide adequate protection. Accordingly, before requiring field team personnel to use PPE, appropriate administrative and engineering controls shall be implemented as the first means of defense for mitigating hazards and protecting site personnel.

In accordance with applicable OSHA regulations (Subpart E of 29 CFR 1926), personnel shall not be allowed to use PPE unless the hazards for which the PPE are intended to protect against have been

assessed and the appropriate PPE has been specified by a qualified HS professional. PPE requirements must be based on a hazard assessment (Section 4.1) that includes a comparative evaluation of site conditions, task-specific operations, potential hazards relative to the performance characteristics of the PPE items, and anticipated durations of use. Only radiological protective clothing *(ANTI-Cs)* are to be used at sites contaminated by radiation. Other disposable protective clothing (e.g., Tyvek®) may be used at sites contaminated by mixed (radiological and chemical) wastes. Task-specific PPE requirements, which meet applicable OSHA requirements of Subpart E of 29 CFR 1926, shall be provided in Section 7 of the SSHASP.

Furthermore, personnel who use PPE to perform a job shall be trained to recognize the limitations of the equipment and to properly select, fit, use, inspect, maintain, and store the equipment. Such training shall occur and be documented before the user enters an area requiring the use of the PPE. To promote greater consistency among the various ER subcontractors and field teams and to facilitate compliance with 29 CFR 1926.65(g)(5), ESH-5 has developed a procedure addressing limitations, selection, fitting, use, inspection, and maintenance of PPE, which is included in the LANL ER Project *Manual for Site Health and Safety Activities*.. Where OSHA has mandated methods in the chemical-specific regulatory standards included in Subparts D and Z of 29 CFR 1926 (Section 4.2.2.4), such methods shall be specified as requirements, as applicable, in Section 7 of the SSHASP. Personnel who use ANTI-Cs shall have successfully completed Radiological Worker II training (Section 10.4.4).

The level of protective clothing and accessories selected may be upgraded or downgraded based upon new findings or change(s) in site conditions or operations. Whenever a significant change occurs, the PPE requirements shall be reassessed by the SSO, and a SSHASP modification form shall be issued, as necessary.

It is the responsibility of each user of PPE to inspect the equipment before and as necessary during each use. Furthermore, each user should make it a practice not to use PPE that shows signs of compromised integrity. The SSO shall monitor individuals in areas where PPE is required to ensure that they are properly attired.

7.1 Respiratory Protective Equipment

Use of respiratory protection shall occur only in accordance with requirements of 29 CFR 1910.134, *American National Standard for Respiratory Protection* (ANSI Z88.2-1992), the HASP, and SSHASP. Where respiratory protective equipment requirements are mandated by OSHA in the chemical-specific standards included in Subparts D and Z of 29 CFR 1926 (Section 4.2.2.4), such requirements shall be specified as requirements, as applicable, in Section 7 of the SSHASP. Personnel required to use respirators shall have certification of current training, medical fitness, and respirator fit-testing in accordance with these requirements, which are summarized in this section. Subontractors whose employees use respiratory protective equipment to perform ER Project work shall provide documentation to support compliance with each aspect of the mandated standards.

Employers of personnel who wear respirators to perform ER Project work shall maintain and implement a current written respiratory protection program, which addresses the requirements described below, unless the employer opts to abide by LANL's respiratory protection program. The Subcontractor's respiratory protection program shall be submitted to the Field Unit HS Representative for review and approval by appropriate ESH personnel at least 30 days before the scheduled start date of field operations involving use of the respiratory protective equipment. Whenever air-supplying (Level B) respiratory protection will be used, project-specific SOPs addressing the requirements and procedures for using the Level B equipment shall be submitted similarly for review and approval by appropriate ESH personnel.

7.1.1 Designated Qualified Person

The employer's program shall include designation of a qualified individual who supervises the respiratory protection program in accordance with 29 CFR 1910.134(e)(2) and (e)(4) and Section 3.2.3.5.

7.1.2 Implementation of Administrative and Engineering Controls

Each employer of employees who use respiratory protective equipment is required by OSHA to have a policy that describes the administrative and engineering controls to be used to prevent or minimize employee exposure to atmospheric contamination. This policy must also include a statement to the effect that when it is not feasible to implement such a policy or while the controls are being implemented, respiratory protection shall be used in accordance with applicable requirements.

7.1.3 Use of Approved Equipment

Respiratory protective equipment shall be selected from equipment jointly approved by the Mine Safety and Health Administration (MSHA) and the NIOSH under the provisions of 30 CFR Part 11 (Office of the Federal Registrar). The Subcontractor's program shall include identification of the type of equipment [manufacturer(s) and model(s)] to be used and the associated NIOSH/MSHA approvals.

7.1.4 Standard Operating Procedures

Each written respiratory protection program shall include standard operating procedures that govern selection, use, cleaning, maintenance, inspection, and emergency use of respirators; training of supervisors and respirator wearers; and recordkeeping. Respiratory protection plans prepared by subcontractors should provide enough information to allow LANL reviewers to understand the decision logic for selecting and using a particular kind of respirator. This information should include a hazard identification and evaluation process (including oxygen-deficient conditions and conditions immediately dangerous to life or health [IDLH]) and a corresponding respirator selection process. When required by other regulations (e.g., Subparts D and Z of 29 CFR 1926), these evaluations must include historical sampling data or other method(s) of assessing exposure. Selection criteria are included in Sections 4.5.4 and 7 of *American National Standard for Respiratory Protection* (ANSI Z88.2-1992). If the hazard identification and assessment evaluation process has been addressed sufficiently in the Subcontractor's HAZWOPER program (Section 4.2.2.6) and/or the SSHASP, it need not be repeated in the respiratory protection program but should be cross-referenced appropriately.

7.1.5 Respirator Users' Medical Status

Employees shall not be assigned to perform tasks requiring the use of a respirator unless the employee has had an annual medical exam that demonstrates his/her ability to perform work while using the respirator. The employee shall obtain the written opinion of a qualified physician (preferably one specializing in occupational medicine) verifying that he/she is able to wear a respirator (Section 11). The physician shall determine which health and physical conditions are pertinent. Criteria for conducting the medical evaluations are provided in the *American National Standard for Respiratory Protection—Respirator Use—Physical Qualification for Personnel* (ANSI Z88.6)

7.1.6 Training

Respirator users shall be instructed and trained in the limitations and proper use of respiratory protective equipment by a competent person (Section 3.2.3.5). The user, supervisor or SSO, and issuer of respirators shall be trained in the proper use, maintenance, and storage of respirators and their limitations. Subcontractors should outline the training provided to their employees. If respiratory protection training has been addressed sufficiently in the Subcontractor's HAZWOPER program (Section 4.2.2.6), it need not be repeated in the respiratory protection program but should be cross-referenced appropriately and supplemented (as necessary) by training that is specific to the particular type of respirator being used.

7.1.7 Fit-Testing

Only individuals who have been trained and quantitatively fit-tested for the specific manufacturer and model of respirator facepiece being used may use the respirator while performing ER work. Fit-Tests shall be conducted in accordance with the *American National Standard for Respiratory Protection* (ANSI Z88.2-1992). The maximum protection factor for half-face air-purifying respirators is 10 times the PEL or

threshold limit value (TLV) of the most toxic contaminant against which the respirator must protect, provided the wearer achieved a respirator fit factor of at least 100 during the fit-test. (Table 4-2 of the SSHASP identifies contaminants of occupational health concern at the site, and corresponding toxicity information and exposure limits are listed in Appendix C of the SSHASP.) Similarly, the maximum protection factor for full-facepiece air-purifying respirators is 100 times the PEL or TLV of the most toxic contaminant against which the respirator must protect.

7.1.8 Work Area Surveillance

Appropriate surveillance of work area conditions and degree of employee exposure or stress shall be maintained by a qualified person (i.e., SSO, industrial hygiene technician, RSP, HPT, and RCT). This requirement can only be satisfied by assessing hazards and monitoring exposure (Sections 4 and 6). Subcontractors can use a combination of engineering analysis and air sampling data to document conditions. If the exposure-monitoring process has been addressed sufficiently in the Subcontractor's HAZWOPER program (Section 4.2.2.6) and/or the SSHASP, it need not be repeated in the respiratory protection program but should be cross-referenced appropriately.

7.1.9 Cleaning and Disinfection

Respirators shall be cleaned and disinfected as frequently as necessary to ensure that the user is properly protected. Respirators used by more than one worker or intended for emergency use shall be thoroughly cleaned and disinfected after each use. The respiratory protection program should outline the cleaning and disinfection methods and frequencies used to ensure complete cleaning and disinfection.

7.1.10 Inspection and Repair

Respirators used routinely shall be inspected by the user before each use and after each cleaning. Respirators for emergency use shall be inspected by a qualified person at least monthly and after each use. Worn or deteriorated parts shall be replaced.

7.1.11 Storage

Respirators shall be stored in a convenient, clean, and sanitary location and in a manner that prevents damage during storage. A brief description of how the Subcontractor intends to handle this issue is sufficient.

7.1.12 Quality Assurance

There shall be regular inspections and evaluations to determine the effectiveness of the respiratory protection program. This can be accomplished through the use of documented checks by a designated knowledgeable supervisor, an outside agency, or an independent consultant.

7.1.13 Other Requirements

In addition to the above outlined requirements, there are other requirements identified in the OSHA standard, which may need to be addressed in the Subcontractor's respiratory protection program. Examples would include air quality where supplied-air systems (Level B) will be used; equipment associated with any atmosphere supplying respirators (e.g., hoses, compressors, air line couplings, and containers); and emergency egress for environments where the air quality may be IDLH. The type of information that must be provided by the Subcontractor is that which is necessary for LANL reviewers to verify regulatory compliance.

Furthermore, in accordance with the *American National Standard for Respiratory Protection* (ANSI Z88.2-1992) LANL requires that periodic air samples be collected from air compressors used to produce breathing air. These samples must be collected as part of acceptance testing of a compressor and periodically during use. The quality of breathing air shall meet or exceed the specifications for "Grade D"

air established by the Compressed Gas Association (ANSI and the Compressed Gas Association, *Commodity Specification for Air, ANSI/CGA G-7.1-1989).*

8 Decontamination

Decontamination involves physically removing contaminants from personnel and equipment and/or chemically converting them into innocuous waste substances. This section has been developed to meet applicable DOE and OSHA requirements (i.e., those included in 29 CFR 1926.65(k), Subparts D and Z of 29 CFR 1926 [Section 4.2.2.4], and/or LANL's Radiological Control Manual (LANL, LM 107-01.1). According to the DOE, the CRZ should include separate designated areas for a personnel contamination reduction corridor and an equipment contamination reduction corridor. The contamination reduction corridor boundaries should be conspicuously marked, and should have restricted entry and exit points. Personnel shall decontaminate themselves and any equipment that is contaminated or suspected of contamination according to the procedures specified in Section 8 of the SSHASP.

The SSO and health physics personnel shall monitor decontamination activities to determine their effectiveness. If procedures are found to be ineffective, these individuals shall take steps to correct any deficiencies, and any deviations from the SSHASP shall be documented using a modification form per Section 1.3. The following general requirements apply to personnel and equipment decontamination processes for ER Project work:

- Personnel, equipment, and vehicles must be decontaminated before exiting the CRZ, clothing and equipment, which cannot be decontaminated sufficiently shall be properly contained and labeled prior to being transferred beyond the controlled work zones of the site. For sites having only radiological contamination, it is appropriate to first screen for radiological contamination to determine whether decontamination is necessary.

- If any significant contamination is encountered, personnel protective equipment should be disposed rather than decontaminated for reuse (Section 8.2.2).

- Loose contaminants (dusts and vapors) that cling to clothing or equipment shall be removed according to the applicable decon procedures (e.g., using a water or water-based detergent rinse and scrub brush), except when radiation action levels are exceeded (Section 8.2.3).

- Care should be taken to avoid generation of mixed (chemical and radiological) waste during decontamination operations.

- Rinse water and waste generated onsite shall be contained and disposed according to Sections 4.2.1.4.

8.1 Equipment Decontamination

Samples, sampling equipment, and mechanical equipment shall be decontaminated as specified in the site-specific waste management plan and in "Field Decontamination of Drilling and Sampling Equipment," (LANL ER-SOP-1.08), or a comparable procedure specified in Section 8 of the SSHASP.

Where a centralized decontamination pad or facility will be established for decontaminating heavy equipment (e.g., rigs, augers, loaders), Section 8 of the SSHASP shall specify site-specific procedures for addressing transport of equipment from the site of investigation to the centralized decontamination facility in a manner that minimizes the potential for, or contains the spread of contamination.

8.2 Personnel Decontamination

This section was developed to meet the OSHA HAZWOPER requirements of 29 CFR 1926.65(k). It may be adapted in the SSHASP for use in meeting the chemical-specific decontamination requirements of the applicable OSHA standard(s) in Subparts D and Z of 29 CFR 1926 for the substance(s) included in Table 2 (Section 4.2.2.4), which appear in Table 4-2 of the SSHASP.

Provided in Appendix D are two possible strategies for personal decontamination: standard and extensive. Project managers choosing to use an alternative strategy must incorporate the strategy in the SSHASP for review and approval per Section 1.2. Both strategies provided in Appendix D include procedures, diagrams of decontamination facilities, and suggested equipment for operations involving use of Levels D, C, and B PPE. Each of the diagrams is generic because the actual positions and orientations of decontamination stations may vary, depending on day-to-day variations in site operations and conditions. Some of the stations in the standard strategy serve multiple functions, which could be allocated to separate stations, as appropriate, to adjust for day-to-day variations in site operations and conditions. The quantities of equipment listed are those that should be on hand during each day's activities at the site. Since site conditions vary, some sites have more decontamination stations than others; thus, more equipment is necessary at these sites to decontaminate personnel and environmental monitoring equipment effectively.

The following guidelines are provided for determining decontamination strategy requirements for implementation under differing site conditions:

- The standard decontamination strategy (Options 1 through 3 in Appendix D) assumes that waste minimization is practiced and should be implemented only when site contamination is relatively low.

- The extensive decontamination strategy (Options 4 through 6 in Appendix D) should be implemented on a contingency basis, at the discretion of the SSO, health physics personnel, and/or ESH-5 or ESH-1. No absolute levels have been set for triggering implementation of the extensive strategy for decontamination; rather, these personnel shall monitor the extent of contamination throughout site operations and shall determine whether the standard strategy is sufficient for existing conditions.

- If there is difficulty in successfully decontaminating personnel, PPE, or environmental monitoring equipment using the standard decontamination strategy, the extensive strategy should be implemented.

8.2.1 Decontaminating Environmental Monitoring Equipment

Most environmental monitoring equipment used at ER sites is not intended to be disposable and should be protected from contamination during use in the EZ and/or CRZ. When such equipment becomes contaminated it may be difficult to decontaminate without damaging electronic components. Environmental monitoring equipment that cannot be decontaminated readily by surface wiping should be wrapped or encased in a protective material (e.g., a plastic bag) to minimize contamination, provided that the protective material does not adversely affect operation of the equipment. Openings in the protective material may be necessary in some cases to accommodate probe connections and gas inlets/outlets but should be sealed using tape whenever feasible. Environmental monitoring equipment that cannot be decontaminated by field methods described in Section 8 of the SSHASP require disassembly and decontamination at a laboratory. Such equipment should be double-bagged, sealed, and properly labeled for transfer beyond controlled zones for eventual temporary storage prior to reuse or transfer off-site for decontamination.

8.2.2 Disposal Versus Laundering of PPE

PPE used in the EZ shall not be transferred beyond the CRZ into the clean environment of the SZ unless it has been appropriately screened for contamination, contained and labeled as necessary. Used PPE should be handled and temporarily stored pending analytical results as though it is suspect contaminated waste.

Although protective clothing may be either disposable or nondisposable, at some LANL work sites even disposable protective clothing may be reused by field team members. However, even at sites where the types and concentrations of contaminants are insignificant and work activities are nonstrenuous, disposable protective clothing should be disposed at least weekly because of wear and tear that eventually would compromise the integrity of the protective material.

Nondisposable protective clothing (e.g., cotton or insulated coveralls) should be laundered at least weekly. Such PPE must be placed in a labeled container before being transferred to a designated laundry facility for cleaning and eventual reuse. Special instructions for containing, transporting, and cleaning nondisposable PPE, if any, (including acceptance criteria for "decontamination" or "clean" classification) must be included in Section 8 of the SSHASP. Requirements for properly notifying laundry management of the potential for hazardous contamination in accordance with OSHA's hazard communication standard (29 CFR 1926.59) must also be specified in the SSHASP.

8.2.3 Special Procedures for Decontamination of Radiologically Contaminated PPE and Environmental Monitoring Equipment

When radiological contamination is detected above background levels, the Field Unit HS Representative or ESH-1 shall be contacted immediately, before the contaminated item is removed from the EZ. Decontamination and disposal of PPE shall be conducted in accordance with the requirements of LANL's Radiological Control Manual (LANL, LM 107-01.1) and as specified in Section 8 of the SSHASP.

8.2.4 Emergency Decontamination of Personnel

Decontamination of personnel in an emergency is discussed in Section 9.3.1.4.

9 Emergency/Incident Action Plan

This section describes generic aspects of the emergency/incident action plan, which apply to all field operations of the ER Project. Site-specific details of this plan and the necessary equipment and supplies to execute this plan shall be included in Section 9 of the SSHASP. Any deviations or exceptions to this section shall be described in Section 9 of the SSHASP.

This section has been developed to meet the requirements of 29 CFR 1926.24 and 1926.65(l), and as applicable, 29 CFR 1926.65(q) or 1926.35(b). It addresses contingency planning, response actions, and associated personnel and equipment requirements in the event of occurrence of an incident or emergency as defined in this section. DOE and OSHA require that this plan be rehearsed regularly as part of the overall training program for site operations (29 CFR 1926.65[l][3][iv]).

Explanations and definitions for determining the category of an unplanned or uncontrolled event are provided in the LANL ER Project *Manual for Site Health and Safety Activities.*. For purposes of this section, the term "emergency" is used to refer to unplanned or uncontrolled events, such as

- situations necessitating rescue and/or rendering of first-aid and/or cardiopulmonary resuscitation (CPR) by qualified onsite responders per this section;
- situations necessitating fire fighting by qualified onsite responders per this section;
- releases of hazardous substances that cannot be responded to and adequately dealt with by qualified onsite personnel and resources per this section; and
- incidents involving local or adjacent facility operations that may influence field operations.

For purposes of ER field work, the term "incidental release" is used to refer to unplanned or uncontrolled releases of hazardous substances that can be responded to and adequately dealt with by qualified onsite personnel and resources per this section. By this definition, incidental releases are defined as a release of insufficient quantity to pose a significant HS hazard to field personnel in the immediate vicinity, to the field personnel responding defensively, or to the surrounding environment (DOE, EH/EM Assistance Team Emergency Response Working Group) . The FTL or JS, assisted by the SSO, shall direct and coordinate responses to incidental releases. These responsibilities include: appropriately responding to the situations listed above, safely evacuating onsite personnel, gathering onsite personnel at the

designated muster area, notifying emergency contacts, documenting that onsite personnel are accounted for at the muster area, and follow-up investigation and reporting of the incident.

Releases of hazardous substances in sufficient quantity to necessitate a response either by personnel from outside the immediate release area or by other designated responders, such as the fire department or LANL's Hazardous Materials Response (HAZMAT) Team (ESH-10), are considered emergencies (DOE, EH/EM Assistance Team Emergency Response Working Group; and Smith, D., Office of Safety and Quality Assurance [EH 30] and Carnes, E., Office of Nuclear Safety [EH 11]). In such circumstances, onsite personnel are only allowed to take defensive actions for which they have been trained and are equipped in accordance with this section. For onsite personnel having had the first-responder awareness level training (Section 10.1.2.1), such defensive actions are limited to evacuating the site, identifying the nature of the release, isolating and denying entry to the site, and notifying authorities of the release. For onsite personnel having had first-responder operations level training (Section 10.1.2.2), such defensive actions are limited to those of first-responder awareness level training, plus

- preventing exposure;
- keeping the release from spreading; and
- containing the release from a safe distance.

The FTL or JS, assisted by the SSO, shall direct and coordinate responses to emergencies in accordance with this section until off-site emergency responders arrive and implement the incident command system. Onsite spills or releases of hazardous substances shall be handled in accordance with applicable requirements of this section and according to an approved site-specific spill prevention control and countermeasures plan prepared in accordance with LANL's Spill Prevention Control and Countermeasures Plan.

9.1 Posting Requirements

At the start of field operations, emergency contacts and phone numbers, reporting information, emergency equipment, and maps of the route(s) to the Los Alamos Medical Center and to the LANL Occupational Medicine Clinic (ESH-2) shall be posted at a location onsite where personnel may readily access the information. This site-specific information shall be included in Appendix D of the SSHASP.

9.2 Emergency Alerting and Site Evacuation Procedures

The FTL or JS and the SSO shall determine site-specific emergency alerting procedures, evacuation procedures and routes, and locations of muster areas. This information must be included in Section 9 of the SSHASP and shall be communicated by the SSO, or the FTL or JS to onsite personnel during the pre-job start HS briefing and/or the daily tailgate HS meetings. DOT provides information for determining the extent of and safe distances for evacuation (DOT, *1993 Emergency Response Guidebook*), which shall be referenced in Appendix C of the SSHASP for each chemical substance identified in Table 4-2 of the SSHASP. Evacuation routes and muster areas should be predominately upwind, uphill, and upstream of work areas where fire or release of chemicals or radiological contaminants might occur.

An employee alarm system shall be specified in Section 9 of the SSHASP and shall be established at the work site in accordance with 29 CFR 1926.65(l)(3)(vi) and 1926.159. Section 9 of the SSHASP shall also include means and methods for alerting contact personnel at adjacent facilities of onsite events that could pose a threat to off-site facilities, and for designated personnel at adjacent off-site facilities to alert onsite personnel of events that could pose a threat to onsite personnel or operations. The phone numbers or radio stations of contact personnel at adjacent facilities (the Facility Manager or his/her designee) shall be listed in the list of emergency contacts included in Appendix D of the SSHASP.

In the event of an incident necessitating evacuation:

- the FTL or JS, SSO, and/or health physics personnel should alert other personnel of the emergency situation;
- onsite personnel should evacuate the site according to the procedures established during the pre-job start HS briefing or daily tailgate HS meeting, and should assemble at the designated muster area;
- the FTL or JS, or his/her delegate, is responsible for accounting for all onsite personnel at the muster area to determine whether any personnel are missing; and
- evacuated personnel shall remain at the muster area until the re-entry alarm is sounded or an authorized individual provides further instruction.

9.3 Procedures for Onsite Responders

Onsite personnel who are trained and equipped to respond to incidents in accordance with Section 9 shall implement the following general response procedures:

- Assess existing and potential hazards to personnel and the environment onsite, and to off-site individuals and property or facilities. Isolate the incident or emergency area and prohibit access by unauthorized people.
- As feasible, perform rescue, first-aid, and/or CPR duties as trained.
- Establish a communication center and maintain telephone or radio communication with appropriate off-site support experts. Arrange for an escort to intercept and direct off-site responders to the site.
- To the extent possible and necessary, conduct emergency decontamination (Section 9.3.1.4).
- Approach all releases of unknown substances as though a highly toxic or hazardous substance is involved (i.e., contact LANL's HAZMAT Team or include in SSHASP: use of Level A PPE, appropriate exposure monitoring, and implementation of the "buddy system").
- Stop, retard, and/or contain the source and flow of hazardous discharge to the extent possible and necessary using available onsite equipment and supplies with which response personnel have been sufficiently trained to use for emergency response purposes (Section 9). Examples of such actions may include application of absorbent materials (e.g., spill pillows, vermiculite, sand, or dirt) and/or construction of berms or dikes at a safe distance around the spill or leak source.
- Record chain of events including times of occurrence.

9.3.1 Emergency Medical Treatment and First-Aid/CPR

In accordance with 29 CFR 1926.50, provisions shall be made prior to commencement of field operations for prompt medical attention in case of serious injury or illness. In the absence of a hospital or clinic that is reasonably accessible in terms of time and distance to the work site (i.e., capable of rendering treatment within four minutes of occurrence of the injury or illness), a person who has a valid certificate in first-aid training from the American Red Cross, or equivalent, shall be available at the work site to render first-aid, and a vehicle shall be maintained onsite ready for use to transport the victim(s) off-site for medical treatment. A copy of the HASP and SSHASP shall be kept in the vehicle designated for emergency transport of victims and shall be given to emergency medical care providers. First-aid supplies, including

protective equipment for rendering first-aid and CPR, specified in Section 9 of the SSHASP shall be maintained accessible and ready for use in the SZ.

In the event of an incident necessitating medical care, the FTL or JS, or his/her delegate, shall arrange for notification of key contacts listed in Appendix D and Table 3 of the SSHASP (i.e., off-site emergency responders, other line managers, the Field Unit HS Representative, and the employee's manager) as soon as possible.

9.3.1.1 Life-Threatening Cases

In life-threatening situations, qualified persons designated in the HASP and Section 9 of the SSHASP should

- implement appropriate first aid procedures and immediately phone for emergency medical assistance;
- take measures to prevent further damage or injury, and, if appropriate, transport to the Los Alamos Medical Center; and
- notify the FPL and/or Field Unit HS Representative as soon as possible.

9.3.1.2 Other Cases

In the event of an injury or an illness with symptoms of over exposure to hazardous substances, qualified coworkers should immediately provide first-aid to the victim(s) and transport the victim(s) for initial medical evaluation and triage to LANL's Occupational Medicine Clinic (ESH-2, TA-3, SM 409, phone: 667-0660) during business hours (M-F 7:30 a.m. to 5:00 p.m.) or after hours to the Los Alamos Medical Center at the location indicated on the postings included in Appendix D of the SSHASP. At sites having radiological substances listed in Table 4-2 of the SSHASP, injuries resulting in dermal abrasions where the outer surface of the skin is broken must be evaluated by ESH-2.

9.3.1.3 Exposure to Another's Blood or Body Fluids

Anyone who renders first aid involving exposure to another person's blood or body fluids may be at risk of exposure to disease that may be transmitted through contact with the other person's blood or body fluids. LANL and Non-LANL Employees who have rendered occupational first-aid or CPR and have been exposed to another person's blood or body fluids shall immediately report to LANL's Occupational Medicine Clinic (ESH-2, TA-3). In addition, Non-LANL employees who have rendered first-aid or CPR should also notify their management or company HS representative to determine appropriate follow-up action in accordance with their employer's bloodborne pathogen program (Section 4.2.2.2).

9.3.1.4 Emergency Decontamination of Personnel

Victims who sustain life-threatening injuries or illness should receive life-saving care immediately without prior decontamination. If the victim has been contaminated by an extremely toxic or corrosive material that could cause severe injury or loss of life either to the victim or to the people administering first aid, then the victim should be decontaminated immediately in a manner as safe and effective as possible. Personnel experiencing a life-threatening medical crisis are to be decontaminated only if decontamination of the victim would not be expected to result in greater endangerment of the victim.

9.4 Reporting Emergencies/Incidents

The ER/ESH procedure for making notifications and processing reports and investigations in follow-up to an emergency or incident is provided in the LANL ER Project *Manual for Site Health and Safety Activities*. Accidents, emergencies, incidents, injuries, and illnesses must be reported to the FPL and/or the Field Unit HS Representative. In the event of an occurrence necessitating medical care, the FTL or JS shall

arrange for notification of key personnel listed in Appendix D of the SSHASP (i.e., other line managers, the Field Unit HS Representative, and the employee's manager) as soon as possible.

9.5 Response Critique and Follow-up

Before normal site activities are resumed, the FPL, or his/her delegate, shall evaluate the incident or emergency to determine

- the cause;
- effectiveness of emergency/incident planning, preparedness, and response;
- how the emergency or incident could have been prevented; and
- considerations for improvements of the emergency/incident response plan.

Points to be considered include whether procedures were adequate and were implemented correctly and in a timely manner. Also before resuming normal site activities, personnel must be fully trained and equipped to handle another emergency or incident. This requires restocking emergency equipment and supplies, and inspecting, testing, and resetting emergency equipment and systems.

10 Training

Described in this section are the DOE, OSHA, and LANL worker health and safety training requirements applicable to ER field operations. A summary of the training provided by ESH-13 is included in Table 4. In accordance with OSHA's training requirement in 29 CFR 1926.65(e)(1)(ii), field team personnel shall have the necessary training to perform their assigned task(s) and associated responsibilities. Before the FTL or JS tasks a field team member with performing an ER field duty, the SSO shall verify that the field team member has current certifications of required training.

LANL employees (including LANL contract employees) are eligible to take any LANL courses offered by ESH-13 and BUS-6. Subcontractors to the ER Project are responsible for implementing their own training programs. With the exception of LANL-specific training described under Section 10.4, training offered by ESH-13 is available to ER subcontractors for a fee, and only upon referral by an FPL. Training offered by BUS-6 is also available to ER Subcontractors for a fee.

10.1. HAZWOPER Requirements

10.1.1 General Requirements

All employees working onsite exposed to safety hazards, health hazards, or hazardous substances and their supervisors and managers responsible for the site shall receive training meeting the requirements of this section before they are permitted to engage in HAZWOPER work. Employees are not permitted to participate in or supervise ER field activities until they have been trained to the level required by their job function and responsibility.

Employees and supervisors who have successfully completed the training and field experience requirements of this section shall be certified by their instructor, or the head instructor and trained supervisor, as having successfully completed the necessary training. OSHA requires that a written certificate shall be given to each person so certified.

TABLE 4 - ESH-13 TRAINING			
Training Course *	**Audience**	**Requirement Reference**	**Driver**
Bloodborne Pathogens	workers likely to be exposed to another's blood or body fluids	HASP Sections10.2 and 4.2.2.2	29 CFR 1910.1030
Conduct of Operations and Occurrence Reporting (Booklet)	all workers	HASP Section 10.4.2	DOE Order 5480.19
Confined Space Awareness	confined space entrants, attendants, and supervisors	HASP Section 4.2.2.5	29 CFR 1910.146
CPR: Adult First Aid: Standard	workers in remote areas	HASP Sections10.2 and 4.2.2.2	29 CFR 1926.50
Cranes: Incidental Crane and Rigging Safety	workers who operate cranes for simple lifts, of low weight compared to the crane's capacity, that do not require special rigging	SSHASP Table 10	29 CFR 1910. 179–184
Cranes: Qualified Crane and Rigging Safety	workers who operate cranes for complicated, heavy, or high-consequence lifts that require substantial skill	SSHASP Table 10	29 CFR 1910.179-184
Electrical Safety Awareness	electrical and electronic engineers, electrical and electronic equipment assemblers, electrical and electronic technicians, electricians, industrial machine operators, material handling operators, mechanics, painters, riggers, roustabouts, stationery engineers, and blue-collar supervisors	HASP Section 4.2.2.8	29 CFR 1910.332
CBT Fire Extinguisher Awareness	workers designated by line management to use on-site fire extinguishing equipment	SSHASP Table 10	29 CFR 1926.150
Forklift Safety Fundamentals	workers who operate forklifts	SSHASP Table 10	29 CFR 1910.178

Training Course *	Audience	Requirement Reference	Driver
General Employee Radiological Training (part of General Employee Training)	workers who require unescorted access to radiological controlled areas	HASP Section 10.4.1	10 CFR 835 DOE/LANL RADCON Manuals
General Employee Training	all workers on site more than 10 consecutive workdays	HASP Section 10.4.1	DOE Order 5480.20
Hazard Communication Introduction	all ER workers	HASP Section 4.2.2.3	29 CFR 1926.59 29 CFR 1910.1200
HAZWOPER: General Site Worker (40 hours) 24-Hour Supervised Field Experience HAZWOPER: Refresher for Environmental Restoration Workers	general site workers who have the potential of exposure above established permissible exposure limits	HASP Sections10.1.1.1 and 10.1.1.4	29 CFR 1926.65 29 CFR 1910.120
HAZWOPER: Occasional Site Worker (24 hours) HAZWOPER: 8-Hour Supervised Field Experience HAZWOPER: Refresher for Environmental Restoration Workers	regular or occasional site workers who do not have the potential of exposure above established permissible exposure limits	HASP Sections 10.1.1.2 and 10.1.1.4	29 CFR 1926.65 29 CFR 1910.120
HAZWOPER: Supervisor (8 hours)	supervisors/managers of general, regular, or occasional site workers	HASP Section 10.1.1.3	29 CFR 1926.65 29 CFR 1910.120
HAZWOPER: First-Responder Awareness Level HAZWOPER: Annual refresher or demonstrated competency	individuals who are likely to witness or discover a hazardous substance release and are trained to initiate the emergency response sequence through notification	HASP Section 10.1.2.1	29 CFR 1926.65 (q)(6)(i) 29 CFR 1910.120 (q)(6)(i)

Required Training Course	Audience	Requirement Reference	Driver
HAZWOPER: First-responder Operations Level ** (at least 8 hours) HAZWOPER: Annual refresher or demonstrated competency	individuals who initially respond in a defensive manner to releases or potential release of hazardous substances	HASP Section 10.1.2.2	29 CFR 1926.65 (q)(6)(ii) 29 CFR 1910.120 (q)(6)(ii)
HAZWOPER: Occasional Site Worker (24 hours) HAZWOPER: Refresher for TSD Workers	all workers at permitted and interim status TSD facilities		29 CFR 1926.65 (p) 29 CFR 1910.120 (p)
HMPT: Initial and general awareness and safety training *** HMPT: Refresher every 2 years	hazardous material worker whose job function involves packaging and transport of hazardous materials	HASP Section 10.6	49 CFR Part 172.700-704
Hearing Conservation	workers who may be exposed to high noise environments	HASP Section 4.2.2.7	29 CFR 1910.95 or AF Noise Standard
Lockout/Tagout (Booklet)	all workers	HASP Section 4.2.2.8	29 CFR 1910.147 LP 106-01.2
Lockout/Tagout Red Lock Procedure for Control of Hazardous Energy Sources	authorized employees who service, maintain, or modify equipment	HASP Section 4.2.2.8	29 CFR 1910.147 LP 106-01.2
OSHA Rights and Responsibilities (Booklet)	all workers	SSHASP Table 10	DOE Order 5483.1A
OSHA Excavating and Trenching Operations	workers designated as "competent" for excavating and trenching operations	SSHASP Table 10	29 CFR 1926.650 DOE Order 5480.9
Plutonium Safety	workers who perform hands-on work with plutonium, with training specified by the radiological work permit	SSHASP Table 10	DOE/LANL RADCON Manuals

Required Training Course *	Audience	Requirement Reference	Driver
Radiological Worker I Training Health Physics Checklist Indoctrination (for personal dosimetry or bioassay programs)	workers who require unescorted access to radiological buffer areas, radiation areas, and areas posted for radioactive materials	HASP Sections10.4.3 and 10.4.4	10 CFR 835 DOE/LANL RADCON Manuals
Radiological Worker II Training Health Physics Checklist Indoctrination (for personal dosimetry or bioassay programs)	workers who require unescorted access to high and very high radiation areas, contamination and high contamination areas, and airborne radioactivity areas; and/or workers who have potential contact with hot particles, or perform operations on bench tops, in fume hoods, at sample stations, in open-front boxes, or in glove boxes	HASP Sections 10.4.3 and 10.4.4	10 CFR 835 DOE/LANL RADCON Manuals
Radiological Control Technician Training	radiological control technicians	HASP Section 10.1.1.7	10 CFR 835 DOE/LANL RADCON Manuals
Respirators: Air-Purifying	workers required to wear air-purifying respirators	HASP Section 7.1.6	29 CFR 1910.134 DOE Order 5480.4
Respirators: Self-Contained Breathing Apparatus	workers required to wear self-contained breathing apparatus	HASP Section 7.1.6	29 CFR 1910.134 DOE Order 5480.4
Respirators: ITT Compressor/Air-Supply Systems	workers required to wear supplied-air respirators	HASP Section 7.1.6	29 CFR 1910.134 DOE Order 5480.4
Tritium Safety	workers who perform hands-on work with tritium, with training specified by the radiological work permit	SSHASP Table 10	DOE/LANL RADCON Manuals

Required Training Course *	Audience	Requirement Reference	Driver
Waste Generation Overview Waste Documentation Forms (if filling out forms)	hazardous waste generators and waste management coordinators	HASP Sections10.4.5 and 10.5	40 CFR 260–270 LS 10-3
Waste Generation Overview RCRA Personnel Training RCRA Refresher Training	less-than-90-day storage area or TSD facility workers	HASP Section 10.5	40 CFR 260–270 LS 10-3
Site-specific training: daily briefings; SOPs, ARs, HASP, and high explosives	all workers	HASP Sections10.1.3 and 10.1.4	29 CFR 1926.65 (e)

* ESH-13 or BUS-6 Training course titles are listed. Equivalent courses may be taken except for GET, Radworker I and II, RCT, and Waste Documentation Forms.

** ESH-13 does not provide First-responder Operations Level Training.

*** For additional HMPT required training, for shippers and drivers of hazardous materials, contact BUS-6 at 7-1038.

Trainers shall be qualified to instruct employees about the subject matter that they are presenting. Trainers shall have the academic credentials and instructional experience necessary for teaching the subject(s), or have completed a training program for teaching the subject(s). Instructors shall demonstrate competent instructional skills and knowledge of the subject matter.

Employers who can show by documentation or certification that an employee's work experience and/or training has resulted in training equivalent to requirements of this section shall not be required to provide the initial training requirements of Sections 10.1.1.1 or 10.1.1.2. They shall certify this equivalency and provide a copy of this certificate to the employee.

Anyone who has not been certified in accordance with this section is prohibited from engaging in ER field activities.

10.1.1.1 Initial 40-Hour Training and 24-Hour Supervised Field Experience

Individuals engaged in HAZWOPER activities that expose or potentially expose them to hazardous substances and health hazards shall receive a minimum of 40-hours of instruction off-site and a minimum of 24-hours actual field experience under the direct supervision of a trained, experienced HAZWOPER supervisor.

10.1.1.2 Initial 24-Hour Training and 8-Hour Supervised Field Experience

Training requirements of this section pertain to individuals who are unlikely to be exposed to hazardous substances at levels above published exposure limits and who are

- onsite only occasionally to perform a specific limited task (e.g., ground water monitoring, land or geo-physical surveying);
- regularly onsite working only in areas that have been monitored and fully characterized indicating that exposures are under published occupational exposure limits, and the characterization indicates that there are no health hazards or the possibility of an emergency developing.

Individuals engaged in HAZWOPER activities within these categories shall receive a minimum of 24-hours of instruction off-site and a minimum of 8-hours actual field experience under the direct supervision of a trained, experienced HAZWOPER supervisor. Individuals who have received this training and who subsequently are expected to perform work falling under the description of Section 10.1.1.1 shall complete an additional 16-hours of off-site training and 16-hours of supervised field experience to meet the requirements of Section 10.1.1.1.

10.1.1.3 Management and Supervisor Training

Onsite management and supervisors directly responsible for, or who supervise employees engaged in, HAZWOPER work shall receive initial training (per 10.1.1.1 or 10.1.1.2, as applicable) and at least 8-hours of additional specialized training at the time of job assignment on such topics as, but not limited to, the employer's, and where appropriate, LANL's

- HS program and the associated training program,
- PPE program,
- spill containment program, and
- health hazard monitoring and techniques.

10.1.1.4 Annual Refresher Training

Individuals who have received the initial training in accordance with previous subsections in this section shall receive 8-hours annual refresher training on

- names of personnel and alternates responsible for the employer's HAZWOPER health and safety program;
- safety, health, and other hazards related to HAZWOPER work;
- use of PPE (Section 7);
- work practices by which the employee can minimize risks of exposure to hazards;
- safe use of engineering controls and equipment onsite;
- medical surveillance requirements (Section 11);
- Sections 4 through 6 of LANL's HASP and model SSHASP; and
- applicable topics in Section 10.1.1.3.

10.1.1.5 Site Safety Officer Requirements

In accordance with OSHA requirements in 29 CFR 1926.65(b)(2)(i)(B) and (e)(1)(ii), SSOs shall have the necessary training to develop and implement the applicable SSHASP and to implement HASP requirements.

10.1.1.6 Industrial Hygiene Technician Requirements

In accordance with OSHA's training requirement in 29 CFR 1926.65(e)(1)(ii), industrial hygiene technicians shall have the necessary training to perform their assigned task(s) and associated responsibilities as defined in Section 3.2.3.2.

10.1.1.7 Health Physics Personnel Requirements

In accordance with applicable DOE and LANL requirements and OSHA's training requirement (29 CFR 1926.65[e][1][ii]), health physics personnel shall have the necessary training to develop and implement health physics-related sections of the applicable SSHASP and to implement applicable HASP requirements. This training shall include the training required by ESH-1 for issuance of a radiological surveillance authorization agreement per Section 3.2.4.

10.1.2 Emergency Response Training

If a project manager chooses to have onsite personnel take any action other than immediate evacuation of the site in the event of a release or substantial threat of release of a hazardous substance, onsite personnel must receive the training described in this section, as applicable for the tasks to be performed. OSHA requires that personnel who have been trained in accordance with this section must receive annual refresher training of sufficient content and duration to maintain their competencies, or shall demonstrate their competency at least yearly.

10.1.2.1 First-Responder Awareness Level Training

DOE and OSHA require that individuals who are likely to witness or discover a hazardous substance release and who are expected to initiate an emergency response sequence by notifying proper authorities of the release, shall have completed first-responder awareness level training (29 CFR 1926.65[q][6][i]). Onsite personnel having had only the first-responder awareness level training are

limited to taking no further action than that described in the fifth paragraph of Section 9. First-responders shall have sufficient training or have had sufficient experience to objectively demonstrate competency in the following:

- An understanding of what hazardous substances are and the risks associated with them in an incident.
- An understanding of the potential outcomes associated with an emergency created when hazardous substances are present.
- The ability to recognize the presence of hazardous substances in an emergency.
- The ability to identify the hazardous substances, if possible.
- An understanding of the role of the first-responder awareness individual in the employer's emergency response plan, including site security and control and the DOT's *Emergency Response Guidebook* (DOT).
- The ability to realize the need for additional resources and to make appropriate notifications to the communication center.

10.1.2.2 First-Responder Operations Level Training

DOE and OSHA require that individuals who respond to releases or potential releases of hazardous substances as part of the initial response to the site for the purpose of protecting nearby persons, property, or the environment from the effects of the release, shall have completed first-responder operations level training (29 CFR 1926.65[q][6][ii]). Onsite personnel having had the first-responder operations level training are limited to taking no further action than that described in the fifth paragraph of Section 9. First-responders operations level shall have completed at least 8-hours of training or have had sufficient experience to objectively demonstrate competency in the following areas in addition to those of the awareness level training:

- Knowledge of the basic hazard and risk assessment techniques.
- Knowledge of proper selection and use of PPE provided to first-responder operational level individuals.
- An understanding of basic hazardous materials terms.
- Knowledge of performing basic control, containment and/or confinement operations within the capabilities of the resources and PPE available onsite.
- Knowledge of implementing basic decontamination procedures.
- An understanding of the relevant SOPs and termination procedures.

10.1.3 Pre-Job Start HS Briefing

In accordance with 29 CFR 1926.65(b)(4)(iii), the SSO shall conduct training on the contents of the SSHASP before field work begins so that each field team member is informed of the site-specific information and requirements applicable to the scope of work. This HS briefing shall cover the SSHASP contents and applicable portions of the HASP.

10.1.4 Daily Tailgate HS Meetings

Before beginning field work each day, the SSO and the FTL or JS shall conduct a tailgate HS meeting. Field team members should be encouraged to discuss any health- or safety-related concerns during this

meeting without fear of reprisal. Topics covered and attendance shall be documented. During these tailgate meetings, field team members shall be informed of at least the following:

- Any newly identified hazards and associated monitoring and exposure control measures and results not discussed previously.
- Problems or concerns (especially HS) that have arisen since the previous tailgate meeting.

10.2 First-Aid Requirements

In accordance with 29 CFR 1926.50, in the absence of a hospital or clinic that is reasonably accessible in terms of time and distance to the work site (i.e., capable of rendering treatment within four minutes of occurrence of the injury or illness), a person who has a valid certificate in first-aid training from the American Red Cross, or equivalent, shall be available at the work site to render first-aid. Refer to Section 9.3.1 for more detailed information concerning first-aid.

10.3 Other OSHA Requirements

OSHA has numerous other standards and associated training requirements applicable to ER work. Some of these requirements apply at a programmatic level and are addressed in Section 4.2.2. Other training requirements apply to specific individuals who are either a competent person or a qualified person in the subject matter pertaining to their job function (Section 3.2.3.5), as defined by OSHA (29 CFR 1926.32[f] and [m], respectively) and/or as defined by applicable operation- or substance-specific standards (29 CFR 1926 and/or 1910), which are referred to throughout the HASP and the SSHASP. Examples of these types of training are those for confined-space entry, lockout/tagout of energized equipment, electrical safety, trenching and excavation, respiratory protection, bloodborne pathogen exposure control, etc.

Site-specific training requirements meeting requirements of this section are dictated by the operations and conditions occurring onsite, and shall be specified in Section 10 of the SSHASP or in a modification form to the SSHASP as the requirement arises.

10.4 LANL-Specific Requirements

There are certain LANL-specific training requirements, listed in this section, that are applicable to personnel performing particular job functions at LANL. Except for the training requirement in Section 10.4.5, ESH-13 will provide LANL-specific training referenced in this section to ER Project participants at no cost to the employer of the trainee and without prior authorization of the FPL.

10.4.1 General Employee Training

Anyone who will perform ER field work and will be onsite (or a combination of sites) for more than 10 consecutive work days shall have current certification of having completed LANL's General Employee Training (GET). This training is LANL-specific and is provided by ESH-13. Recertification is required every two years for personnel requiring unescorted access to DOE Order 5480.20 Nuclear Facilities.

10.4.2 Health and Safety Read Training

ESH-13 distributes booklets on Conduct of Operations and Occurrence Reporting, OSHA Rights and Responsibilities, and General Employee Radiological Worker Training on an annual basis to meet specific training requirements. These booklets will be provided through group, program and contracting offices. Workers shall read and document having read the booklets.

10.4.3 Health Physics Checklist Indoctrination

Individuals who will perform ER work at sites where radiation dosimetry is required (Table 6-2 of the SSHASP) must attend LANL's Health Physics Checklist Indoctrination in accordance with the sixth paragraph of Section 6.

10.4.4 Radiological Worker II

Before beginning work at a site where radiological hazards exist or may be expected, individuals must have completed LANL's Radiological Worker II training provided by ESH-13. Individuals who have completed this training at other sites in the DOE complex within the previous two years may transfer the core training and practical exercise, but must complete LANL's self-study Site-Specific Radiological Worker training provided by ESH-13. Each individual must requalify in Radiological Worker II training every two years while performing work at a site where radiological hazards exist or may be expected. On the alternate year, when requalification is not required, Radiological Worker Refresher training is required. A self-study booklet is provided by ESH-13.

10.4.5 Waste Generator and Waste Management Training

Waste management coordinators and generators of hazardous and mixed waste who must complete waste profile and waste disposal forms are required to complete LANL's Waste Documentation Forms Training.

10.5 RCRA Training

Waste management coordinators, hazardous and mixed waste generators, TSDF workers, and less than 90-day storage area workers are required to have tra ining as defined by EPA (40 CFR 260-270). These individuals must have completed a Waste Generation Overview. In addition, TSDF and less than 90-day storage area workers must complete RCRA personnel training and an annual RCRA refresher or their equivalents.

10.6 DOT Requirements

Individuals whose job function involves the transport of hazardous substances are required to take at a minimum, Hazardous Materials Packaging and Transportation (HMPT) Initial and General Awareness Safety training in accordance with 49 CFR 172.700-704. There are additional training requirements for shippers and drivers of hazardous substances. BUS-6 provides this training to subcontractors for a fee. Equivalency for non-LANL courses is subject to BUS-6 approval. Contact BUS-6 at 7-1038 for further information.

11 Medical Surveillance

Before the FTL or JS authorizes access to areas of the site where site controls have been established (e.g., EZ, CRZ, and other regulated areas), it is the responsibility of the SSO to verify that personnel entering such areas have a current certification of medical evaluation and medical clearance (Appendix E or equivalent) in accordance with this section. The site-specific medical surveillance requirements that meet applicable OSHA regulations and DOE requirements shall be specified in Section 11 of the SSHASP.

A written medical surveillance program that complies with requirements of this section shall be implemented by employers of personnel working for the ER Project. Each of the following employees shall be active participants in his/her employer's medical surveillance program:

- Employees who are or may be exposed to hazardous substances or health hazards at or above OSHA's permissible exposure limits or other published exposure limits.

- Employees who wear a respirator during performance of work.

- Employees who are injured, become ill, or show signs or symptoms of possible over exposure to hazardous substances or who may be exposed to health hazards during performance of work regulated by HAZWOPER or applicable OSHA standard(s) in Subparts D and Z of 29 CFR 1926 for the substance(s) included in Table 2 (Section 4.2.2.4), which appear in Table 4-2 of the SSHASP.

11.1 Cost and Frequency of Examinations

Employers shall make available to each employee participating in this program medical examinations and consultations performed by or under the supervision of a licensed physician (preferably one knowledgeable in occupational medicine) at a reasonable time and place, without cost to or loss of pay by the employee. These examinations shall be available

- at least as frequently as specified in Appendix F of the HASP or an applicable standard, unless the examining physician believes a shorter or longer duration is needed or required;

- at termination of employment or upon reassignment to non-HAZWOPER work if the employee has performed field work with the potential for exposure since his/her last exam (initial or annual); a written explanation of a decision not to provide a termination examination shall be provided in the employee's medical file;

- as necessary for evaluation and treatment of occupational injuries;

- as soon as possible after notification that the employee has incurred a puncture wound at a job site where radiological contamination exceeds background levels, has been exposed to concentrations of contaminants above permissible or published exposure limits or has developed symptoms indicating possible over exposure to hazardous substances or health hazards during performance of work; or

- at additional times for follow-up examinations or consultations as determined by the examining physician.

11.2 Content of Examinations

Initial (baseline) and annual medical examinations shall include at least the examinations and/or tests specified in Appendix F. The examining physician shall determine the content of periodic and termination examinations so that any changes from baseline examination results can be assessed in accordance with Appendix F.

11.3 Information to Be Provided to the Examining Physician

Together with the Physician Certification of Medical Evaluation Form (Appendix E or equivalent), the employer shall provide the following to the examining physician:

- a copy of the HAZWOPER standard (29 CFR 1910.120 or 1926.65), the access to employee exposure and medical records standard (29 CFR 1910.20), the respiratory protection standard (29 CFR 1910.134), the occupational noise exposure standard (29 CFR 1910.95), and/or applicable OSHA standard(s) in Subparts D and Z of 29 CFR 1926 for the substance(s) included in Table 2 (Section 4.2.2.4), which appear in Table 4-2 of the SSHASP;

- a description of the employee's duties as they relate to the employee's exposures;

- the employee's actual or anticipated exposure levels;
- a description of any PPE (especially equipment for respiratory protection) actually or reasonably anticipated to be used during performance of work; and
- information from previous medical examinations of the employee not readily available to the examining physician. (This only applies to employees who are on temporary duty assignment and whose usual annual occupational medical evaluations are performed elsewhere.)

11.4 Information to be Obtained from the Evaluating Physician

The employer shall obtain and furnish the employee with a copy of a written opinion from the examining physician. Using the form provided in Appendix E or equivalent, this information must include

- the physician's opinion as to whether his/her examination revealed that the employee has any medical conditions that would place the employee at increased risk of impairment of the employee's health from assigned work (e.g., specifically noting compliance with applicable regulations);
- the physician's recommended limitations on the employee's assigned work, if any;
- a statement that the physician has informed the employee of the results of the medical examination and any medical conditions that require further examination or treatment.

The written opinion provided to the employer shall not reveal findings or diagnoses unrelated to occupational exposures. The confidential results of the medical examination and tests shall be kept by the examining and/or evaluating physician, not the employer (unless the employer has a physician on staff who performs the medical evaluations). The results of the medical examination and tests shall be provided to the employee by the physician when requested in writing by the employee, at no cost to the employee in accordance with Section 13.2.

12 Quality Control and Quality Assurance Plan

12.1 Site Inspections

According to *Construction Project Safety and Health Management* (DOE Order 5480.9A), the construction Subcontractor shall conduct daily inspections of the work site to identify hazards and instances of noncompliance with project HS requirements. The construction Subcontractor responsible for this duty is the prime ER Subcontractor, or where a prime is not involved, the Subcontractor performing the work. The FTM or DPL, serving as the construction manager (as defined in DOE 5480.9A and Section 3.2.1.2), shall conduct work site HS inspections on at least a weekly basis. The FPL, serving as the project manager (as defined in DOE 5480.9A and Section 3.2.1.1), shall conduct inspections of his/her ER Projects exceeding $500,000 on at least a monthly basis during periods of active construction. For projects under $500,000, the FPL shall develop and implement an inspection schedule which ensures that a representative sample of ongoing projects are inspected on at least a monthly basis.

Records of inspections noting any hazards and the corrective actions taken shall be kept. Section 12 of the SSHASP specifies the site-specific inspections to be performed by the SSO or other designated person and the frequency of inspections.

12.2 ER/HS Oversight Program

In accordance with recordkeeping requirements of Section 13, ER participants shall provide access to and/or furnish all documentation necessary to LANL to verify compliance with requirements of the HASP, SSHASP, or any applicable law or regulation. This support shall include maintenance of appropriate HS

records at the site as required by the HASP, SSHASP, or any applicable regulatory requirement, or as deemed necessary by the FPL or Field Unit HS Representative.

ER participants shall support an initial programmatic and periodic in-process verifications of compliance with applicable requirements. The initial programmatic verification will consist of review of the applicable SSHASP document including any necessary supplements (such as individual verification records for training, medical, etc.) and employer's program or procedure documents which verify the existence of and compliance with applicable requirements. The periodic in-process verifications, which will be conducted by LANL, will include verification of ER participants' records which demonstrate compliance with requirements of the HASP, SSHASP and applicable regulations. These inspections will be conducted primarily at the field sites, but may involve the requirement to furnish current documentation not present at the field site.

Inspections may be conducted by the FPL, his/her delegate, and/or representatives of the ESH Division. It is also anticipated that occasional verification by the LANL Audits & Assessments Branch or the DOE may be required.

ER participants are advised that the results of these inspections shall be in writing and submitted to the LANL performance fee evaluation team and to appropriate LANL management personnel. A copy of the results will also be furnished to the affected employer(s) for resolution of discrepancies, if any.

If during the course of verification a circumstance is discovered which presents a threat of serious injury or death, notice will be promptly provided to the affected onsite supervisor and to the FTL for action as directed in Section 3.4.

13 Recordkeeping

13.1 Site Records

The SSO shall keep a record of daily HS-related events in a bound logbook and shall verify employee training and medical surveillance records in accordance with Section 3.2.3.1. Health physics personnel shall keep records of health physics-related events in accordance with requirements of their radiological surveillance authorization agreement (Section 3.2.4). Records of all training must be maintained and available for oversight review. ESH-13 maintains training records of training provided by ESH-13 only. Site records shall be provided to the FTM or DPL at the close of the project, who will provide them to the FPL for storage at LANL's RPF.

13.2 Employee Exposure and Medical Records

Employee exposure monitoring and medical records shall be retained by the employer of the employee in accordance with OSHA's standard for access to employee exposure and medical records (29 CFR 1926.33). Medical records shall not include examination or test results, but shall include the employee's name and social security number; the physician's written opinion (per Section 11.4) and recommended limitations; any medical complaints related to exposure of hazardous substances; and a copy of the information provided to the examining physician by the employer (not including a copy of the OSHA standard).

Records shall be retained in accordance with, though not limited to, the following requirements:

- To the extent permitted by law, the employer shall maintain and keep in confidence records for each employee.
- Medical records for each employee shall be maintained by the employer for the duration of employment plus 30 years (except health insurance claims records maintained separately from the employer's medical surveillance program records, first-aid records of one-time treatments,

and medical records of employees who have worked for the employer for less than one year and who have seen the records before termination).

- Exposure records for each employee monitored per Table 6-2 of the SSHASP shall be maintained by the employer for 30 years.

- At an employee's request, the employer shall ensure that each employee has access to his/her records.

- At an employee's written request, the employer shall ensure that representatives designated by the employee have access to his/her record(s) (A sample consent form is provided in Appendix A of 29 CFR 1926.33).

- Whenever an employee, or his/her designated representative, requests access to an employee record, the employer shall ensure that access is provided in a reasonable time and manner. If the employer cannot provide access to the record(s) within 15 working days, before the 15th working day following the request for access, the employer shall apprise the requester of the reason for the delay and the earliest date the record(s) can be made available.

- Whenever an employee, or his/her designated representative, requests a copy of a record, the employer shall ensure that either

  - a copy of the record is provided without cost to such requester,

  - the necessary copying equipment is made available without cost to such requester for the purpose of copying the record, or

  - the record is lent to such requester for a reasonable time to enable a copy to be made.

- Once a record has been provided without cost to the requester, the employer may charge a reasonable, nondiscriminatory administrative cost for subsequent copies of the record. However, an employer shall not charge for an initial request for a copy of new information that has been added to a record which was previously provided.

For purposes of follow-up investigation of an accident or incident, the employee's consent for the investigator(s) to access his/her records shall be obtained in accordance with 29 CFR 1926.33.

13.3 Employee Notification Procedure

In accordance with 29 CFR 1926.33, the SSO is required to provide notification of personal exposure monitoring (dosimetry) results to each employee (including another employers' employees) for whom exposure monitoring was performed using the form that is provided in the LANL ER Project *Manual for Site Health and Safety Activities*. The form must be reviewed and acknowledged by each employee for whom monitoring has been conducted and notification provided. The SSO shall provide a copy of the notification form to the subject employee and to his/her supervisor. These records are confidential and shall be dealt with as such in accordance with requirements of Section 13.2. The original form shall be retained with other original site records. Results of the exposure monitoring shall be communicated to others in a manner that does not identify the employee for whom the monitoring was performed, including other affected onsite personnel during the daily tailgate meeting following receipt and evaluation of the results.

13.4 Emergency/Incident Records

Records of emergency or incident reports and follow-up investigations shall be processed according to Section 9.4.

14 References

14.1 HASP

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14.2 Model SSHASP

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Appendix A

SSHASP ACKNOWLEDGMENT FORM

SSHASP ACKNOWLEDGMENT FORM

Project Title: _____ Date: _____

TA(s): _____ SSHASP No.: _____

I acknowledge that I have read or have been briefed on the contents of this SSHASP in accordance with requirements of Sections 1.2 and 10.1.3 of the HASP.

Name	Title	Company	Z Number (or other photo ID)	Signature/Date

Appendix B

SSHASP MODIFICATION FORM

SSHASP MODIFICATION FORM

Project Title: _____

TA(s): _____ SSHASP No.: _____ Modification No.: _____

Modifications of the SSHASP shall be made per Section 1.3 of the HASP.
Attach to this page the SSHASP modifications.

Comments of the following reviewers have been incorporated as stipulated, or resolved with written record and copy to the respective reviewer.

Prepared by _____
(Print Name) (Title) (Signature) (Date)

Review and Approval by:

Field Unit HS Representative _____
(Print Name) (Title) (Signature) (Date)

FTM or DPL, or FTL or JS (optional at discretion of FPL) _____
(Print Name) (Title) (Signature) (Date)

Technical Area (TA) Representative (optional at discretion of FPL) _____
(Print Name) (Title) (Signature) (Date)

FPL _____
(Print Name) (Title) (Signature) (Date)

Concurrence by:

Subcontractor Representative (Management or HS Rep.) _____
(Print Name) (Title/Company) (Signature) (Date)

Subcontractor Representative (Management or HS Rep.) _____
(Print Name) (Title/Company) (Signature) (Date)

Subcontractor Representative (Management or HS Rep.) _____
(Print Name) (Title/Company) (Signature) (Date)

Other _____
(Print Name) (Title/Company) (Signature) (Date)

Appendix C

HAZARD ASSESSMENT METHOD

APPENDIX C
HAZARD ASSESSMENT METHOD

Determination of the hazard assessment should be made by an HS professional using the following or comparable method (e.g., the method included in the penalties section of the current *OSHA Field Operations Manual*).

Instructions for determining the hazard assessment rating:

Along the vertical axis, determine the hazard severity of the injury or illness which may result from the hazard. Along the horizontal axis, determine the mishap probability or likelihood of the hazard occurring. The square where the row and column meet identifies the hazard assessment.

For the particular hazard being analyzed, in Table 4-2 or 4-3 of the SSHASP include the verbal hazard definition term determined here under the "Hazard Assessment" column of that table. For example, if the hazard severity is "Major" and the mishap probability is "probably will occur", then the entry in Table 4-2 or 4-3 of the SSHASP would be: "Serious".

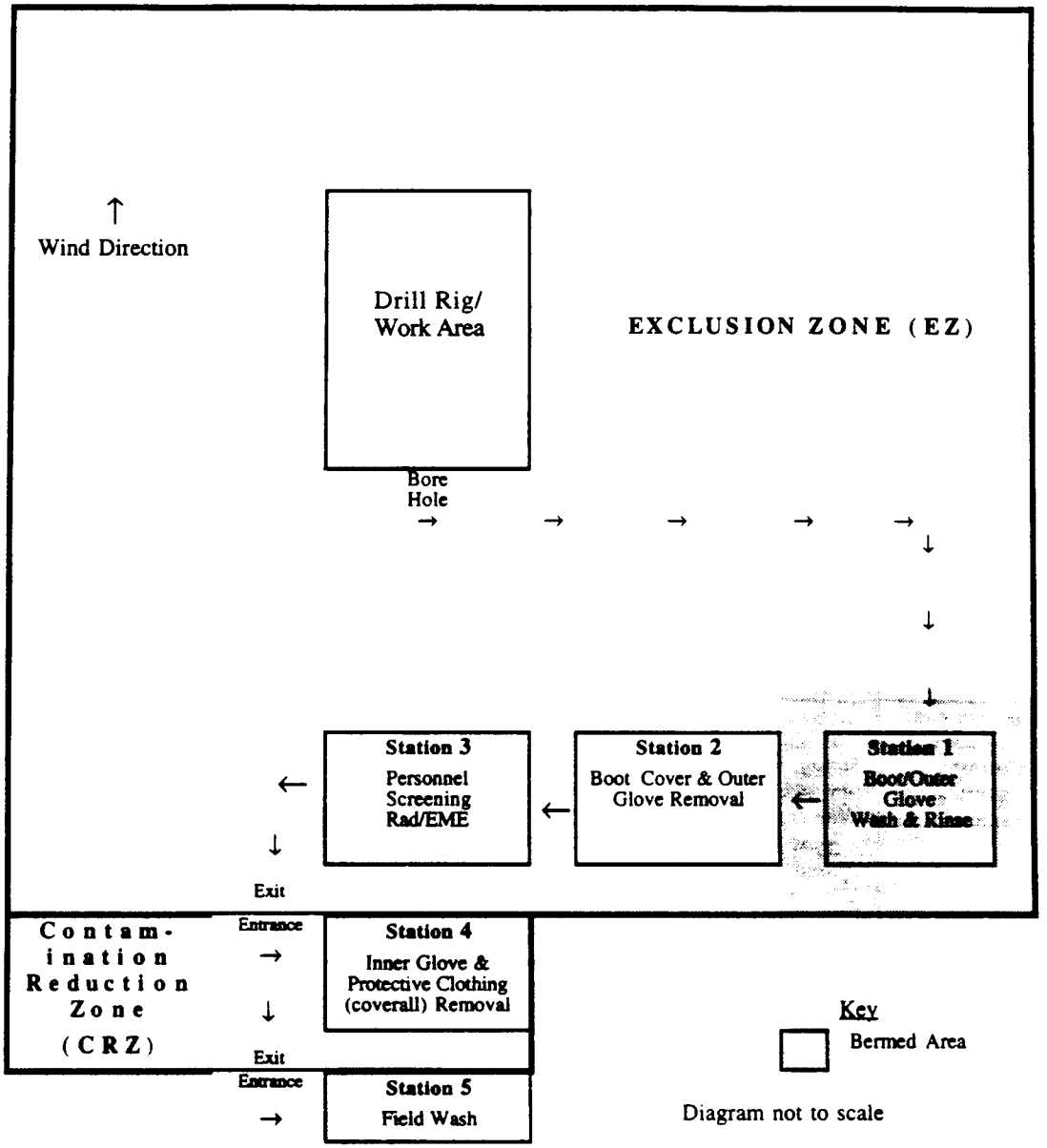
Hazard Severity	Mishap Probability			
	Likely to Occur	Probably will Occur	Possibly could Occur	Unlikely to Occur
Catastrophic (i.e., death or life-threatening injury from a single encounter)	Imminent	Imminent	Serious	Minor
Major (i.e., significant injury/illness resulting in irreversible harm)	Imminent	Serious	Moderate	Minor
Minor (i.e., injury or illness not likely to threaten mobility, vision etc. - resulting in reversible harm)	Serious	Moderate	Minor	Negligible
Negligible	Minor	Minor	Negligible	Negligible

Appendix D

PERSONNEL DECONTAMINATION

LAYOUT, PROCEDURE, AND EQUIPMENT LIST OPTIONS

OPTION 1
STANDARD LEVEL-D
DECONTAMINATION FACILITY LAYOUT



SUPPORT ZONE (SZ)

OPTION 1
STANDARD LEVEL-D
DECONTAMINATION PROCEDURES

For waste management purposes and to minimize generation of mixed waste; the RCT, HPT, or RSP should scan the boots, gloves, and soiled areas of other PPE before personnel proceed to decon station 1. If contamination is detected, initiate rad decon procedure as directed by the RCT, HPT, or RSP before proceeding to decon station 1.

Decon Station No.	Decon Station Function	Procedure
1	Boot/Outer Glove Wash & Rinse	Step into container of wash detergent solution. Scrub chemical protective boots or boot covers and gloves with decon solution. Step out of wash container and into rinse container. Rinse decon solution using pressurized water sprayer; if solvent necessary, rinse with it first followed by water rinse. Rinse effectively but sparingly to minimize generation of large amounts of potentially contaminated water.
2	Boot Cover & Outer Glove Removal	Remove boot covers (if any) and outer gloves. Deposit in lined waste container.
3	Personnel Screening Rad/EME	Screen hands and feet (and coveralls if directed by RSP/RCT) for gross β/γ and α contamination. If any visually detectable contamination on self, wash and rinse boots, inner gloves, and/or PC until levels detected during screening are $\leq$ background levels. If contamination detected still > background levels CONTACT SSO OR RSP/RCT IMMEDIATELY (See Section 8.2 of the HASP for further guidance.) This also is station for removing EME covering prior to transport into CRZ. Screen EME first; if contamination detected $\leq$ background levels, remove covering and deposit in lined waste container at Station 2 prior to carrying EME into CRZ. NOTE: IF ANY CONTAMINATION DETECTED > BACKGROUND LEVELS, CONTACT SSO OR RSP/RCT IMMEDIATELY. (See Sections 8.2.1 and 8.2.3 of the HASP for further guidance.)
4	Inner Glove & Protective Clothing (coverall) Removal	Remove tape (if any), then field coveralls by peeling them inside out from the neck down while being careful not to spread contamination from external surface of PC to street clothing, skin, or other areas. Deposit coveralls in the lined waste container or neatly set them aside in a relatively clean area of the CRZ until reuse. Second, remove inner gloves by rolling them inside out carefully avoiding touching the outer surface to bare skin. Deposit the gloves in the lined waste container. (Note: If PC will be laundered rather than disposed, there must be separate, lined, clearly labeled containers available at this station: (1) for disposable waste PC, (2) for laundry. Also, see Section 8.2.2 of the HASP.)
5	Field Wash	Wash exposed skin (e.g., hands and face); shower and redress in street clothes if such facilities are available on site.

OPTION 1
STANDARD LEVEL-D DECONTAMINATION
SUGGESTED FACILITY EQUIPMENT

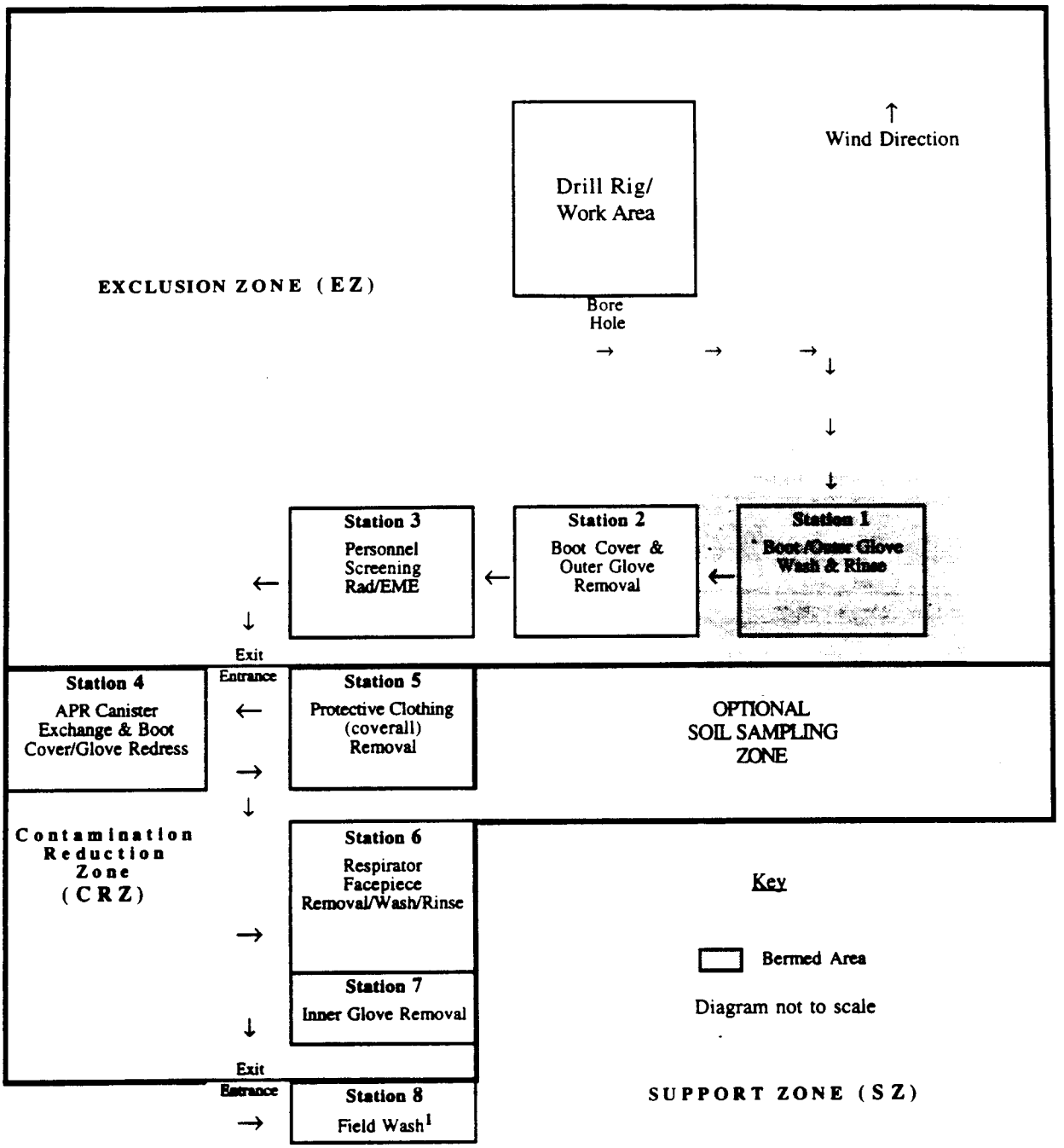
Listed by Decon Station No.

Decon Stn. No.	Decon Station Function	Equipment Item(s)
1	Boot/Outer Glove Wash & Rinse	Berm Unit (e.g., 4" depth), 2 Containers (10-30 gal; shallow), Detergent Solution (≤10 gal. aqueous), 1 (2 optional) Pressurized (garden) Sprayer (3-5 gal), 1 Scrub Brush (nylon bristle), Rinse Water (≤15 gal non-potable)
2	Boot Cover & Outer Glove Removal	Bench/Chair/Stool (optional), Container/Drum (55 gal.), Drum Liner (55 gal.)
3	Personnel Screening Rad/EME	Table and Plastic Sheeting (tableslip), or Plastic Drop Cloth (~3' x 3')
4	Inner Glove & Protective Clothing (Coverall) Removal	Bench/Chair/Stool (optional), Container/Drum (55 gal.), Drum Liner (55 gal.)
5	Field Wash	Bucket/Container (1-3 gal.), Disposable Towels (as needed), Hand Soap (bar or soln.), Paper Towel Waste Container (non-hazardous waste), Plastic Sheeting (tableslip), Table, Water Container (2.5 ≤ x ≤ 10 gal. non-potable)

Listed by Equipment Item

Equipment Item	Quantity Per Decon station		Total Quantity
	Decon Stn No.	Quantity	
Bench/Chair/Stool	2, 4	1 @ each stn. (optional)	2 (optional)
Berm Unit (e.g., 4" depth)	1	1	1
Bucket/Container (1-3 gal)	5	1	1
Container (10-30 gal; shallow)	1	2	2
Container/Drum (55 gal)	2, 4	1 @ each stn.	2
Detergent Soln. (≤10 gal. aqueous)	1	1	1
Disposable Towels	5	As needed	As needed
Drum Liner (55 gal)	2, 4	1 @ each stn.	2
Hand Soap (bar or soln)	5	1	1
Paper Towel Waste Container (non-hazardous waste)	5	1	1
Table & Plastic Sheeting (tableslip) (May substitute plastic drop cloth (~3' x 3') @ Stn. 3)	3, 5	1 @ each stn.	2 (Stn. 3 optional)
PPE (e.g., gloves & boot covers)	5	As needed per SSHASP	←
Pressurized (Garden) Sprayer (3-5 gal)	1	1 (2 optional)	1 (2 optional)
Scrub Brush (nylon bristle)	1	1	1
Rinse Water (≤15 gal non-potable)	1	1	1
Water Container (2.5 gal ≤ x ≤10 gal)	5	1	1

OPTION 2
STANDARD LEVEL-C
DECONTAMINATION FACILITY LAYOUT



[1] Note that for Level C operations (especially during hot weather), it may be advantageous and necessary to have the Field Wash Station include a shower facility - not for decon purposes, but for field team personnel to cool down and rinse off perspiration. If a shower facility is specified in the SSHASP, a street clothing redress facility (Station 9) in sequence following Station 8 will also be necessary.

OPTION 2
STANDARD LEVEL-C
DECONTAMINATION PROCEDURES

For waste management purposes and to minimize generation of mixed waste; the RCT, HPT, or RSP should scan the boots, gloves, and soiled areas of other PPE before personnel proceed to decon station 1. If contamination is detected, initiate rad decon procedure as directed by the RCT, HPT, or RSP before proceeding to decon station 1.

Decon Station No.	Decon Station Function	Procedure
1	Boot/Outer Glove Wash & Rinse	Step into container of wash detergent solution. Scrub chemical protective boots or boot covers and gloves with decon solution. Step out of wash container and into rinse container. Rinse decon solution using pressurized water sprayer; if solvent necessary, rinse with it first followed by water rinse. Rinse effectively but sparingly to minimize generation of large amounts of potentially contaminated water.
2	Boot Cover & Outer Glove Removal	Remove boot covers (if any) and outer gloves. Deposit in lined waste container.
3	Personnel Screening Rad/EME	Screen hands, feet, and respirator (and coveralls if directed by RSP/RCT) for gross β/γ and α contamination. If any visually detectable contamination on self, wash and rinse boots, inner gloves, PC, and/or respiratory equipment until levels detected during screening are $\leq$ background levels. If contamination detected still > background levels CONTACT SSO OR RSP/RCT IMMEDIATELY. (See Section 8.2 of the HASP for further guidance.) As needed, if respirator canisters get wet, exchange prior to reentering EZ. This also is station for removing EME covering prior to transport into CRZ. Screen EME first; if contamination detected $\leq$ background levels, remove covering and deposit in lined waste container at Station 2 prior to carrying EME into CRZ. NOTE: IF ANY CONTAMINATION DETECTED > BACKGROUND LEVELS, CONTACT SSO OR RSP/RCT IMMEDIATELY. (See Sections 8.2.1 and 8.2.3 of the HASP for further guidance.)
4	APR Canister Exchange & Boot Cover/Glove Redress	If worker leaves EZ only to exchange APR canister or for adjustment of respirator equipment (e.g., an emergency), this is last step in decon procedure; if not, continue to Station 5 after task here is completed. Since facepiece may be contaminated and will be handled while wearing inner gloves; if facepiece is removed, decontaminate it following Station 6 instructions. After removing facepiece, remove and trash inner gloves per Station 7 instructions. After completing intended task here, don new inner/outer gloves and boot covers (and tape if in use) and return to EZ. Deposit used canisters in lined waste container located at nearby Station 8. (See note under Station 8.)
5	Protective Clothing (coverall) Removal	Remove tape (if any), then field coveralls by peeling inside out from neck down while being careful not to spread contamination from external surface of PC to street clothing, skin, or other areas. Deposit coveralls in lined waste container or neatly set them aside in relatively clean area of CRZ until reuse. (Note: If PC will be laundered rather than disposed, there must be separate, lined, clearly labeled containers available at this station: (1) for waste PC, (2) for laundry. Also, see Section 8.2.2 of the HASP.)
6	**Respirator Facepiece Removal/Wash/ Rinse**	IF AT ANY TIME ANY VISABLE OR RAD CONTAMINATION WAS ON RESPIRATOR FACEPIECE, REFER TO SECTION 8.2.2 and 8.2.3 FOR FURTHER DECON INSTRUCTIONS. If no visible or rad contamination was on the facepiecs, carefully remove respirator facepiece while minimizing contact between gloved hands and exposed skin/hair. Squeeze soap solution from quart size squeeze bottle onto a paper towel and use soapy towel to clean respirator appropriately. Squeeze rinse water from other quart size squeeze bottle onto paper towel or sponge and wipe respirator until rinsed sufficiently. If respirator should be sterilized, use disposable sterile wipe pads. Deposit waste items in disposable waste container at adjacent Station 5. (Note: OSHA requires respirators be cleaned and sanitized regularly by user as frequently as necessary to ensure proper protection and inspected before and after each use.)
7	Inner Glove Removal	Remove inner gloves by rolling inside out, carefully avoiding touching outer surface to skin. Deposit the gloves in the disposable waste container at nearby Station 5.
8	Field Wash	Wash exposed skin (e.g., hands and face); shower and redress in street clothes if such facilities are available on site.

OPTION 2
STANDARD LEVEL-C DECONTAMINATION
SUGGESTED FACILITY EQUIPMENT

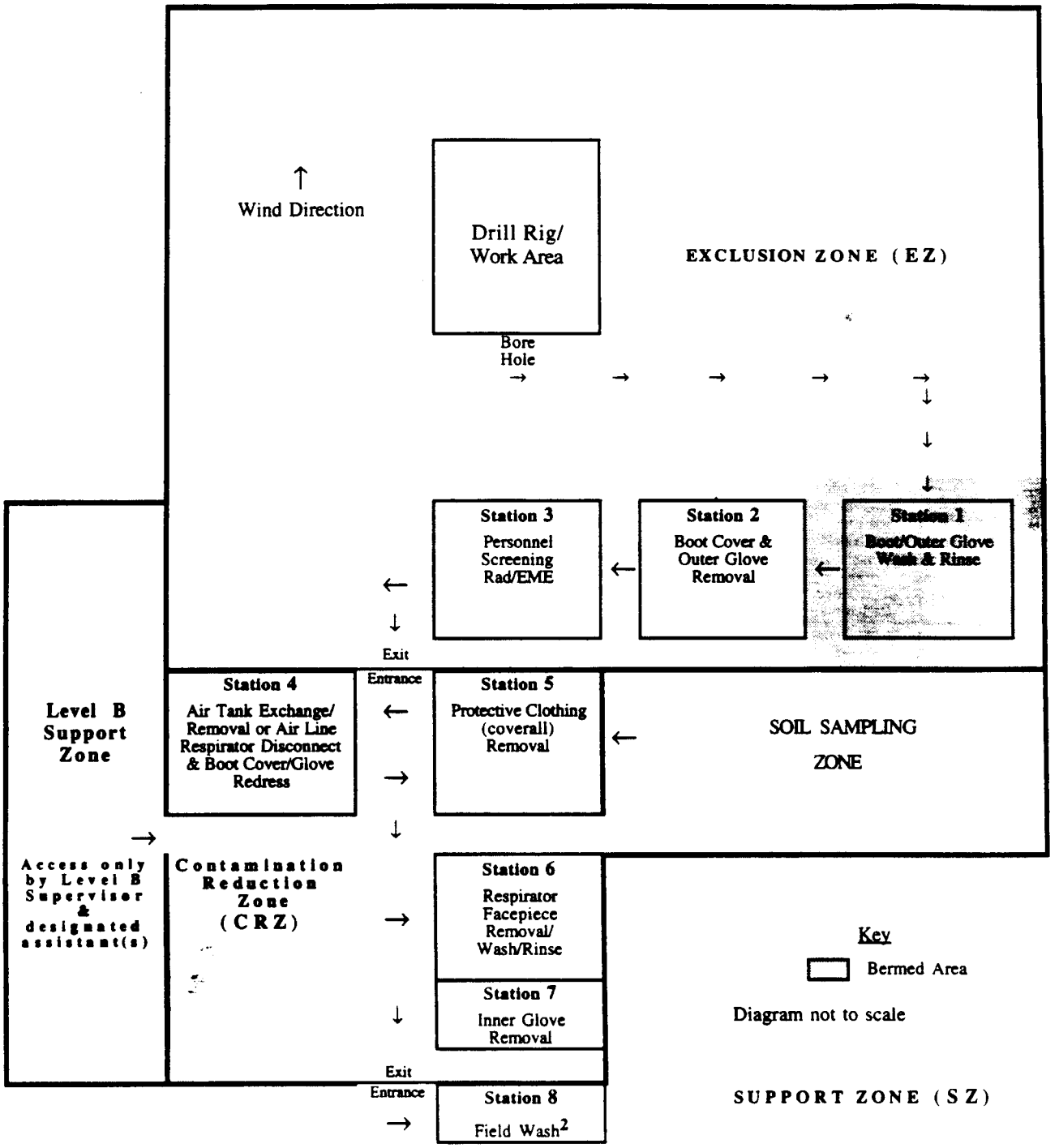
Listed by Decon Station No.

Decon Stn. No.	Decon Station Function	Equipment Item(s)
1	Boot/Outer Glove Wash & Rinse	Berm Unit (e.g., 4" depth), 2 Containers (10-30 gal; shallow), Detergent Solution (≤10 gal. aqueous), 1 (2 optional) Pressurized (garden) Sprayer (3-5 gal), 1 Scrub Brush (nylon bristle), Rinse Water (≤15 gal non-potable)
2	Boot Cover & Outer Glove Removal	Bench/Chair/Stool (optional), Container/Drum (55 gal.), Drum Liner (55 gal.)
3	Personnel Screening Rad/EME	Table and Plastic Sheeting (tableslip), or Plastic Drop Cloth (~3' x 3')
4	APR Canister Exchange & Boot Cover/Glove Redress	PPE (e.g., gloves & boot covers) quantity as needed per SSHASP, Plastic Drop Cloth (~ 3' x 3') or Table & Plastic Tableslip, and same supplies as Station 6 unless respirator facepiece decon step will only be done at Station 6.
5	Protective Clothing (coverall) Removal	Bench/Chair/Stool (optional), Container/Drum (55 gal.), Drum Liner (55 gal.), sealable bags for temporary storage of PC to be reused on site, indelible ink marking pen for labeling PC bag. Note: two drums are necessary if non-disposable PC will be laundered for reuse.
6	Respirator Facepiece Removal/Wash/Rinse	Disposable Towels (as needed), Disposable Sterile Wipe Pads (e.g., North Part No. 7003, as needed), Table, Plastic Sheeting (tableslip), 2 Qt.-size Squeeze Bottles (1 with liq. soap soln. & 1 with rinse water), sponge(s)
7	Inner Glove Removal	(Nothing additional necessary; used gloves can be tossed into Station 5 container/drum adjacent to table at Station 6)
8	Field Wash	Bucket/Container (1-3 gal.), Disposable Towels (as needed), Hand Soap (bar or soln.), Paper Towel Waste Container (non-hazardous waste), Plastic Sheeting (tableslip), Table, Water Container (2.5 ≤ x ≤ 10 gal. non-potable)

Listed by Equipment Item

Equipment Item	Quantity Per Decon station		Total Quantity
	Decon Stn No.	Quantity	
Bench/Chair/Stool	2, 5	1 @ each stn. (optional)	2 (optional)
Berm Unit (e.g., 4" depth)	1	1	1
Bucket/Container (1-3 gal)	8	1	1
Container (10-30 gal; shallow)	1	2	2
Container/Drum (55 gal)	2, 5	1 @ each stn.	2
Detergent Soln. (≤10 gal. aqueous)	1	1	1
Disposable Towels	4, 6, 8	As needed	As needed
Disposable Sterile Wipe Pads (e.g., North Part No. 7003)	6	As needed	As needed
Drum Liner (55 gal)	2, 5	1 @ each stn.	2
Hand Soap (bar or soln)	8	1	1
Paper Towel Waste Container (non-hazardous waste)	8	1	1
Table & Plastic Sheeting (tableslip) (May substitute plastic drop cloth (~3' x 3') @ Stn. 3)	3, 4, 6, 8	1 @ each stn.	4 Stn. 4 optional
PPE (e.g., gloves & boot covers)	4	As needed per SSHASP	←
Pressurized (Garden) Sprayer (3-5 gal)	1	1 (2 optional)	1 (2 optional)
Qt.-size Squeeze Bottles (1 with liq. soap soln. & 1 with rinse water)	4, 6	2 @ each stn.	2 to 4 (Stn. 4 optional)
Scrub Brush (nylon bristle)	1	1	1
Rinse Water (≤15 gal) non-potable	1	1	1
Water Container (2.5 gal ≤ x ≤10 gal)	8	1	1

OPTION 3
STANDARD LEVEL-B
DECONTAMINATION FACILITY LAYOUT



2 Note that for Level B operations (especially during hot weather), it may be advantageous and necessary to have the Field Wash Station include a shower facility - not for decon purposes, but for field team personnel to cool down and rinse off perspiration. If a shower facility is specified in the SSHASP, a street clothing redress facility (Station 9) in sequence following Station 8 will also be necessary.

OPTION 3
STANDARD LEVEL-B
DECONTAMINATION PROCEDURES

For waste management purposes and to minimize generation of mixed waste; the RCT, HPT, or RSP should scan the boots, gloves, and soiled areas of other PPE before personnel proceed to decon station 1. If contamination is detected, initiate rad decon procedure as directed by the RCT, HPT, or RSP before proceeding to decon station 1.

Decon Station No.	Decon Station Function	Procedure
1	Boot/Outer Glove Wash & Rinse	Step into container of soapy wash solution: scrub/wash chelcal protective boots/boot covers & gloves. Step from wash container into rinse container. Rinse decon solution using pressurized water sprayer; if necessary, rinse with solvent first followed by water rinse. Rinse effectively but sparingly to minimize generation of large amounts of potentially contaminated water.
2	Boot Cover/ Outer Glove Removal	Remove boot covers (if any) and outer gloves. Deposit in the waste container.
3	Personnel Screening Rad/EME	Screen hands, feet, and respirator (and coveralls if directed by RSP/RCT) for gross β/γ and α contamination. If any visually detectable contamination on self, wash and rinse boots, inner gloves, PC, and/or respiratory equipment until levels detected during screening are $\leq$ background levels. If contamination detected still > background levels CONTACT SSO OR RSP/RCT IMMEDIATELY (See Section 8.2 of the HASP for further guidance.) This also is station for removing EME covering prior to transport into CRZ. Screen EME first; if contamination detected $\leq$ background levels, remove covering and deposit in lined waste container at Station 2 prior to carrying EME into CRZ. NOTE: IF ANY CONTAMINATION DETECTED > BACKGROUND LEVELS, CONTACT SSO OR RSP/RCT IMMEDIATELY. (See Sections 8.2.1 and 8.2.3 of the HASP for further guidance.)
4	Air Tank Exchange/ Removal or Air line Respirator Disconnect & Boot Cover/Glove Redress	If worker leaves EZ only to exchange air tank, disconnect air line, or for adjustment of respirator equipment (e.g., an emergency), this is the last station in the decontamination sequence; if not, continue to Station 5 after task at this Station is completed. Level B Support Zone staff should be available to assist at this station. Doff respiratory equipment except for facepiece. Since face-piece may still be somewhat contaminated and will be handled while wearing inner gloves; if facepiece is removed, decontaminate it following Station 6 instructions. After removing facepiece, remove and trash inner gloves per Station 7 instructions. After completing intended task here, don new inner/outer gloves, boot covers, and tape; return to EZ. The Level B Supervisor or assistant(s) will decontaminate Level B equipment as needed per Level B Support Zone procedure at end of this table.
5	Protective Clothing (coverall) Removal	Remove field coveralls by peeling inside out from neck down while being careful not to spread contamination from external surface of PC to street clothing, skin, or other areas. Deposit coveralls in lined waste container or neatly set them aside in relatively clean area of CRZ until reuse. (Note: If PC will be laundered rather than disposed, there must be separate, lined, clearly labeled containers available at this station: (1) for waste PC, (2) for laundry. See Section 8.2.2 of the HASP.)
6	Respirator Facepiece Removal/ Wash/ Rinse	IF AT ANY TIME ANY VISABLE OR RAD CONTAMINATION WAS ON RESPIRATOR FACEPIECE, REFER TO LEVEL B SOP FOR FURTHER DECON INSTRUCTIONS. If no visible or rad contamination was on facepiece, carefully remove facepiece while minimizing contact between gloved hands and exposed skin/hair. Squeeze soap solution from quart size squeeze bottle onto paper towel and use towel to clean respirator appropriately. Squeeze rinse water from other quart size squeeze bottle onto paper towel/sponge and wipe respirator until rinsed sufficiently. If respirator should be sterilized, use disposable sterile wipe pads. Deposit waste items in disposable waste container at Stn. 5. (Note: OSHA requires respirators be cleaned/sanitized regularly by user as frequently as necessary to ensure proper protection, and inspected before/after each use.)
7	Inner Glove Removal	Remove inner gloves by rolling inside out, carefully avoiding touching outer surface to skin. Deposit gloves in the disposable waste container at nearby Station 5.
8	Field Wash	Wash exposed skin (hands/face); shower/redress in street clothes if facilities available on site.
Level B Support Zone		Level B Supervisor or designated assistant(s) will assist field team members with donning, adjusting, decon, and removal of Level B respiratory equipment. Respirator tanks, hoses, air lines, and other reusable equipment other than facepieces should be washed with detergent solution using a pressurized sprayer, scrub brush, sponge, and/or squeeze bottle. Rinse equipment using water in a pressurized sprayer or squeeze bottle. If solvent rinse necessary, subsequently rinse with water. Rinse effectively but sparingly to minimize generation of large amounts of potentially contaminated water. Any disposable items should be disposed in the disposable waste container at Stn. 5 or a similar container located at this Station. Level B Support Zone staff shall decontaminate themselves following procedures for Stations 5 & 7 prior to exiting the CRZ. (Note respirator facepieces are screened per Stn 3 instructions and decontaminated per Stn. 6 instructions.)

OPTION 3
STANDARD LEVEL-B DECONTAMINATION
SUGGESTED FACILITY EQUIPMENT

Listed by Decon Station No.

Decon Stn. No.	Decon Station Function	Equipment Item(s)
1	Boot/Outer Glove Wash & Rinse	Berm Unit (e.g., 4" depth), 2 Containers (10-30 gal; shallow), Detergent Solution (≤10 gal. aqueous), 1 (2 optional) Pressurized (garden) Sprayer (3-5 gal), 1 Scrub Brush (nylon bristle), Rinse Water (≤15 gal non-potable)
2	Boot Cover & Outer Glove Removal	Bench/Chair/Stool (optional), Container/Drum (55 gal.), Drum Liner (55 gal.)
3	Personnel Screening Rad/EME	Table, Plastic Sheeting (tableslip),
4	Air Tank Exchange/ Removal or Air Line Disconnect & Boot Cover/Glove Redress	PPE (e.g., gloves & boot covers) quantity as needed per SSHASP, Bench/Chair/Stool (optional)
5	Protective Clothing (coverall) Removal	Bench/Chair/Stool (optional), Container/Drum (55 gal.), Drum Liner (55 gal.), sealable bags for temporary storage of PC to be reused on site, indelible ink marking pen for labeling PC bag. Note: two drums are necessary if non-disposable PC will be laundered for reuse
6	Respirator Facepiece Removal/Wash/Rinse	Disposable Towels (as needed), Disposable Sterile Wipe Pads (e.g., North Part No. 7003, as needed), Table, Plastic Sheeting (tableslip), 2 Qt.-size Squeeze Bottles (1 with liq. soap soln. & 1 with rinse water), sponge
7	Inner Glove Removal	(Nothing additional necessary; used gloves can be tossed into Station 5 container/drum adjacent to table at Station 6)
8	Field Wash	Bucket/Container (1-3 gal.), Disposable Towels (as needed), Hand Soap (bar or soln.), Paper Towel Waste Container (non-hazardous waste), Plastic Sheeting (tableslip), Table, Water Container (2.5 ≤ x ≤ 10 gal. non-potable)
Level B Support Zone		Optional, to be specified in SSHASP or Level B SOP: Berm Unit (e.g., 4" depth), 2 Containers (10-30 gal; shallow), Detergent Solution (≤30 gal. aqueous), 2 Pressurized (garden) Sprayers (3-5 gal), Scrub Brush(es) (nylon bristle), Sponge(s), 2 Quart Size Squeeze Bottles, Plastic Drop Cloth (size to contain all Level B equipment/supplies), (optional) Table and Plastic Sheeting (tableslip), Container/Drum (55 gal.) & Drum Liner (optional if container at Station 6 sufficient for all CRZ disposable waste)

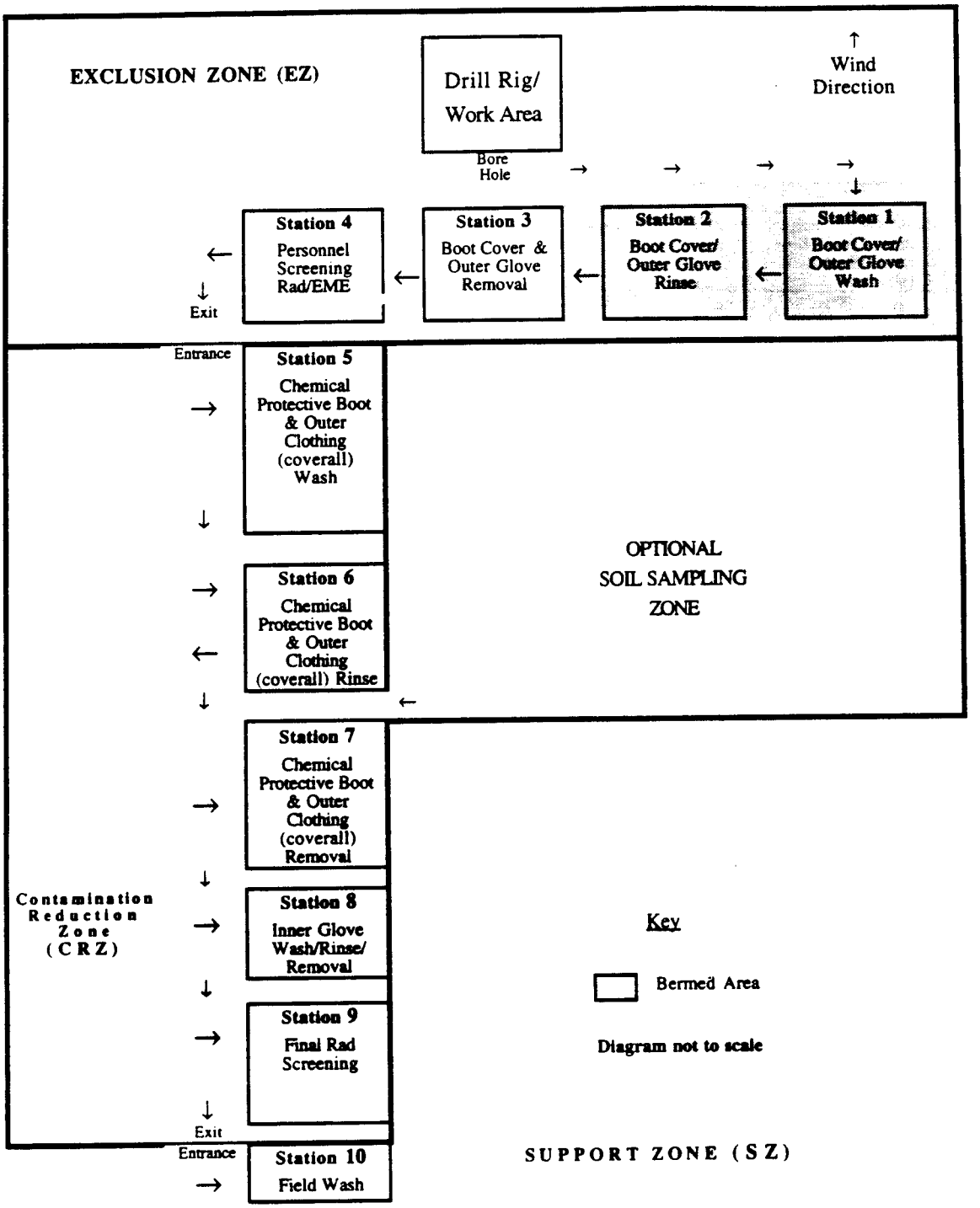
Listed by Equipment Item

Equipment Item	Quantity Per Decon station		Total Quantity
	Decon Stn No.	Quantity	
Bench/Chair/Stool	2, 4, 5, LBSZ[5]	1 @ each stn.	4 (optional)
Berm Unit (e.g., 4" depth)	1, LBSZ	1 @ each stn.	2
Bucket/Container (1-3 gal)	8	1	1
Container (10-30 gal; shallow)	1, LBSZ	2 @ each stn.	2 to 4 (LBSZ optional)
Container/Drum (55 gal)	2, 5, LBZX	1 @ each stn.	3 (LBSZ optional)
Detergent Soln. (≤10 gal. aqueous)	1, LBSZ	1 @ each stn.	2 (LBSZ optional)
Disposable Towels	4, 6, 8, LBSZ	As needed	As needed
Disposable Sterile Wipe Pads (e.g., North Part No. 7003)	4, 6	As needed	As needed
Drop Cloth (plastic , size to contain all Level B equipment/supplies)	LBSZ	1	1
Drum Liner (55 gal)	2, 5, LBSZ	1 @ each stn.	3 (LBSZ optional)
Hand Soap (bar or soln)	8, LBSZ	1 @ each stn.	1 (LBSZ optional)
Paper Towel Waste Container (non-hazardous waste)	8	1	1
Table & Plastic Sheeting (tableslip)	3, 6, 8, LBSZ	1 @ each stn.	4 (LBSZ optional)
PPE (e.g., gloves, tape, & boot covers)	4	As needed per SSHASP	As needed
Pressurized (Garden) Sprayer (3-5 gal)	1, LBSZ	1 @ each stn. min., 2 if solvent used	2 to 4 (LBSZ optional)
Qt.-size Squeeze Bottles (1 with liq. soap soln. & 1 with rinse water)	6, LBSZ	2 @ each stn.	2 to 4 (LBSZ optional)
Scrub Brush (nylon bristle)	1, LBSZ	1 @ each stn.	2 (LBSZ optional)
Sponge(s)	4	1 @ each stn.	1
Rinse Water (≤15 gal) non-potable	1, LBSZ	1 @ each stn.	2 (LBSZ optional)
Water Container (2.5 gal ≤ x ≤10 gal non-potable)	8	1	1

[5] LBSZ = Level B Support Zone

OPTION 4

EXTENSIVE LEVEL-D DECONTAMINATION FACILITY LAYOUT



OPTION 4
EXTENSIVE LEVEL-D
DECONTAMINATION PROCEDURES

For waste management purposes and to minimize generation of mixed waste; the RCT, HPT, or RSP should scan the boots, gloves, and soiled areas of other PPE before personnel proceed to decon station 1. If contamination is detected, initiate rad decon procedure as directed by the RCT, HPT, or RSP before proceeding to decon station 1.

Decon Stn. No.	Decon Station Function	Procedure
1	Boot Cover/Outer Glove Wash	Step into container of wash detergent solution. Scrub boot covers and gloves with decon solution; if necessary, use detergent solution in pressurized sprayer to remove visible contamination. Step out of wash container and into Station 2 rinse container.
2	Boot Cover/Outer Glove Rinse	Rinse boot covers and gloves using pressurized water sprayer; if solvent necessary, rinse with it first followed by water rinse. Rinse effectively but sparingly to minimize generation of large amounts of potentially contaminated water.
3	Boot Cover & Outer Glove Removal	Remove outer boots, tape (if any accessible), and outer gloves. Deposit in lined waste container.
4	Personnel Screening Rad/EME	Screen hands and feet (and coveralls if directed by RSP/RCT) for gross β/γ and α contamination. If any visually detectable contamination on self, wash and rinse boots, inner gloves, and/or PC until levels detected during screening are $\leq$ background levels. If contamination detected still > background levels CONTACT SSO OR RSP/RCT IMMEDIATELY (See Section 8.2 of the HASP for further guidance.) This also is station for removing EME covering prior to transport into CRZ. Screen EME first; if contamination detected $\leq$ background levels, remove covering and deposit in lined waste container at Station 2 prior to carrying EME into CRZ. NOTE: IF ANY CONTAMINATION DETECTED > BACKGROUND LEVELS, CONTACT SSO OR RSP/RCT IMMEDIATELY. (See Sections 8.2.1 and 8.2.3 of the HASP for further guidance.)
5	Chemical Protective Boot & Outer Clothing (coverall) Wash	Wash chemical protective boots & outer clothing (coverall) using pressurized sprayer containing detergent solution. Rinse effectively but sparingly to minimize generation of large amounts of potentially contaminated water. Be careful not to get respirator canisters wet if they will still be used.
6	Chemical Protective Boot & Outer Clothing (coverall) Rinse	Rinse chemical protective boots & outer clothing (coverall) using pressurized sprayer containing rinse water. Rinse effectively but sparingly to minimize generation of large amounts of potentially contaminated water. Be careful not to get respirator canisters wet if they will still be used.
7	Chemical Protective Boot & Outer Clothing (coverall) Removal	Remove tape (if any), then field coveralls by peeling inside out from neck down while being careful not to spread contamination from external surface of PC to street clothing, skin, or other areas. Deposit coveralls in lined waste container or neatly set them aside in relatively clean area of CRZ until reuse. (Note: If PC will be laundered rather than disposed, there must be separate, lined, clearly labeled containers available at this station: (1) for waste PC, (2) for laundry. Also, see Section 8.2.2 of the HASP.)
8	Inner Glove Wash/Rinse/ Removal	Wash inner gloves using soap solution, then rinse gloves using water in squeeze bottle. Remove inner gloves by rolling inside out, carefully avoiding touching outer surface to skin. Deposit the gloves in the disposable waste container at nearby Station 7.
9	Final Rad Screening	Screen hands and feet (and body if so directed by RSP/RCT) for gross β/γ and α contamination. IF ANY CONTAMINATION DETECTED > BACKGROUND LEVELS, CONTACT RSP/RCT IMMEDIATELY. As needed, wash and rinse hands and/or other exposed skin until levels of detection during screening are $\leq$ background levels prior to exiting the CRZ.
10	Field Wash	Wash exposed skin (e.g., hands and face); shower and redress in street clothes if such facilities are available on site.

OPTION 4
EXTENSIVE LEVEL-D DECONTAMINATION
SUGGESTED FACILITY EQUIPMENT

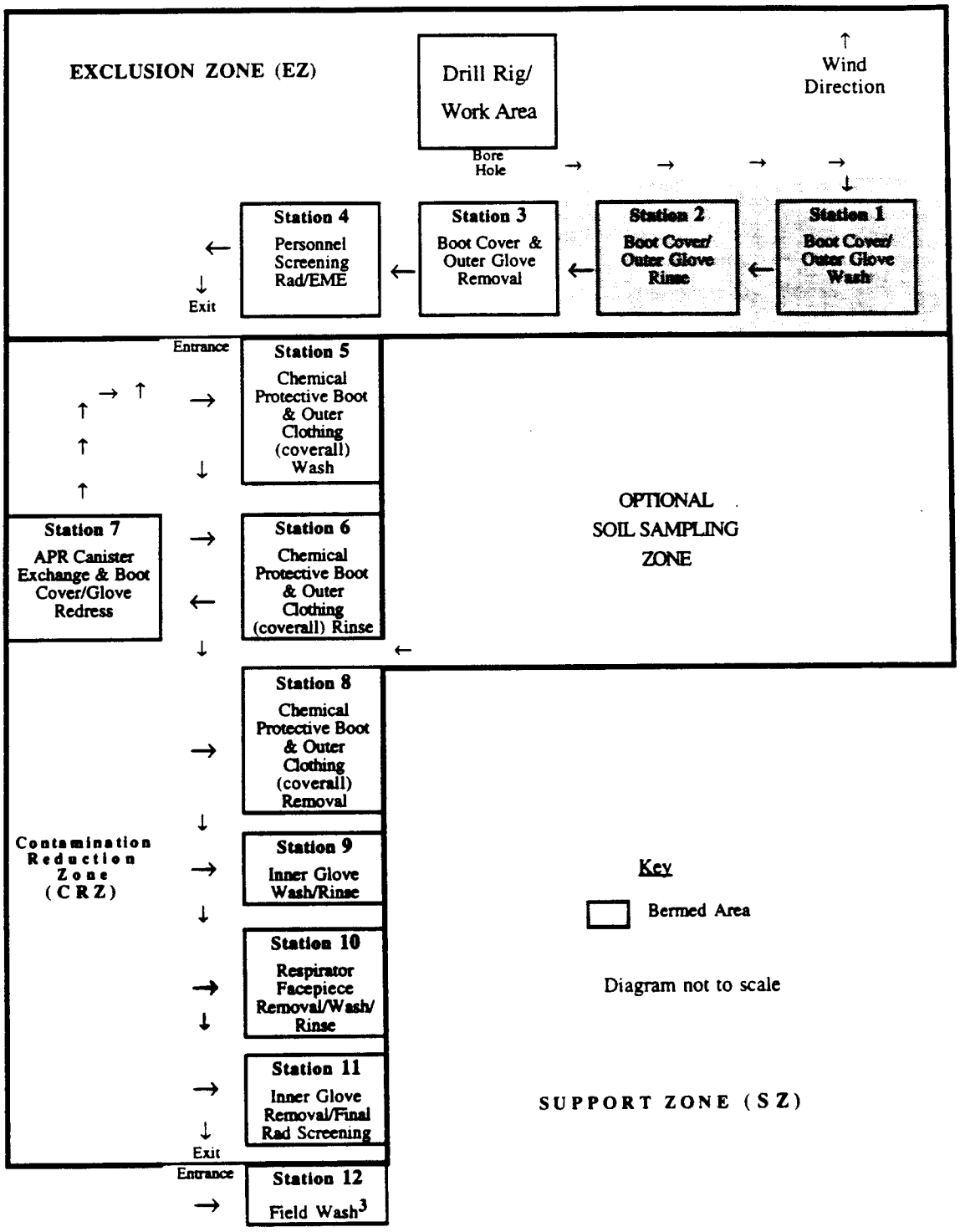
Listed by Decon Station No.

Decon Stn. No.	Decon Station Function	Equipment Items
1	Boot Cover/Outer Glove Wash	Berm Unit (e.g., 4" depth), 1 Container (10-30 gal; shallow), Detergent Solution (≤30 gal. aqueous), 1 Pressurized (garden) Sprayer (3-5 gal), 1 Scrub Brush (nylon bristle)
2	Boot Cover/Outer Glove Rinse	Berm Unit (e.g., 4" depth), 1 Container (10-30 gal; shallow), 1 Pressurized (garden) Sprayer (3-5 gal), Rinse Water (≤30 gal non-potable)
3	Boot Cover & Outer Glove Removal	Bench/Chair/Stool (optional), Container/Drum (55 gal.), Drum Liner (55 gal.)
4	Personnel Screening Rad/EME	Table, Plastic Sheeting (tableslip), rad/EME screening instruments (dedicated to EZ)
5	Chemical Protective Boot/Clothing Wash	Berm Unit (e.g., 4" depth), 1 Container (10-30 gal; shallow), Detergent Solution (≤30 gal. aqueous), 1 Pressurized (garden) Sprayer (3-5 gal), 1 Scrub Brush (nylon bristle)
6	Chemical Protective Boot/Clothing Rinse	Berm Unit (e.g., 4" depth), 1 Container (10-30 gal; shallow), 1 Pressurized (garden) Sprayer (3-5 gal), Rinse Water (≤30 gal. non-potable)
7	Chemical Protective Boot/Clothing Removal	Bench/Chair/Stool (optional), Container/Drum (55 gal.), Drum Liner (55 gal.)
8	Inner Glove Removal	(Nothing additional necessary; used gloves can be tossed into Station 7 container/drum adjacent to table at Station 9)
9	Final Rad Screening	Table, Plastic Sheeting (tableslip), rad screening instruments (dedicated to CRZ)
10	Field Wash	Bucket/Container (1-3 gal.), Disposable Towels (as needed), Hand Soap (bar or soln.), Paper Towel Waste Container (non-hazardous waste), Table, Plastic Sheeting (tableslip), Water Container (2.5 ≤ x ≤ 10 gal. non-potable)

Listed by Equipment Item

Equipment Item	Quantity Per Decon station		Total Quantity
	Decon Stn No.	Quantity	
Bench/Chair/Stool	3, 2	1 @ each stn.	2 (optional)
Berm Unit (e.g., 4" depth)	1, 2, 5, 6	1 each for stns. 1 & 2, and 5 & 6	2
Bucket/Container (1-3 gal)	10	1	1
Container (10-30 gal; shallow)	1, 2, 5, 6	1 @ each stn.	4
Container/Drum (55 gal)	3, 7	1 @ each stn.	2
Detergent Soln. (≤30 gal. aqueous)	1, 5	1 @ each stn.	2
Disposable Towels	10	As needed	As needed
Drum Liner (55 gal)	3, 7	1 @ each stn.	2
Hand Soap (bar or soln)	10	1	1
Paper Towel Waste Container (non-hazardous waste)	10	1	1
Table & Plastic Sheeting (tableslip)	4, 8, 10	1 @ each stn.	3
Pressurized (Garden) Sprayer (3-5 gal)	1, 2, 5, 6	1 @ each stn., 2 @ Stns. 2 & 6 if solvent used	4 to 6
Scrub Brush (nylon bristle)	1, 5	1 @ each stn.	2
Rinse Water (≤30 gal) non-potable	2, 6	1 @ each stn.	2
Water Container (2.5 gal ≤ x ≤10 gal non-potable)	10	1	1

OPTION 5
EXTENSIVE LEVEL-C
DECONTAMINATION FACILITY LAYOUT



[3] Note that for Level C operations (especially during hot weather), it may be advantageous and necessary to have the Field Wash Station include a shower facility - not for decon purposes, but for field team personnel to cool down and rinse off perspiration. If a shower facility is specified in the SSHASP, a street clothing redress facility (Station 13) in sequence following Station 12 will also be necessary.

OPTION 5
EXTENSIVE LEVEL-C DECONTAMINATION PROCEDURES

For waste management purposes and to minimize generation of mixed waste; the RCT, HPT, or RSP should scan the boots, gloves, and soiled areas of other PPE before personnel proceed to decon station 1. If contamination is detected, initiate rad decon procedure as directed by the RCT, HPT, or RSP before proceeding to decon station 1.

Decon Stn. No.	Decon Station Function	Procedure
1	Boot Cover/Outer Glove Wash	Step into container of wash detergent solution. Scrub boot covers and gloves with decon solution; if necessary, use detergent solution in pressurized sprayer to remove visible contamination. Step out of wash container and into Station 2 rinse container.
2	Boot Cover/Outer Glove Rinse	Rinse boot covers and gloves using pressurized water sprayer; if solvent necessary, rinse with it first followed by water rinse. Rinse effectively but sparingly to minimize generation of large amounts of potentially contaminated water.
3	Boot Cover/Outer Glove Removal	Remove outer boots, tape (if any accessible), and outer gloves. Deposit in lined waste container.
4	Personnel Screening Rad/EME	Screen hands, feet, and respirator (and coveralls if directed by RSP/RCT) for gross β/γ and α contamination. If any visually detectable contamination on self, wash and rinse boots, inner gloves, PC, and/or respiratory equipment until levels detected during screening are $\leq$ background levels. If contamination detected still > background levels CONTACT SSO OR RSP/RCT IMMEDIATELY (See Section 8.2 of the HASP for further guidance.) This also is station for removing EME covering prior to transport into CRZ. Screen EME first; if contamination detected $\leq$ background levels, remove covering and deposit in lined waste container at Station 2 prior to carrying EME into CRZ. NOTE: IF ANY CONTAMINATION DETECTED > BACKGROUND LEVELS, CONTACT SSO OR RSP/RCT IMMEDIATELY. (See Sections 8.2.1 and 8.2.3 of the HASP for further guidance.)
5	Chemical Protective Boot & Protective Clothing Wash	Wash chemical protective boots & protective clothing using pressurized sprayer containing soap solution. Rinse effectively but sparingly to minimize generation of large amounts of potentially contaminated water; careful not to get respirator canisters wet if they'll be reused.
6	Chemical Protective Boot & Protective Clothing Rinse	Rinse chemical protective boots & protective clothing using pressurized sprayer containing rinse water. Rinse effectively but sparingly to minimize generation of large amounts of potentially contaminated water; be careful not to get respirator canisters wet if they'll be reused.
7	APR Canister Exchange & Boot Cover/Glove & Tape Redress	If worker leaves EZ only to exchange APR canister or for adjustment of respirator equipment (e.g., an emergency), this is last step in decon procedure; if not, continue to Station 8 after task here is completed. Since facepiece may be contaminated and will be handled while wearing inner gloves; if facepiece is removed, decontaminate it following Stations 9 & 10 instructions. After removing facepiece, remove and trash inner gloves per Station 11 instructions. After completing intended task here, don new inner/outer gloves and boot covers (and tape if in use) and return to EZ. Deposit used canisters in lined waste container located at nearby Station 8. (See note under Station 8.)
8	Chemical Protective Boot & Protective Clothing Removal	Remove tape (if any), then field coveralls by peeling inside out from neck down while being careful not to spread contamination from external surface of PC to street clothing, skin, or other areas. Deposit coveralls in lined waste container or neatly set aside in relatively clean area of CRZ until reuse. (Note: If PC will be laundered rather than disposed, there must be separate, lined, clearly labeled containers available at this station: (1) for waste PC, (2) for laundry. Also, see Section 8.2.2 of the HASP.)
9	Inner Glove Wash/Rinse	Rinse inner gloves using water in squeeze bottle.
10	Respirator Facepiece Removal/Wash/ Rinse	IF AT ANY TIME ANY VISABLE OR RAD CONTAMINATION WAS ON RESPIRATOR FACEPIECE, REFER TO LEVEL B SOP FOR FURTHER DECON INSTRUCTIONS. If no visible or rad contamination was on the facepiecs, carefully remove respirator facepiece while minimizing contact between gloved hands and exposed skin/hair. Squeeze soap solution from quart size squeeze bottle onto a paper towel and use soapy towel to clean respirator appropriately. Squeeze rinse water from other quart size squeeze bottle onto paper towel or sponge and wipe respirator until rinsed sufficiently. If respirator should be sterilized, use disposable sterile wipe pads. Deposit waste items in disposable waste container at adjacent Station 8. (Note: OSHA requires respirators be cleaned and sanitized regularly by user as frequently as necessary to ensure proper protection and inspected before and after each use.)
11	Inner Glove Removal & Final Rad Screening	Remove inner gloves by rolling inside out, carefully avoiding touching outer surface to skin. Deposit the gloves in the disposable waste container at nearby Station 8. Screen hands and feet (and body if so directed by RSP/RCT) for gross β/γ and α contamination. IF ANY CONTAMINATION DETECTED > BACKGROUND LEVELS, CONTACT RSP/RCT IMMEDIATELY. As needed, wash and rinse hands and/or other exposed skin until levels of detection during screening are $\leq$ background levels prior to exiting the CRZ.
12	Field Wash	Wash exposed skin (e.g., hands and face); shower and redress in street clothes if such facilities are available on site.

OPTION 5
EXTENSIVE LEVEL-C DECONTAMINATION
SUGGESTED FACILITY EQUIPMENT

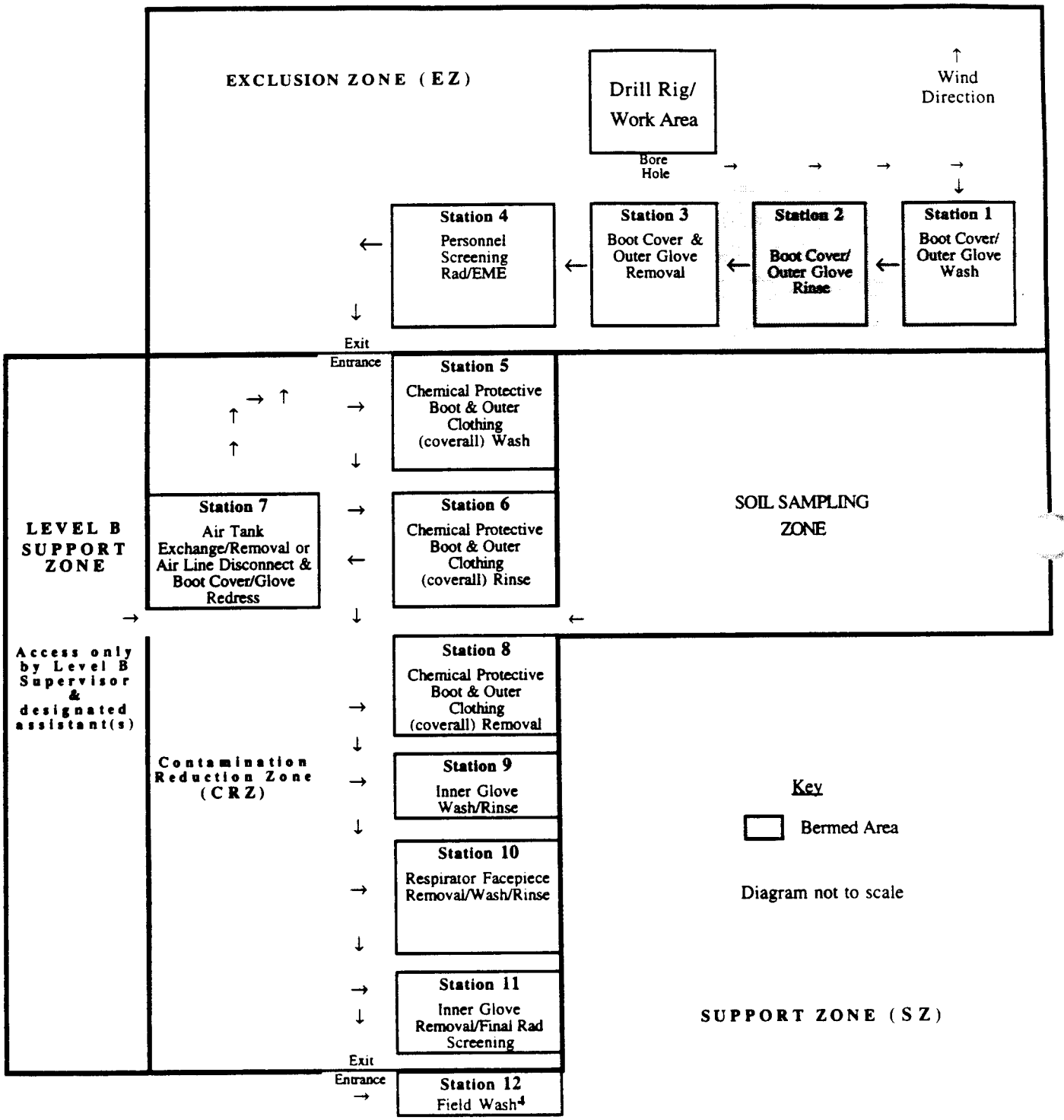
Listed by Decon Station No.

Decon Stn. No.	Decon Station Function	Equipment Items
1	Boot Cover/Outer Glove Wash	Berm Unit (e.g., 4" depth), 1 Container (10-30 gal; shallow), Detergent Solution (≤30 gal. aqueous), 1 Pressurized (garden) Sprayer (3-5 gal), 1 Scrub Brush (nylon bristle)
2	Boot Cover/Outer Glove Rinse	Berm Unit (e.g., 4" depth), 1 Container (10-30 gal; shallow), 1 Pressurized (garden) Sprayer (3-5 gal), Rinse Water (≤30 gal. non-potable)
3	Boot Cover & Outer Glove Removal	Bench/Chair/Stool (optional), Container/Drum (55 gal.), Drum Liner (55 gal.)
4	Personnel Screening Rad/EME	Table, Plastic Sheeting (tableslip), rad/EME screening instruments (dedicated to EZ)
5	Chemical Protective Boot/Clothing Wash	Berm Unit (e.g., 4" depth), 1 Container (10-30 gal; shallow), Detergent Solution (≤30 gal. aqueous), 1 Pressurized (garden) Sprayer (3-5 gal), 1 Scrub Brush (nylon bristle)
6	Chemical Protective Boot/Clothing Rinse	Berm Unit (e.g., 4" depth), 1 Container (10-30 gal; shallow), 1 Pressurized (garden) Sprayer (3-5 gal), Rinse Water (≤30 gal. non-potable)
7	APR Canister Exchange & Boot Cover/Glove Redress	PPE (e.g., gloves, tape, & boot covers) quantity as needed per SSHASP, Plastic Drop Cloth (~ 3' x 3') or Table and Plastic Sheeting (tableslip), and same supplies as Station 10 unless respirator facepiece decon step will only be done at Station 10
8	Chemical Protective Boot/Clothing Removal	Bench/Chair/Stool (optional), Container/Drum (55 gal.), Drum Liner (55 gal.)
9	Inner Glove Wash/Rinse	2 Qt.-size Squeeze Bottles (1 with liq. soap soln. & 1 with rinse water); (use same table as Station 11)
10	Respirator Facepiece Removal/Wash/Rinse	Disposable Towels (as needed), Disposable Sterile Wipe Pads (e.g., North Part No. 7003, as needed), Plastic Sheeting (tableslip), 2 Qt.-size Squeeze Bottles (1 with liq. soap soln. & 1 with rinse water), sponge; (use same table as Station 11)
11	Inner Glove Removal & Final Rad Screening	Table, Plastic Sheeting (tableslip), rad screening instruments (dedicated to CRZ), gloves can be tossed into waste container at Station 8
12	Field Wash	Bucket/Container (1-3 gal.), Disposable Towels (as needed), Hand Soap (bar or soln.), Paper Towel Waste Container (non-hazardous waste), Table and Plastic Sheeting (tableslip), Water Container (2.5 ≤ x ≤ 10 gal. non-potable)

Listed by Equipment Item

Equipment Item	Quantity Per Decon station		Total Quantity
	Decon Stn No.	Quantity	
Bench/Chair/Stool	3, 8	1 @ each stn.	2 (optional)
Berm Unit (e.g., 4" depth)	1, 2, 5, 6	1 each for stns. 1 & 2, and 5 & 6	2
Bucket/Container (1-3 gal)	12	1	1
Container (10-30 gal; shallow)	1, 2, 5, 6	1 @ each stn.	4
Container/Drum (55 gal)	3, 8	1 @ each stn.	2
Detergent Soln. (≤30 gal. aqueous)	1, 5	1 @ each stn.	2
Disposable Towels	7, 10, 12	As needed	As needed
Disposable Sterile Wipe Pads (e.g., North Part No. 7003)	7, 10	As needed	As needed
Drum Liner (55 gal)	3, 8	1 @ each stn.	2
Hand Soap (bar or soln)	12	1	1
Paper Towel Waste Container (non-hazardous waste)	12	1	1
Table & Plastic Sheeting (tableslip)	4, 7, 12	1 @ each stn.	3
PPE (e.g., gloves, tape, & boot covers)	7	As needed per SSHASP	As needed
Pressurized (Garden) Sprayer (3-5 gal)	1, 2, 5, 6	1 @ each stn., 2 @ Stns. 2 & 6 if solvent used	4 to 6
Qt.-size Squeeze Bottles (1 with liq. soap soln. & 1 with rinse water)	7, 10	2 @ each stn.	4
Scrub Brush (nylon bristle)	1, 5	1 @ each stn.	2
Rinse Water (≤30 gal) non-potable	2, 6	1 @ each stn.	2
Water Container (2.5 gal ≤ x ≤10 gal non-potable)	12	1	1

OPTION 6
EXTENSIVE LEVEL-B
DECONTAMINATION FACILITY LAYOUT



[4] Note that for Level B operations (especially during hot weather), it may be advantageous and necessary to have the Field Wash Station includ shower facility - not for decon purposes, but for field team personnel to cool down and rinse off perspiration. If a shower facility is specified the SSHASP, a street clothing redress facility (Station 13) in sequence following Station 12 will also be necessary.

OPTION 6

EXTENSIVE LEVEL-B DECONTAMINATION PROCEDURES

For waste management purposes and to minimize generation of mixed waste; the RCT, HPT, or RSP should scan the boots, gloves, and soiled areas of other PPE before personnel proceed to decon station 1. If contamination is detected, initiate rad decon procedure as directed by the RCT, HPT, or RSP before proceeding to decon station 1.

Decon Stn. No.	Decon Station F[illegible]	Procedure
1	Boot Cover/Outer Glove Wash	Step into container of wash detergent solution. Scrub boot covers and gloves with decon solution; if necessary, use detergent solution in pressurized sprayer to remove visible contamination. Step out of wash container and into Station 2 rinse container.
2	Boot Cover/Outer Glove Rinse	Rinse boot covers and gloves using pressurized water sprayer; if solvent necessary, rinse with it first followed by water rinse. Rinse effectively but sparingly to minimize generation of large amounts of potentially contaminated water.
3	Boot Cover & Outer Glove Removal	Remove outer boots, tape (if any accessible), and outer gloves. Deposit in lined waste container.
4	Personnel Screening Rad/EME	Screen hands, feet, and respirator (and coveralls if directed by RSP/RCT) for gross β/γ and α contamination. If any visable contamination on self, wash and rinse boots, inner gloves, PC, and/or respiratory equipment until levels detected during screening are $\leq$ background levels. If contamination detected still > background levels CONTACT SSO OR RSP/RCT IMMEDIATELY (See Section 8.2 of the HASP for further guidance.) This also is station for removing EME covering prior to transport into CRZ. Screen EME first; if contamination detected $\leq$ background levels, remove covering and deposit in lined waste container at Station 2 prior to carrying EME into CRZ. NOTE: IF ANY CONTAMINATION DETECTED > BACKGROUND LEVELS, CONTACT SSO OR RSP/RCT IMMEDIATELY. (See Sections 8.2.1 and 8.2.3 of the HASP for further guidance.)
5	Chemical Protective Boot/Protective Clothing/ Respiratory Equip. Wash	Wash chemical protective boots, outer clothing (coverall), and respiratory equipment using pressurized sprayer containing detergent solution. Rinse effectively but sparingly to minimize generation of large amounts of potentially contaminated water.
6	Chemical Protective Boot/Clothing/ Respiratory Equip. Rinse	Rinse chemical protective boots, outer clothing (coverall), and respiratory equipment using pressurized sprayer containing rinse water. Rinse effectively but sparingly to minimize generation of large amounts of potentially contaminated water.
7	Air Tank Exchange/ Removal or Air Line Disconnect & Boot Cover/Glove & Tape Redress	If worker leaves EZ only to exchange air tank, disconnect air line, or for adjustment of respirator equipment (e.g., an emergency), this is the last station in the decontamination sequence; if not, continue to Station 8 after task at this Station is completed. Level B Support Zone staff should be available to assist at this station. Doff respiratory equipment except for facepiece. Since the facepiece may still be somewhat contaminated and will be handled while wearing inner gloves; if facepiece is removed, decontaminate it following Stations 9 & 10 instructions. After removing facepiece, remove and trash inner gloves per Station 11 instructions. After completing intended task at this Station, don new inner and outer gloves, boot covers, and tape and return to EZ. The Level B Supervisor or assistant(s) will decontaminate the Level B equipment as needed per Level B Support Zone procedure at end of this table.
8	Chemical Protective Boot & Protective Clothing Removal	Remove tape (if any), then field coveralls by peeling inside out from neck down while being careful not to spread contamination from external surface of PC to street clothing, skin, or other areas. Deposit coveralls in lined waste container or neatly set them aside in relatively clean area of CRZ until reuse. (Note: If PC will be laundered rather than disposed, there must be separate, lined, clearly labeled containers available at this station: (1) for waste PC, (2) for laundry. Also, see Section 8.2.2 of the HASP.)
9	Inner Glove Wash/Rinse	Rinse inner gloves using water in squeeze bottle.

(continued)

OPTION 6
EXTENSIVE LEVEL-B DECONTAMINATION PROCEDURES (cont'd)

Decon Stn. No:	Decon Station Function	Procedure
10	Respirator Facepiece Removal/Wash/ Rinse	IF AT ANY TIME ANY VISABLE OR RAD CONTAMINATION WAS ON RESPIRATOR FACEPIECE, REFER TO LEVEL B SOP FOR FURTHER DECON INSTRUCTIONS. If no visible or rad contamination was on the facepiecs, carefully remove respirator facepiece while minimizing contact between gloved hands and exposed skin/hair. Squeeze soap solution from quart size squeeze bottle onto a paper towel and use soapy towel to clean respirator appropriately. Squeeze rinse water from other quart size squeeze bottle onto paper towel or sponge and wipe respirator until rinsed sufficiently. If respirator should be sterilized, use disposable sterile wipe pads. Deposit waste items in disposable waste container at adjacent Station 8. (Note: OSHA requires respirators be cleaned and sanitized regularly by user as frequently as necessary to ensure proper protection and inspected before and after each use.)
11	Inner Glove Removal & Final Rad Screening	Remove inner gloves by rolling inside out, carefully avoiding touching outer surface to skin. Deposit the gloves in the disposable waste container at nearby Station 8. Screen hands and feet (and body if so directed by RSP/RCT) for gross β/γ and α contamination. IF ANY CONTAMINATION DETECTED > BACKGROUND LEVELS, CONTACT RSP/RCT IMMEDIATELY. As needed, wash and rinse hands and/or other exposed skin until levels of detection during screening are $\leq$ background levels prior to exiting the CRZ.
12	Field Wash	Wash exposed skin (e.g., hands and face); shower and redress in street clothes if such facilities are available on site.
Level B Support Zone		Level B Supervisor or designated assistant(s) will assist field team members with donning, adjusting, decon, and removal of Level B respiratory equipment. Respirator tanks, hoses, air lines, and other reusable equipment other than facepieces should be washed with detergent solution using a pressurized sprayer, scrub brush, sponge, and/or squeeze bottle. Rinse equipment using water in a pressurized sprayer or squeeze bottle. If solvent rinse necessary, subsequently rinse with water. Rinse effectively but sparingly to minimize generation of large amounts of potentially contaminated water. Any disposable items should be disposed in the disposable waste container at Station 5 or a similar container located at this Station. Level B Support Zone staff shall decontaminate themselves following procedures for Stations 5, 6, 8, 9, &11 prior to exiting the CRZ. (Note respirator facepieces are screened per Station 4 instructions and decontaminated per Station 10 instructions.)

OPTION 6
EXTENSIVE LEVEL-B DECONTAMINATION
SUGGESTED FACILITY EQUIPMENT

Listed by Decon Station No.

Decon Stn. No.	Decon Station Function	Equipment Items
1	Boot Cover/Outer Glove Wash	Berm Unit (e.g., 4" depth), 1 Container (10-30 gal; shallow), Detergent Solution (≤30 gal. aqueous), 1 Pressurized (garden) Sprayer (3-5 gal), 1 Scrub Brush (nylon bristle)
2	Boot Cover/Outer Glove Rinse	Berm Unit (e.g., 4" depth), 1 Container (10-30 gal; shallow), 1 Pressurized (garden) Sprayer (3-5 gal), Rinse Water (≤30 gal. non-potable)
3	Boot Cover & Outer Glove Removal	Bench/Chair/Stool (optional), Container/Drum (55 gal.), Drum Liner (55 gal.)
4	Personnel Screening Rad/EME	Table, Plastic Sheeting (tableslip), rad/EME screening instruments (dedicated to EZ)
5	Chemical Protective Boot & Outer Clothing (coverall) Wash	Berm Unit (e.g., 4" depth), 1 Container (10-30 gal; shallow), Detergent Solution (≤30 gal. aqueous), 1 Pressurized (garden) Sprayer (3-5 gal), 1 Scrub Brush (nylon bristle)
6	Chemical Protective Boot & Outer Clothing (coverall) Rinse	Berm Unit (e.g., 4" depth), 1 Container (10-30 gal; shallow), 1 Pressurized (garden) Sprayer (3-5 gal), Rinse Water (≤30 gal non-potable)
7	Air Tank Exchange/ Removal or Air Line Disconnect & Boot Cover/Glove Redress	PPE (e.g., gloves & boot covers) quantity as needed per SSHASP, Bench/ Chair/Stool (optional)
8	Chemical Protective Boot & Outer Clothing (coverall) Removal	Bench/Chair/Stool (optional), Container/Drum (55 gal.), Drum Liner (55 gal.)
9	Inner Glove Wash/Rinse	2 Qt.-size Squeeze Bottles (1 with liq. soap soln. & 1 with rinse water); (use same table as Station 11)
10	Respirator Facepiece Removal/Wash/Rinse	Disposable Towels (as needed), Disposable Sterile Wipe Pads (e.g., North Part No. 7003, as needed), Plastic Sheeting (tableslip), 2 Qt.-size Squeeze Bottles (1 with liq. soap soln. & 1 with rinse water), sponge; (use same table as Station 11)
11	Inner Glove Removal & Final Rad Screening	Table, Plastic Sheeting (tableslip), rad screening instruments (dedicated to CRZ), gloves can be tossed into waste container at Station 8
12	Field Wash	Bucket/Container (1-3 gal.), Disposable Towels (as needed), Hand Soap (bar or soln.), Paper Towel Waste Container (non-hazardous waste), Table, Plastic Sheeting (tableslip), Water Container (2.5 ≤ x ≤ 10 gal. non-potable)
Level B Support Zone		Optional, to be specified in SSHASP or Level B SOP: Berm Unit (e.g., 4" depth), 2 Containers (10-30 gal; shallow), Detergent Solution (≤30 gal. aqueous), 2 Pressurized (garden) Sprayers (3-5 gal), Scrub Brush(es) (nylon bristle), Sponge(s), 2 Quart Size Squeeze Bottles, Plastic Drop Cloth (size to contain all Level B equipment/supplies), (optional) Table and Plastic Sheeting (tableslip), Container/Drum (55 gal.) & Drum Liner (optional if container at Station 8 sufficient for all CRZ disposable waste)

Listed by Equipment Item

Equipment Item	Quantity Per Decon station		Total Quantity
	Decon Stn No.	Quantity	
Bench/Chair/Stool	2, 4, 5, LBSZ	1 @ each stn.	4 (optional)
Berm Unit (e.g., 4" depth)	1, 2, 5, 6	1 each for stns. 1 & 2, and 5 & 6	2
Bucket/Container (1-3 gal)	12	1	1
Container (10-30 gal; shallow)	1, 2, 5, 6, LBSZ	1 @ each stn.	5 (LBSZ optional)
Container/Drum (55 gal)	3, 8, LBZX	1 @ each stn.	3 (LBSZ optional)
Detergent Soln. (≤30 gal. aqueous)	1, 5, LBSZ	1 @ each stn.	3 (LBSZ optional)
Disposable Towels	7, 10, 12, LBSZ	As needed	As needed
Disposable Sterile Wipe Pads (e.g., North Part No. 7003)	7, 10, LBSZ	As needed	As needed
Drop Cloth (plastic, size to contain all Level B equipment/supplies)	LBSZ	1	1
Drum Liner (55 gal)	3, 8, LBZX	1 @ each stn.	3 (LBSZ optional)
Hand Soap (bar or soln)	12, LBSZ	1 @ each stn.	1 (LBSZ optional)
Paper Towel Waste Container (non-hazardous waste)	12	1	1
Table & Plastic Sheeting (tableslip)	4, 11, 12, LBSZ	1 @ each stn.	4 (LBSZ optional)
PPE (e.g., gloves, tape, & boot covers)	7	As needed per SSHASP	As needed
Pressurized (Garden) Sprayer (3-5 gal)	1, 2, 5, 6, LBSZ	1 @ each stn.; 2 @ Stns. 2, 6, LBSZ if solvent used	5 to 8 (LBSZ optional)
Qt.-size Squeeze Bottles (1 with liq. soap soln. & 1 with rinse water)	7, 10, LBSZ	2 @ each stn.	6 (LBSZ optional)
Scrub Brush (nylon bristle)	1, 5, LBSZ	1 @ each stn.	3 (LBSZ optional)
Sponge(s)	10, LBSZ	1 @ each stn.	2 (LBSZ optional)
Rinse Water (≤30 gal) non-potable	2, 6, LBSZ	1 @ each stn.	3 (LBSZ optional)
Water Container (2.5 gal ≤ x ≤10 gal non-potable)	12	1	1

Appendix E

PHYSICIAN CERTIFICATION OF MEDICAL EVALUATION FORM

APPENDIX E - HASP

PHYSICIAN CERTIFICATION OF MEDICAL EVALUATION

COMPLETE PRIOR TO EMPLOYEE BEGINNING ASSIGNMENT AT LANL AND RETURN TO:

Los Alamos National Laboratory, Occupational Medicine Group,
Mail Stop D421, Los Alamos, NM 87545
Phone: 505/667-7890
Fax: 505/665-7879

INFORMATION PROVIDED BY REQUESTING EMPLOYER:

EMPLOYER:	EMPLOYEE:
Name: _____	Name: _____
Mailing Address: _____	DOB: _____
City, State, Zip: _____	SS #: _____
Phone: _____	
FAX Number: _____	

Description of LANL Job Assignment/Tasks: _____

_____

REQUIRED MEDICAL SURVEILLANCE/CERTIFICATION (SEE APPLICABLE REGULATIONS):

- ☐ Hazardous Waste operations (29 CFR 1926.65 or 29 CFR 1910.120)
- ☐ Use of personal protective equipment (29 CFR 1910.134 and ANSI Z 88.2)
  - ○ Air Purifying ○ half ○ full
  - ○ Supplied Air ○ half ○ full
  - ○ Self Contained Breath Apparatus (SCBA)
- ☐ Arsenic (29 CFR 1926.1118 (n) or 29 CFR 1910.1018)
- ☐ Asbestos/Beryllium (29 CFR 1926.1101(m) or 29 CFR 1910.1101)
- ☐ Benzene (29 CFR 1926.1128 or 29 CFR 1910.1028)
- ☐ Bloodborne Pathogens (29 CFR 1910.1030(f))
- ☐ Cadmium (29 CFR 1926.1127 or 29 CFR 1910.1027)
- ☐ Formaldehyde (29 CFR 1926.1148 or 29 CFR 1910.1048)
- ☐ High Noise Exposure - hearing protection (29 CFR 1910.95)
- ☐ Lead (29 CFR 1926.62 or 29 CFR 1910.1025)
- ☐ Vinyl Chloride (29 CFR 1926.1117 or 29 CFR 1910.1017)
- ☐ Other _____

TO BE COMPLETED BY THE EVALUATING PHYSICIAN:

Date Medical Evaluation Completed: _____

Work Restrictions Identified? ☐ No ☐ Yes (Describe) _____

_____

☐ I have completed a medical evaluation of this employee and he/she is **MEDICALLY CLEARED** to perform the job tasks as outlined above with restrictions (if any) as noted. The employee is physically fit to wear the required protective equipment including respirators as identified above. I have explained the results of this evaluation to the employee and have advised him/her of any medical conditions that require further examination or treatment.

Examining Physician Signature: _____ Mailing Address: _____

Physician Name (typed): _____ _____

Date: _____ Phone No. _____

FAX No. _____

OR

☐ I have completed a medical evaluation of this employee and I am **UNABLE TO MEDICALLY CLEAR** this employee to perform the job tasks as outlined above. I have explained the results of this evaluation to the employee and have advised him/her of any medical conditions that require further examination or treatment.

Examining Physician Signature: _____ Mailing Address: _____

Physician Name (typed): _____ _____

Date: _____ Phone No. _____

FAX No. _____

Appendix F

MEDICAL SURVEILLANCE

REQUIREMENTS AND FREQUENCIES

APPENDIX F

MEDICAL SURVEILLANCE REQUIREMENTS

Medical surveillance requirements are regulated by several OSHA standards, which are identified in this table together with the corresponding action levels triggering the requirements, the required medical surveillance, and the frequencies of surveillance. In accordance with this table and Section 11 of the HASP, site-specific medical surveillance requirements shall be specified in Section 11 of the SSHASP.

- ER Project work involving hazardous waste operations regulated by OSHA under 29 CFR 1926.65
- Substance(s) included in Table 2 of the HASP (Section 4.2.2.4), which are considered of occupational health concern in the hazard assessment (Table 4-2 of the SSHASP) are regulated under applicable OSHA standard(s) in Subparts D and Z of 29 CFR 1926
- Hearing conservation program requirements per 29 CFR 1910.95 and Sections 4.2.2.7 and 11 of the HASP.
- Respiratory protection program requirements per 29 CFR 1910.134 and Sections 7.1 and 11 of the HASP.

Hazard	Action Level	Minimum Requirements	Frequency
Hazardous Waste Operations - General	Potential for exposure to hazardous substances or health hazards ≥ PELs or published exposure limits while performing HAZWOPER work	29 CFR 1926.65(f), 29 CFR 1910.120, and Section 11 of the HASP • The physician shall be provided a copy of 29 CFR 1926.65 and Section 11 of the HASP • Medical and work history (or update if already on file) especially emphasizing symptoms related to hazardous substances and health hazards • Physical examination • Vital signs • Eye examination • Audiogram • EKG • Urinalysis • Blood chemistry • Complete blood count (CBC) • Pulmonary function tests (FVC and FEV_1) • Heavy metal screen (as appropriate/req'd below) • Evaluation of stresses related to repetitive motion • Evaluation of ability to wear PPE under conditions anticipated at work site(s)	Refer also to *LANL ER Project HASP* Section 11. • Baseline: Within first 30 days of HAZWOPER field work • Annual: At least once every 12 months, unless examining physician believes shorter or longer frequency is needed or required • Periodic: Per Section 11 of the *LANL ER Project HASP*
Arsenic (inorganic)	> 5 $\mu g/M^3$	29 CFR 1926.1118(n), 29 CFR 1910.1018, and Section 11 of the HASP • Physician shall be provided copy of 29 CFR 1926.1118 and Section 11 of HASP • Medical history, to include smoking history and presence and degree of respiratory symptoms (e.g., breathlessness, cough, sputum production, wheezing) • General medical evaluation per requirements under hazardous waste operations, plus: - 14" by 17" (35.56 x 43.18 cm) posterior-anterior chest X-ray and International Labor Office UICC/Cincinnati (ILO U/C) rating - Sputum cytology examination - Any other examination or test relevant to arsenic exposure deemed appropriate by examining physician to complete written medical opinion	At least annually for employees who are < 45 years of age with > 10 years of exposure to arsenic above the action level At least semi-annually for other employees exposed above the action level Upon termination of employment, whenever an employee covered by this requirement has not been examined within six months prior to termination of employment Whenever an employee develops signs or symptoms commonly associated with exposure to inorganic arsenic

Hazard	Action Level	Minimum Requirements	Frequency
Asbestos Beryllium	≥ 0.05 fiber/cc > 0.5 $\mu g/M^3$	Asbestos - 29 CFR 1926.1101(m), 29 CFR 1910.1101, and Section 11 of the HASP Beryllium - LANL AR 6-7 and TB 607 • Physician shall be provided copy of 29 CFR 1926.1101 or LANL AR-6-7, and Section 11 of HASP • Medical and work history emphasizing pulmonary, cardiovascular, and gastrointestinal systems • Standardized questionnaire contained in Appendix D of 29 CFR 1926.58 (Part 1 for initial/baseline exam, Part 2 for annual exam) • General medical evaluation per requirements under hazardous waste operations, plus: - chest X-ray administered at discretion of physician; interpretation and classification of chest X-rays according to Appendix E of 29 CFR 1926.58 • Any other exam or test relevant to asbestos or beryllium exposure deemed necessary by examining physician	When employee will work where asbestos may be ≥ Action Level, within first 40 days of initial job assignment and at least annually thereafter as long as such exposure continues, or more frequently if specified by examining physician
Benzene	≥ 0.5 ppm	29 CFR 1926.1128(i), 29 CFR 1910.1028, and Section 11 of the HASP • Physician shall be provided copy of 29 CFR 1926.1128 and Section 11 of HASP • Medical and work history, with particular attention to: - Past work exposure to benzene or any other hematological toxins - Family history of blood dyscrasias including hematological neoplasms - History of: * renal or liver dysfunction * medications * blood dyscrasias including genetic hemoglobin abnormalities, bleeding abnormalities, and abnormal function of formed blood elements * previous exposure to ionizing radiation * exposure to marrow toxins outside of current work situation • General medical evaluation per requirements under hazardous waste operations • Any additional tests relevant to benzene exposure deemed necessary by the examining physician **NOTE:** Immediately following each occasion an employee is removed from exposure to benzene because of hematological findings pursuant to paragraphs (i)(8)(i) & (ii), the employer shall provide the employee with six months of medical removal protection benefits according to paragraph (i)(9).	Prior to initial assignment and at least annually thereafter whenever employee works where benzene exposure ≥ Action Level. Initial examination not required if adequate records show employee has been examined according to requirements within past 12 months. Whenever employee develops symptoms commonly associated with toxic exposure to benzene Emergency Examinations: Whenever an employee is exposed to benzene during an emergency situation; if result is ≥ 75 mg phenol per liter, complete blood count shall be done (similar to Initial Examination) at monthly intervals for a duration of three months following the emergency Additional Examination and Referrals: Blood count shall be repeated witin two weeks whenever: • Hemoglobin level or hematocrit fall below normal limit (outside 95% confidence interval[C.I.]), as determined by the lab for the particular geographic area and/or these indices show persistent downward trend from employee's pre-exposure norms (providing findings cannot be explained by other medical reasons) • Thrombocyte (platelet) count varies more than 20% below employee's most recent values or falls outside normal limit (95% C.I.) as determined by the lab • Leukocyte count below 4,000 per mm^3 or an abnormal differential count If abnormality persists, examining physician shall refer employee to hematologist or internist or further evaluation (per paragraphs (i)(5)(iii) & (iv)) unless examining physician has good reason to believe such referral is unnecessary. When physician makes referral to hematologist/internist, employee shall be removed from areas where exposure to benzene may exceed action level, until such time as physician determines according to (i)(8)(ii).

Hazard	Action Level	Minimum Requirements	Frequency
Occupational Exposure to Bloodborne Pathogens (see Section 9.3.1.3)	Any occupational exposure	29 CFR 1910.1030(f) and Section 11 of the HASP Physician shall be provided copy of 29 CFR 1910.1030 and Section 11 of HASP Medical evaluations and procedures shall be provided according to recommendations of U.S. Public Health Service, Center for Disease Control and Prevention current when evaluations and procedures occur Employees Having Occupational Exposure Potential: Hepatitis B vaccine and vaccination series shall be offered by employer to employees who have occupational exposure potential. Employer shall assure that employees who decline to accept hepatitis B vaccination offered by employer sign statement in Appendix A of standard.	Employees Having Occupational Exposure Potential: Hepatitis B vaccination shall be offered to employee within 10 working days of initial assignment; unless employee has previously received complete hepatitis B vaccination series, antibody testing has revealed employee is immune, or vaccine is contraindicated for medical reasons. If employee declines hepatitis B vaccination but later while still covered under standard decides to accept vaccination, employer shall make vaccination available then.) Post-Exposure Evaluation and Follow-up: Immediately following report of exposure incident
Cadmium	$\geq 2.5\ \mu g/M^3$ and all employees performing tasks involving cadmium (e.g., brazing, burnig, cutting, painting, welding)	29 CFR 1926.1127(l), 29 CFR 1910.1027, and Section 11 of the HASP • Physician shall be provided copy of 29 CFR 1926.1127 and Section 11 of HASP • Medical and work history emphasizing past, present and anticipated future exposure to cadmium; any history of renal, cardiovascular, respiratory, hematopoietic, reproductive, and/or musculo-skeletal system dysfunction; current usage of medication with potential nephrotoxic side-effects; and smoking history and current status • General medical evaluation per requirements under hazardous waste operations, plus: - Cadmium in urine (CdU) standardized to grams of creatinine (g/Cr) - Beta-2 microglobulin in urine (β_2-M) standardized to grams of creatinine (g/Cr) with pH specified per Appendix F of 29 CFR 1926.1127 - Cadmium in blood (CdB) standardized to liters of whole blood (lwb) - 14" by 17" posterior-anterior chest X-ray (frequency to be determined by examining physician) - For males > 40 years of age, prostrate palpatation or other at least as effective diagnostic test • Any additional tests or procedures relevant to cadmium exposure deemed appropriate by examining physician Termination of Employment Examination: Per paragraph (l)(8) of the standard NOTE: Collection and handling of biological samples of cadmium in urine (CdU), cadmium in blood (CdB), and beta-2 microglobulin in urine (β_2-M) taken from employees is done in a manner that assures reliability and that analyses are performed by a proficient laboratory (refer to Appendix F of standard)	Initial Examination: When employee will work where cadmium may be ≥ Action Level, within first 30 days of initial job assignment.. Initial exam not required if adequate records show employee has been examined according to requirements within past 12 months.) Action Triggered by Results of Medical Examination: • Take actions according to paragraph (l)(5) of standard Action Triggered by Results of Biological Monitoring: CdU ≤ 3μg/g Cr, β_2-M ≤ 300μg/g Cr, and CdB≤ 5μg/lwb : • Periodic medical exam and biological monitoring within 12 months after initial exam; and thereafter, medical exam at least biennially and biological monitoring at least annually CdU > 3μg/g Cr, β_2-M > 300μg/g Cr, and CdB > 5μg/lwb : • Take actions according to paragraph (l)(3)(ii), possibly including medical removal from work where exposure to cadmium is excessive [per paragraphs (l)(11) & (12)] CdU > 15μg/g Cr, β_2-M > 1,500μg/g Cr, and CdB > 15μg/lwb through the year 1998, and CdU > 7μg/g Cr, β_2-M > 750μg/g Cr, and CdB > 10μg/lwb as of the year 1999 : • Take actions according to paragraph (l)(3)(iii), possibly including medical removal from work where exposure to cadmium is excessive [per (l)(11) & (12)] Termination of Employment Exam: Upon termination of employment, whenever employee covered by requirement has not been examined within 6 months prior to termination of employment Emergency Examination: As soon as possible for any employee who may have been acutely exposed to cadmium Multiple Physician Review: If examining physician was selected by employer, employee has right to designate a 2nd physician to review any finding, determinations, or recommendations of inital examining physician; and to conduct such examinations, consultations, and laboratory tests as 2nd physician deems necessary to for review.

Hazard	Action Level	Minimum Requirements	Frequency
Formaldehyde	≥ 0.5 ppm	29 CFR 1926.1148(l), 29 CFR 1910.1048, and Section 11 of the HASP • The physician shall be provided a copy of 29 CFR 1926.1148 and Section 11 of the HASP • Medical and work history designed to elicit information on work history, smoking history, any evidence of eye, nose, or throat irritation; chronic airway problems or hyperactive airway disease; allergic skin conditions or dermatitis and upper or lower respiratory problems • General medical evaluation per requirements under hazardous waste operations, emphasizing evidence of irritation or sensitization of skin and respiratory system, shortness of breath, or irritation of eyes • Any other test relevant to formaldehyde exposure deemed necessary by examining physician to complete the written opinion	Medical Disease Questionnaire: Prior to assignment to work where action level of formaldehyde is reached and annually thereafter Medical Examination: At the time of initial assignment to work where action level of formaldehyde may be met or exceeded and annually thereafter, for any employee the physician feels (based upon evaluation of the Medical Disease Questionnaire) may be at increased risk from expoasure to formaldehyde Emergency Exposures: Any employee who has been exposed to formaldehyde in an emergency
Hearing Protection	≥ 85 dBA (nonLaboratory personnel) ≥ 80 dBA (Laboratory personnel)	29 CFR 1910.95(g) and Sections 4.2.2.7 and 11 of the HASP • The physician shall be provided a copy of 29 CFR 1910.95 and Section 11 of the HASP Audiogram per Appendix C of 29 CFR 1910.95	Baseline (within 6 months of initial exposure at or above Action Level) and annually thereafter
Lead	≥ 30 µg/M^3	29 CFR 1926.62(j), 29 CFR 1910.1025, and Section 11 of the HASP • Physician shall be provided copy of 29 CFR 1926.62 and Section 11 of HASP • Medical and work history emphasizing past lead exposure, smoking, hygiene, and past gastrointestinal, hematologic, renal, cardivoascular, reproductive and serological problems • General medical evaluation per requirements under hazardous waste operations, plus: - Thorough examination with particular attention to teeth, gums, hematologic, gastrointestinal, renal, cardiovascular, neurological and pulmonary systems - Blood sample and analyses for: - Blood lead level - Red cell indices - Zinc protoporphyrin - Examination of peripheral smear morphology • Any lab or other test relevant to lead exposure deemed necessary by examining physician Biological Monitoring: • Blood sampling and analysis for lead and zinc protoporphyrin	Medical Examinations/Consultations: When employee may be exposed ≥ Action Level: at least annually for any employee whose blood lead level at any time during the preceding 12 months was ≥ 40 µg/dl As soon as possible whenever employee has developed symptoms commonly associated with lead intoxication, employee desires medical advise concerning effects of lead exposure on ability to procreate a healthy child, employee is pregnant, or has exhibited difficulty in breathing during respirator fit-test or use Biological Monitoring: If employee exposed ≥ Action Level, or may be exposed ≥ Action Level, and if last blood analysis indicated ≥ 40 µg/dl: at least every two months until two consecutive blood samples and analyses indicate blood lead level < 40 µg/dl If employee may be exposed ≥ Action Level: at least every two months for the first 6 months and every 6 months thereafter

Hazard	Action Level	Minimum Requirements	Frequency
Respiratory Protection	Use of a respirator	29 CFR 1910.134(b)(10), ANSI Z88.2, and per Sections 7.1 and 11 of the HASP Physician shall be provided copy of 29 CFR 1910.134 and Section 11 of HASP General medical evaluation per requirements under hazardous waste operations. Any other test deemed necessary by examining physician to complete the written opinion	Annually, as applicable
Vinyl Chloride	> 0.5 ppm	29 CFR 1926.1117(k), 29 CFR 1910.1017, and Section 11 of the HASP • The physician shall be provided a copy of 29 CFR 1926.1117 and Section 11 of the HASP • Medical and work history emphasizing: - Alcohol intake - Past history of blood transfusions - Past history of hepatitis - Past history of hospitalization - Work history and past exposure to potential hepatotoxic agents, including drugs and chemicals • General medical evaluation per requirements under hazardous waste operations with specific attention to detecting enlargement of liver spleen or kidneys, or dysfunction of these organs, and for abnormalities in skin, connective tissues and pulmonary system (refer to Appendix A of this standard) • Any other test relevant to vinyl chloride exposure deemed necessary by examining physician to complete the written opinion Lab analyses shall be performed by laboratory licensed under 42 CFR Part 74 A statement of employee's suitability for continued exposure to vinyl chloride including use of PPE and respirators shall be obtained from examining physician promptly after examination; a copy shall be provided to the employee	At the time of initial assignment and: • Every 6 months for employees who have been employed in vinyl chloride or polyvinyl chloride manufacturing for ≥ 10 years • Annually for all others Each employee exposed to an emergency involving vinyl chloride exposure

LANL ER PROJECT
MODEL
SITE-SPECIFIC HEALTH AND SAFETY PLAN (SSHASP)

Project Title _____

TA(s) _____

This plan addresses the health and safety criteria to be followed during investigation, remediation or decommissioning activities associated with the Environmental Restoration (ER) Project at the Los Alamos National Laboratory (LANL)

Reviewed and Approved by:

Signature	Name/Title	Company	Date
Field Unit Health and Safety (HS) Representative			
Health Physics Operations (ESH-1)			
FTM/DPL or FTL/JS (optional at discretion of FPL)			
Technical Area (TA) Representative (Faclity Management or HS Professional)			
Field Project Leader (FPL)			

Concurrence by:

Signature	Name/Title	Company	Date
Subcontractor Management or HS Representative			
Subcontractor Management or HS Representative			
[Other specify]			

The comments of the above reviewers have been incorporated as stipulated, or resolved with written record and copy to the respective reviewer.

Plan Preparer Name/Signature	Group	Date	Mailstop	Phone

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LIST OF ACRONYMS and ABBREVIATIONS

ACGIH ..... American Conference of Governmental Industrial Hygienists
ALARA ..... As Low As Reasonably Achievable
AL ..... Action Level
ANSI ..... American National Standard Institute
APR ..... Air-Purifying Respirator
AR ..... Administrative Requirements
ATM ..... Atmosphere
°C ..... Degrees Centigrade
CFR ..... Code of Federal Regulations
CGI ..... Combustible Gas Indicator
CP ..... Competent Person
CPR ..... Cardiopulmonary Resescitation
CRZ ..... Contamination Reduction Zone
DAC ..... Derived Air Concentration
dBA ..... Decibels (A-Weighted Scale)
DOE ..... U.S. Department of Energy
DOT ..... U.S. Department of Transportation
DPL ..... Decommissioning Project Leader
EPA ..... U.S. Environmental Protection Agency
ER ..... Environmental Restoration
ESH ..... Environmental, Safety and Health
ESH-1 ..... Health Physics Operations Group
ESH-2 ..... Occupational Medicine Group
ESH-5 ..... Industrial Hygiene and Safety Group
ESH-12 ..... Policy and Program Analysis Group
eV ..... Electron Volts
EZ ..... Exclusion Zone
°F ..... Degrees Fahrenheit
Fibers/cc ..... Fibers Per Cubic Centimeter
FID ..... Flame Ionization Detector
FPL ..... Field Project Leader
FTL ..... Field Team Leader
FTM ..... Field Team Manager
GET ..... General Employee Training
HASP ..... Health and Safety Plan
HAZWOPER ..... Hazardous Waste Opertations
HEPA ..... High Efficiency Particulate Air
HPT ..... Health Protection Technician

HS ..... Health and Safety
IARC ..... International Agency for Research on Cancer
IDLH ..... Immediately Dangerous to Life or Health
IHT ..... Industrial Hygiene Technician
IP ..... Ionization Potential
JS ..... Job Superintendent
LAMC ..... Los Alamos Medical Center
LANL ..... Los Alamos National Laboratory
LEL ..... Lower Explosive Limit
LP ..... Laboratory Procedure
mg/Kg ..... Micrograms Per Kilogram
mg/m^3 ..... Milligrams Per Cubic Meter
mm ..... Millimeters
MSDS ..... Material Safety Data Sheet
MUC ..... Maximum Use Concentration
NIOSH ..... National Institute for Occupational Safety and Health
NRR ..... Noise Reduction Rating
OSHA ..... Occupational Safety and Health Administration
PAH ..... Polycyclic Aromatic Hydrocarbons
PEL ..... Permissible Exposure Limit
PF ..... Protection Factor
PID ..... Photoionization Detector
PNA ..... Polynuclear Aromatics
PPE ..... Personal Protective Equipment
PRS ..... Potential Release Site
RCT ..... Radiological Control Technician
RMMA ..... Radioactive Materials Management Area
RSP ..... Radiological Screening Personnel
RWP ..... Radiological Work Permit
SC ..... Spill Containment
SLM ..... Sound Level Meter
SOP ..... Standard Operating Procedures
SSHASP ..... Site-Specific Health and Safety Plan
SSO ..... Site Safety Officer
SUP ..... Supervisor
SWMU ..... Solid Waste Management Unit

SWP ..... Special Work Permit
SZ ..... Support Zone
TA ..... Technical Area
TLD ..... Thermoluminescent Dosimeter
TLV ..... Threshold Limit Value
TWA ..... 8-Hour Time-Weighted Average

1.0 INTRODUCTION

This Site-Specific Health and Safety Plan (SSHASP) has been developed for the Environmental Restoration (ER) Project at the Los Alamos National Laboratory (LANL) to comply with applicable federal and state occupational health and safety (HS) requirements, including those of the U.S. Department of Energy (DOE). The DOE requires LANL to comply with the federal Occupational Safety and Health Administration (OSHA) requirements, although operations at LANL are not subject to the jurisdiction of OSHA. The ER Project has developed a generic Health and Safety Plan, the ER Project HASP, which establishes HS information and requirements applicable to ER field operations projectwide. In addition to the HASP, this SSHASP establishes site-specific HS information and requirements applicable to the scope of work described in Section 2.

ER participants are responsible for conducting work in accordance with applicable regulations. The term "ER participants" refers to anyone performing ER work, including LANL, subcontractors to LANL and their lower-tier contractors, consultants, and agents. In some cases in this document, LANL has chosen to invoke OSHA and LANL requirements which ordinarily may not apply to ER field operations (e.g., OSHA's general industry standards in Part 1910 of Title 29 of the Code of Federal Regulations [29 CFR 1910]). These choices were made on a case-by-case basis to maintain consistency with LANL's ALARA policy and to clarify LANL's expectations with regard to interpretable requirements of the multiple agencies governing ER work. Where there is concern that implementation of work orders or HS requirements would conflict with contract terms, or could unreasonably compromise the safety or health of an individual or the environment, such concerns should be brought to the attention of the Contract Administrator and the Field Unit HS Representative immediately. Failure to comply with terms of HS plans may constitute cause to stop activity or for issuance of a stop work order as specified in Section 3.4.2 of the HASP without cost or penalty to LANL.

This SSHASP shall be reviewed and approved in accordance with Section 1.2 of the HASP. Once this SSHASP has been approved, revisions will be tracked using a SSHASP modification form (Appendix B of the HASP) per Section 1.3 of the HASP. Modifications to this SSHASP may require a change to the terms or scope of a subcontract. Completion of a SSHASP modification form is <u>not</u> the means for modifying the scope or terms of the project contract. To modify a contract, the Subcontractor shall notify the Contract Administrator and Field Unit HS Representative under the changes clause and shall not proceed with the change until a change order has been mutually agreed between the parties, or unless unilateral direction is given by the Contract Administrator.

2.0 BACKGROUND INFORMATION

Project Title:	
TA(s):	
Objective:	
Classification of Work:	
❑ NON-ENVIRONMENTAL RESTORATION	❑ INTERIM ACTION
❑ SITE CHARACTERIZATION: *[check all that apply]*	
❑ Non-Intrusive (e.g., surveying)	❑ Intrusive - Drilling
❑ Limited Intrusive - Hand Auguring or Surface Sampling	❑ Intrusive - Trenching or Excavation
❑ Intrusive - Other *[specify]*:	
❑ VOLUNTARY CORRECTIVE ACTION (VCA)	❑ EXPEDITED CLEAN-UP
❑ DECOMMISSIONING	

TABLE 2-1
SITE DESCRIPTION(S)

[Atop the blank columns, enter the investigational/work site ID(s); sites having the same information may be grouped in the same column. Unless otherwise instructed, enter an "X" in the corresponding box below to indicate the characteristics and/or potential contaminants of concern for each site or group of sites. As appropriate, include a general introductory description of sites or groups of sites in this box. According to Section 2 of the HASP, in Appendix A provide map(s) showing location and approx. size of each site (e.g., boundaries, distances to landmarks, and dimensions or acreage) and critical adjacent structures and/or facilities that might be influenced by field operations. For each of the chemical substances checked, include the highest known data values in Appendix B. Provided below are columns for 23 sites or group of sites. If the project involves fewer sites, delete excess columns and widen those retained. If the project involves more sites or if wider columns are necessary, work with your Field Unit HS Representative to modify the table appropriately (e.g., print additional sites on separate pages or use 8.5" x 14" paper).]

DESCRIPTOR	SITE(s)																						
Characteristics																							
Adjacent Facilities/Structures																							
Roads/Highways																							
Building/Foundation																							
Above Ground Storage Tank																							
UST																							
Below Ground Utilities:																							
Electric																							
Cable																							
Gas																							
Phone																							
Water																							
Sewer																							
Other *[specify]*:																							
Above Ground Electric:																							
≤ 50 kV																							
≥ 50 kV																							
> 345 kV																							
Other *[specify]*:																							

DESCRIPTOR	SITE(s)																						
Topography																							
Canyon Bottom																							
Canyon Slopes *(enter approx. % grade)*																							
Mesa Top																							
Rolling Hills																							
Meadow																							
Streams																							
Other *(specify)*:																							
Pathways of Uncontrolled Release Dispersion	*(for land and water indicate direction, e.g., N, NE, etc.)*																						
Land																							
Air																							
Water																							
Emergency Accessibility	*(indicate "Y" or "N")*																						
Land																							
Air																							
Water																							
Previous Onsite Facilities/Operations	*(where applicable indicate spatial dimensions)*																						
Research																							
Production																							
Previous Release/Spill																							
UST																							
Firing Site																							
Plating																							
Landfill (municipal)																							
Landfill (mixed waste)																							
Storage (rad. mat'ls)																							
Storage (chem. mat'ls)																							
Storage (chem.. waste)																							
Storage (rad. waste)																							
Storage (mixed waste)																							

DESCRIPTOR	SITE(s)																						
Other *[specify]*:																							
Previous ER Information and/or Data Available																							
Knowledge of Process																							
Initial Scoping/ Reconnaissance																							
Phase I																							
Phase II																							
Analytical Data (screening)																							
Analytical Data (validated)																							
Risk Assessment																							
VCA																							
Remediation																							
Other *[specify]*:																							
Previous Substances Used, Disposed, Detected or Suspected																							
High Explosives (HE)																							
Not applicable																							
[specify]																							
Radionuclides	*[indicate isotopes]*																						
Not applicable																							
Americium																							
Cesium																							
Plutonium																							
Strontium																							
Uranium																							
Other *[specify]*:																							
Inorganics																							
CORROSIVE ACIDS/BASES																							
Not applicable																							
Ammonium Hydroxide																							
Chromic Acid/Chromates																							

DESCRIPTOR	SITE(s)																						
Hydrochloric Acid																							
Nitric Acid																							
Perchloric Acid																							
Permanganates																							
Phosphoric Acid																							
Sodium Hydroxide																							
Sulfuric Acid																							
Other *[specify]*:																							
HALOGENS																							
Not applicable																							
[specify]:																							
METALS																							
Not applicable																							
Arsenic																							
Barium																							
Beryllium																							
Cadmium																							
Chromium																							
Copper																							
Lead																							
Mercury																							
Nickel																							
Selenium																							
Silver																							
Thallium																							
Zinc																							
Other *[specify]*:																							
MINERALS *[indicate %]*																							
Not applicable																							
Asbestos (amosite)																							
Asbestos (chrysotile)																							
Asbestos (crocidolite)																							
Asbestos *[other specify]*:																							

DESCRIPTOR	SITE(s)																						
Silica/Quartz																							
Other *[specify]*:																							
OTHER *[specify]*																							
Organics																							
ACIDS																							
Not applicable																							
Acetic																							
Trichloroaetic (TCA)																							
Other *[specify]*:																							
ALCOHOLS																							
Not applicable																							
Butyl																							
Ethyl																							
Glycols *[specify]*:																							
Methyl																							
Other *[specify]*:																							
ALDEHYDES																							
Not applicable																							
Formaldehyde																							
Other *[specify]*:																							
GASES																							
Not applicable																							
Carbon Disulfide																							
Hydrogen Cyanide																							
Hydrogen Sulfide																							
Other *[specify]*:																							
HYDROCARBONS (Halogenated)																							
Not applicable																							
Carbon Tetrachloride																							
Chlorobenzenes																							
Chloroform																							
1,1-Dichloroethane																							

DESCRIPTOR	SITE(s)																						
Dichloroethylene																							
Dichlorobenzene																							
Dioxins																							
Freons *(specify)*:																							
Hexachloro compounds																							
Methyl Chloroform (1,1,1-Trichloroethane)																							
Methylene Chloride																							
Perchloroethylene (1,1,2,2-Tetrachloroethylene)																							
Pentachlorophenol																							
1,1,2-Trichloroethane																							
Trichloroethylene																							
Trichlorophenol																							
Vinyl Chloride																							
Vinylidene Chloride																							
Other *(specify)*:																							
HYDROCARBONS (Non-Halogenated)																							
Not applicable																							
Hexane																							
(specify)																							
HYDROCARBONS (Petroleum Based)																							
Not applicable																							
Benzene																							
Diesel																							
Ethyl Benzene																							
Gasoline																							
Oil *(specify)*:																							
Petroleum distillate/ Stoddard solvent																							
PNAs/PAHs *(specify)*:																							
Toluene																							
Xylenes																							

DESCRIPTOR	SITE(s)																						
Other *[specify]*:																							
KETONES																							
Not applicable																							
Acetone																							
Methyl ethyl ketone (MEK)																							
[specify]																							
PESTICIDES																							
Not applicable																							
[specify]																							
PCBs																							
Not applicable																							
[specify % chlorine]																							
OTHER																							
Not applicable																							
[specify]																							

TABLE 2-2
SCOPE OF WORK

[Briefly describe tasks and enter the corresponding site ID(s) and anticipated dates/duration of work by month. Example task descriptions are given below. Note that a particular task may involve multiple subtasks. For example, the task, "Equipment Decontamination", may include the subtask of "Steam Cleaning". The reason this distinction may be necessary is that for some tasks there may be separately identifiable subtasks that have different potential hazards associated with them or may require different exposure monitoring, protective measures, PPE, and/or training. For this reason, separate tasks or subtasks should be designated to account for variations by site as well as by task.]

Task ID	Task Description	Site ID(s)	Anticipated Dates/Duration
Task 1 - Site Preparation	This task will involve the installation of access road(s), perimeter security fencing, mobile trailers, electrical power, telephone lines, and sanitation facilities. Associated subtasks include: **1-A Heavy Equipment Operation:** Describe who, where, how this will be accomplished **1-B Installation of Electrical Power:** Describe who, where, how this will be accomplished and voltage(s) involved		
Task 2 - Site Characterization	This task will involve drilling outside former landfill site to further characterize types and extent of contamination present at various site locations. Associated subtasks include: **2-A Mobilization/Demobilization:** Set up and removal of site control boundaries, equipment, and supplies. **2-B Drilling:** to depths of approx. __ ft. using a (specify: hand auger, hollow stem auger rig, air rig, mud rig, or other) **2-B.1 Equipment Maintenance and Repair:** May involve use of solvents, fuels, compressed/flammable gases during cleaning and/or welding operations. **2-C Excavating:** to depths/widths of approx. __ ft. /__ ft. using a (specify: back hoe, ditch-witch, or other) **2-D Exposure Monitoring:** Use of real-time and integrated monitoring equipment to screen for employee exposures to radiological, chemical, physical and safety hazards, especially in the EZ **2-E Soil Sampling:** Screening and sampling of soils contained in hollow-stem auger cores and preparation of samples for shipment and analysis **2-F Equipment Decontamination:** Use of pressurized and/or steam cleaning solutions (aqueous), and possibly methanol (non-pressurized) to clean potentially/actually contaminated equipment in the EZ **2-G Personnel Decontamination:** (only need to include this if dedicated decon team will be performing this; usually only have this for larger and/or messier tasks [e.g., remedial actions and/or Level B work])		

Task ID	Task Description	Site ID(s)	Anticipated Dates/Duration
Task 3 - Borehole Completion	Completion of boreholes by a crew separate from the site characterization crew. To be done using a smaller completion rig to install equipment for on-going sampling and testing of gases and liquids in boreholes. Prior to initiating this task, hazards will be reassessed using information obtained during site characterization effort. This task is expected to involve the following subtasks, several of which may occur simultaneously: **3-A Mobilization/Demobilization:** Set up and removal of site control boundaries, equipment, and supplies. **3-B Completing Boreholes:** Describe who, where, how this will be accomplished **3-C Exposure Monitoring:** Use of real-time and integrated monitoring equipment to monitor employee exposures to radiological, chemical, physical and safety hazards **3-D Equipment Decontamination:** Use of pressurized and/or steam cleaning solutions (aqueous), and possibly methanol (non-pressurized) to clean potentially/actually contaminated equipment in the EZ **3-E Personnel Decontamination:** (see comment under 2-G)		
Task 4 - On-Site Waste Management	On-site coordination of waste management, including identification, handling, transport, and disposition of non-hazardous, potentially hazardous and hazardous wastes. This task will be accomplished according to the Project-Specific Waste Management Plan and may occur simultaneous as Tasks 2 or 3 are occurring. Every effort shall be made not to perform this task within the EZ during operations involving use of Level B PPE. Associated subtasks include: **4-A Containing and Labeling Wastes:** Describe; indicate whether drums, bags and/or dumpsters will be used and in which zone(s) this activity will occur **4-B Transporting Waste Containers for Temporary/Permanent Disposal:** describe who will perform this task, where and how		
Task 5 - On-Going Monitoring	On-going sampling and testing of borehole gases/liquids. Determination of level(s) of PPE to be used to perform this work will depend on the data collected during Tasks 2 and 3 identifying gases/liquids within the boreholes, and the extent to which the gases and liquids may be expected to build up within the boreholes. Associated subtasks include: **5-A Mobilization/Demobilization:** Set up and removal of site control boundaries, equipment, and supplies. **5-B Collecting Monitoring Samples/Readings:** using (specify: equipment and/or brief description of how task will be accomplished with focus on potential hazard producing actions) **5-C Exposure Monitoring:** Use of real-time and integrated monitoring equipment to monitor employee exposures to radiological, chemical, physical and safety hazards **5-D Equipment Decontamination:** Use of pressurized and/or steam cleaning solutions (aqueous), and possibly methanol (non-pressurized) to clean potentially/actually contaminated equipment in the EZ		

Task ID	Task Description	Site ID(s)	Anticipated Dates/Duration
Task 6 - Incident Response	Response to an incident (i.e., rendering first-aid/CPR, hazardous substance release, fire, and spill containment) tasks will be performed as necessary and in accordance with Sections 7, 9 and 10 of the HASP and this SSHASP. This task includes the following subtasks: **6-A First-aid/CPR** **6-B Fire Fighting** **6-C Incident Response** *[in accordance with 29 CFR 1926.65(q)(6)(ii)* **6-D Spill Containment** *[in accordance with 29 CFR 1926.65(q)(6)(ii)*		

3.0 ORGANIZATION, RESPONSIBILITIES, and AUTHORITY

Definition of HS roles, responsibilities, authorities, and lines of communication for key personnel identified below are defined in Section 3 of the HASP.

TABLE 3-1
KEY PERSONNEL HAVING HS RESPONSIBILITY

Title	Name	Organization	Phone/Pager
Facility Contacts			
Facility Manager			
Facility Operations Safety Personnel			
Field Project Management			
Field Project Leader (FPL)			
Alternate to FPL			
Field Team Manager (FTM)			
Field Team			
Field Team Leader (FTL)			
Alternate FTL			
Supervisor *[other, specify]*	*[Repeat this line to identify each employer's supervisor of site activities; delete if not applicable]*	Contractor X	
Site Safety Officer (SSO)			
IH Technician (IHT)			
Radiological Control Technician (RCT)			
Health Protection Technician (HPT)			
Radiation Screening Personnel (RSP)			
Trenching/Excavation Competent Person (CP)			
Trenching/Excavation - Registered Professional Engineer (PE)			
Confined Space Entry Supervisor			
Other *[specify]*:			
Support Personnel			
Field Unit HS Representative			
Subcontractor HS/Management Rep.	*[Repeat this line to identify each employer's supervisor of site activities; delete if not applicable]*	Contractor X	
Other *[specify]*:			
Alternate Personnel			
Alternate SSO			
Alternate Health Physics Support: ☐ RSP ☐ RCT ☐ HPT			

4.0 HAZARD ANALYSIS

Provided in this section are the task-specific hazard analysis information and requirements in accordance with Section 4 of the HASP.

4.1 PROJECT PERSONNEL

The personnel identified below by role are expected to perform the task(s) indicated.

TABLE 4-1
PROJECT PERSONNEL BY TASK

[Atop the blank columns, enter the ID of each task involving different personnel roles; tasks involving the same roles may be identified in the same column. Identify the personnel by role who will be performing the task(s) described in Table 2-2 by entering an "X" in the corresponding box. When there will be two or more team members performing the same role on a given task, account for this below by repeating the title (e.g., Sampler 1, Sampler 2) in separate rows. If there will be more than one team and the tasks(s) for a particular personnel role will differ, split the table into subsections identifying each field team. Provided below are 23 blank columns. If fewer columns are necessary, delete excess columns and widen those retained. If more columns are necessary, work with your Field Unit HS Representative to modify the table appropriately (e.g., print additional columns on separate pages or use 8.5" x 14" paper).

PERSONNEL ROLE	TASK(s)																						
☐ FPL [includes alternate]																							
☐ FTM																							
☐ FTL																							
☐ Supervisor *[specify specialty and/or company]*																							
☐ SSO																							
☐ IHT																							
☐ RCT																							
☐ HPT																							
☐ RSP																							
☐ Onsite Waste Management Coordinator																							
☐ Trenching/Excavation Competent Person																							
☐ Trenching/Excavation Professional Engineer																							
☐ Confined Space Entry Supervisor																							

PERSONNEL ROLE	TASK(s)																						
☐ Surveyor																							
☐ Geologist																							
☐ Sampler																							
☐ Driller																							
☐ Driller's Asst.																							
☐ Laborer																							
☐ Heavy Equipment Operator *[specify equip. type]*																							
☐ Competent Person [specify specialty, refer to Section 3.2.3.5 of the HASP]																							
☐ Other *[specify]*																							

4.2 HAZARDOUS SUBSTANCES OF OCCUPATIONAL HEALTH CONCERN

Not all chemical products used to accomplish a task or contaminants at a particular site may pose an occupational health threat. The hazardous substances of occupational health concern are identified in this section by task and by class of substance, in accordance with Section 4.1 of the HASP. Results of a health hazard assessment of each chemical product and site contaminant identified in Table 2-1 and associated rationales are provided in Appendix B. Substances that have a hazard assessment resulting in either "possibly could occur", "probably will occur", or "likely to occur" and which are expected to result in injury or illness having a hazard severity of "minor", "major", or "catastrophic" are considered to pose an occupational health threat to personnel who may be exposed to these substances, and are included in Table 4-2. The key to the hazard assessment ratings is provided below. The chemical, physical and toxicological properties for each hazardous chemical substance of occupational health concern are provided in Appendix C. For each class of substances included in Table 4-2, the most hazardous substance is identified in Table 4-3 together with corresponding administrative and engineering controls.

Key to hazard assessment ratings:

Hazard Severity	Mishap Probability			
	Likely to Occur	Probably will Occur	Possibly could Occur	Unlikely to Occur
Catastrophic (i.e., death or life-threatening injury/illness from a single encounter)	Imminent	Imminent	Serious	Minor
Major (i.e., significant injury/illness resulting in irreversible harm)	Imminent	Serious	Moderate	Minor
Minor (i.e., injury or illness resulting in reversible harm - not likely to threaten mobility, vision)	Serious	Moderate	Minor	Negligible
Negligible	Minor	Minor	Negligible	Negligible

TABLE 4-2

HAZARDOUS SUBSTANCES OF OCCUPATIONAL HEALTH CONCERN

[Atop the blank columns, enter the ID of the task(s) involving the same substances of occupational health concern; tasks involving the same substances may be identified in the same column. Identify the substances of occupational health concern by entering an "I", "S", "Mod", or "Min" in the corresponding box , based upon the hazard assessment in Appendix B. Substances resulting in a mishap probability of "unlikely to occur" or a hazard severity of " negligible" should not be included in this table. Provided below are 23 blank columns. If fewer columns are necessary, delete excess columns and widen those retained. If more columns are necessary, work with your Field Unit HS Representative to modify the table appropriately (e.g., print additional columns on separate pages or use 8.5" x 14" paper).]

Hazardous Chemical Products to be Used During Field Operations

The chemical products listed below are likely to be used for the tasks indicated, onsite or at satellite locations where field support operations occur. MSDSs for each product shall be kept readily available to users of these products, and shall be shared with other employer's employees onsite who may be affected by the hazardous products in accordance with 29 CFR 1926.65(b)(1)(iv) and (v) and 1926.65(i) and Section 4.2.2.3 of the HASP. It is LANL's policy that whenever feasible a less toxic product should be substituted for a more toxic product, especially for products having a carcinogen constituent.

HAZARDOUS SUBSTANCE	TASK(s)																						
Not applicable																							
Compressed Gases																							
Hydrogen (FID)																							
Isobutylene (PID)																							
Methane (FID or LEL/O_2)																							
Acetylene (welding)																							
Oxygen (welding)																							
Other *[specify]*:																							
Fuels/Lubricants (Petroleum-Based Hydrocarbons)																							
Diesel																							
Gasoline																							
Oil																							
Other *[specify]*:																							
Preservatives (Corrosives)																							
Hydrochloric Acid																							
Nitric Acid																							
Sodium Hydroxide																							
Other *[specify]*:																							

HAZARDOUS SUBSTANCE	TASK(s)																						
Solvents (Alcohols and Ketones)																							
Acetone																							
Methanol																							
Other *[specify]*:																							
Other																							
[specify]																							
Site Contaminants																							
High Explosives																							
[specify]																							
Radionuclides *[indicate isotopes]*																							
Americium																							
Cesium																							
Plutonium																							
Strontium																							
Uranium																							
Other *[specify]*:																							
Inorganics																							
CORROSIVES ACIDS/BASES																							
Ammonium Hydroxide																							
Chromic Acid/Chromates																							
Hydrochloric Acid																							
Nitric Acid																							
Perchloric Acid																							
Permanganates																							
Phosphoric Acid																							
Sodium Hydroxide																							
Sulfuric Acid																							
Other *[specify]*:																							
HALOGENS																							
[specify]:																							

HAZARDOUS SUBSTANCE	TASK(s)																						
METALS																							
Arsenic																							
Barium																							
Beryllium																							
Cadmium																							
Chromium																							
Copper																							
Lead																							
Mercury																							
Nickel																							
Selenium																							
Silver																							
Thallium																							
Other *[specify]*:																							
MINERALS *[indicate %]*																							
Asbestos (amosite)																							
Asbestos (chrysotile)																							
Asbestos (crocidolite)																							
Asbestos *[other specify]*:																							
Silica/Quartz																							
Other *[specify]*:																							
OTHER *[specify]*																							
Organics																							
ACIDS																							
Acetic																							
Trichloroacetic (TCA)																							
Other *[specify]*:																							
ALCOHOLS																							
Butyl																							
Ethyl																							
Glycols *[specify]*:																							
Methyl																							
Other *[specify]*:																							

HAZARDOUS SUBSTANCE	TASK(s)																						
ALDEHYDES																							
Formaldehyde																							
Other *[specify]*:																							
GASES																							
Not applicable																							
Carbon Disulfide																							
Hydrogen Cyanide																							
Hydrogen Sulfide																							
Other *[specify]*:																							
HYDROCARBONS (Halogenated)																							
Carbon Tetrachloride																							
Chlorobenzenes																							
Chloroform																							
1,1-Dichloroethane																							
Dichloroethylene																							
Dichlorobenzene																							
Freons *[specify]*:																							
Hexachloro compounds																							
Methyl Chloroform (1,1,1-Trichloroethane)																							
Methylene Chloride																							
Perchloroethylene (1,1,2,2-Tetrachloroethylene)																							
Pentachlorophenol																							
1,1,2-Trichloroethane																							
Trichloroethylene)																							
Trichlorophenol																							
Vinyl Chloride																							
Vinylidene Chloride																							
Other *[specify]*:																							
HYDROCARBONS (Non-Halogenated)																							
Hexane																							
[specify]																							

HAZARDOUS SUBSTANCE	TASK(s)																						
HYDROCARBONS (Petroleum Based)																							
Benzene																							
Diesel																							
Gasoline																							
Oil *[specify]*:																							
PNAs/PAHs *[specify]*:																							
Toluene																							
Xylenes																							
Other *[specify]*:																							
KETONES																							
[specify]																							
PESTICIDES																							
[specify]																							
PCBs																							
[specify % chlorine]																							
OTHER																							

4.3 HAZARD ASSESSMENT AND ADMINISTRATIVE AND ENGINEERING CONTROLS

Hazards included in this section are those expected to result in one of the hazard assessment ratings defined below and could pose an occupational health threat to workers performing the associated task(s). The hazard assessments and rationales are indicated below with the corresponding administrative and engineering controls for protection from and mitigation of the hazards. *[Check the applicable hazards in the Table and fill in the corresponding blank boxes]*

Key to hazard assessment ratings:

	Mishap Probability			
	Likely to Occur	**Probably will Occur**	**Possibly could Occur**	**Unlikely to Occur**
Catastrophic (i.e., death or life-threatening injury/illness from one encounter)	Imminent	Imminent	Serious	Minor
Major (i.e., significant injury/illness resulting in irreversible harm)	Imminent	Serious	Moderate	Minor
Minor (i.e., injury or illness resulting in reversible harm - not likely to threaten mobility, vision)	Serious	Moderate	Minor	Negligible
Negligible	Minor	Minor	Negligible	Negligible

TABLE 4-3

HAZARD ASSESSMENT and ADMINISTRATIVE and ENGINEERING (A&E) CONTROLS

Hazard	Task(s)	Hazard Assessment	Hazard Assessment Rationale	Administrative & Engineering (A&E) Controls (Prevention/Mitigation Measures)
Safety Hazards and Health Concerns				
CONFINED-SPACE ENTRY	❑ PERMIT REQUIRED; A&E controls shall be implemented in accordance with applicable confined space entry permit/program per Section 4.2.2.5 of the HASP and as specified below; contact Field Unit HS Representative to initiate permit process			
❑ Oxygen deficiency/ hazardous atmosphere				Ventilate space sufficiently in compliance with 29 CFR 1926.55(b) and 29 CFR 1926.57 or use Level B PPE (see below)
❑ Fire/explosion hazards when using compressed gas cylinders for Level B air supply				Handle cylinders with care (Refer to Safe Handling of Compressed Gases in Containers [CGA P-1-1984])
❑ Personnel entrapment or situation necessitating emergency egress				Compliance with 29 CFR 1910.146 and Section 4.2.2.5 of the HASP
❑ Limited visibility/mobility				Sufficient illumination shall be provided at the discretion of the SSO and affected employees
❑ Other *[specify]*				

Hazard	Task(s)	Hazard Assessment	Hazard Assessment Rationale	Administrative & Engineering (A&E) Controls (Prevention/Mitigation Measures)
EXCAVATION/ TRENCHING	❑ PERMIT REQUIRED for excavating/trenching > 1 foot; A&E controls shall be implemented in accordance with applicable LANL excavation permit (per LANL AR 1-12) and as specified below; contact Field Unit HS Representative to initiate permit process			
❑ General				❑ No personnel entry into trench/excavation ❑ Inspections by a competent person shall be made prior to start of work, as needed throughout shift and after every rain storm or other hazard increasing occurrence (29 CFR 1926.651) ❑ Appropriate engineering controls shall be implemented in accordance with 29 CFR 1926.651 whenever the stability of a structure adjoining an excavation may be endangered ❑ Excavated materials (spoils) shall be kept at least 2 ft. away from edge of excavation
❑ Underground utilities - elec./fire/explosion hazards				❑ Estimated locations of utilities (i.e., sewer, telephone, gas, electric, water lines, etc.) shall be determined prior to excavating. Notify utility owners of intended work and request they demarcate on ground surface location(s) of underground utilities; have a field team member accompany utility owner rep. to identify intended excavation location(s) and to find out specifics of utility location(s). ❑ If utility owner cannot establish exact location of utility installation(s), excavating may procced with caution and provided detection equipment or other acceptable means to locate utility installation(s) are used. ❑ As excavating operations approach estimated location of underground utility, exact location of the installation shall be determined by safe and acceptable means (i.e., using hand held excavating equipment). ❑ While excavation is open, undergound installations shall be protected, supported or removed as necessary to safeguard site personnel
❑ Buried drums/containers - fire/explosion hazard				A ground-penetrating system or other type of detection system or device shall be used to estimate the location and depth of buried drums or containers; soil or covering material shall be removed with caution to prevent drum or continer rupture
❑ Explosive/flammable environment				Adequate precaution shall be taken (e.g., ventilation in compliance with 29 CFR 1926.55(b) and 29 CFR 1926.57) to prevent personnel exposure to an atmosphere containing flammable gas ≥10% of the lower flammable limit (LEL) of the gas
❑ Cave-in/personnel entrapment				Trench/excavation ≥ 4 feet deep shall have a stairway, ladder, ramp, or other safe means of egress located so as to require more than 25' of lateral travel by personnel in trench/excavation (e.g., 1 ladder for 25'<x≤50' long trench) (29 CFR 1926.651)
❑ Oxygen deficiency/ hazardous atmosphere				Where oxygen deficiency or a hazardous atmoshpere could reasonably be expected to exist, the atmosphere in excavation/trench shall be tested prior to anyone entering excavation > 4 feet in depth; refer to Section 6
❑ Other *[specify]*				

Hazard	Hazard Assessment		Hazard Assessment Rationale	Administrative & Engineering (A&E) Controls (Prevention/Mitigation Measures)
DRILLING/HEAVY EQUIPMENT OPERATION				
❑ General Controls	• Per DOE (Drilling Safety Manual, 1983 and Construction Safety Reference Guide, 1993), drilling rigs shall be designed, manufactured, erected, used, and maintained in accordance with appropriate American Petroleum Institute (API) Specifications and Recommended Practices, as a minimum, and with applicable sections of 29 CFR 1926.251, Subpart N of 29 CFR 1926, and Title 8 of the California Administrative Code (8 CAC). • Hoists, hooks, wires, ropes, slings, and rigging accessories shall be designed, installed, operated, inspected, and tested in accordance with applicable requirements of the DOE Hoisting and Rigging Manual (April 1993, DOE/ID-10500), and with applicable sections of 29 CFR 1926.251 and Subpart N of 29 CFR 1926. • There shall be no apparent damage, excessive wear, or deformation of any part of the drilling equipment. Equipment shall be inspected by a qualified person according to Section 12.1 and the frequencies indicated below. Defective equipment shall be removed from service and any defects shall be corrected or repaired before equipment is put into service. Records of each inspection shall be kept at the rig readily available for review. Reduction of original strength shall be noted and taken into account for determining when equipment shall be taken out of service. - Rigs and masts shall be inspected at least weekly. - Hoists, hooks, wires, ropes, slings, and rigging accessories shall be inspected at the beginning of each shift in which they are to be used and as necessary during use to ensure safety. - Hoisting lines shall be inspected visually each day, and thoroughly at a minimum of 30-day intervals. - Guy wires in use shall be thoroughly inspected at least once a year. - Anchors shall be pull-tested along an angle approximating the wind-guy working plane within 12 months prior to use; test shall be made at poundage determined by anchor location • Each derrick or mast, and hoist shall be permanently marked with its rating capacity. • Drill rigs must be leveled, anchored, and guyed in accordance with manufacturer's recommendations or where there are none, with API Specification 4E. • Pressure-hose connections shall be secured with safety chains or clamped to prevent whipping in the event of a break. • When engaged in work at a location 10 feet or more above the derrick floor or other working surface, the worker shall wear a safety belt with attached lanyard secured to the derrick, except during rig-up/rig-down when workers other than the rig operator shall stand clear. Safety belts, lifelines, and lanyards shall be used in accordance with 29 CFR 1926.104 and Section 7.			
❑ Overhead elec. hazard				During stationery operation, minimum clearance between live lines and any part of equipment or load: 10 ft for lines rated 50 kV; 10 ft + 0.4 in. for each 1 kV over 50 kV, or twice the length of line insulator, whichever is greater. In transit with no load and boom lowered, min. clearance: voltages < 50 kV: 4 ft min voltages 50 kV< x ≤345 kV: 10 ft min voltages 345 kV< x ≤750 kV: 16 ft min
❑ Pinch points in rotating parts				Heavy equipment shall be inspected for engineering controls in compliance with applicable sections of Subparts O of 29 CFR 1926 and 29 CFR 1910
❑ Vehicle operation/ vehicular traffic accident				❑ Field team personnel exposed to vehicular traffic shall be provided with, and shall wear, warning vests or other suitable garments marked with or made of reflectorized or high-visibility material ❑ Heavy equipment shall be inspected for engineering controls in compliance with applicable sections of Subparts O of 29 CFR 1926 and 29 CFR 1910
❑ Other *[specify]*				

Hazard	Task(s)	Hazard Assessment	Hazard Assessment Rationale	Administrative & Engineering (A&E) Controls (Prevention/Mitigation Measures)
WELDING/CUTTING/ BRAZING	❑ PERMIT REQUIRED; A&E controls shall be implemented in accordance with applicable LANL special work permit (SWP) per Section 4.2.2.12 of the HASP and as specified below for spark/flame-producing operations; contact Field Unit HS Representative to initiate permit process			
❑ Fire/explosion/burn hazards when using compressed gases				Implement A&E controls per applicable permit and in accordance with Subpart J of 29 CFR 1926
❑ Toxic substances in breathing zone *[specify]*				Ventilate local area [in compliance with 29 CFR 1926.55(b) and 29 CFR 1926.57]; perform personal exposure sampling (dosimetry) per Section 6 and use ; use PPE per Section 7
❑ Other *[specify]*				
ELECTRICAL	❑ PERMIT REQUIRED; A&E controls shall be implemented in accordance with applicable requirements of Sections 4.2.2.1 and/or 4.2.2.8 of the HASP and as specified below for lockout/tagout of energized equipment; contact Field Unit HS Representative to initiate permit process			
❑ Electrocution - working with energized equipment (e.g., generator)				Take preventative measures and identify and correct deficiencies in accordance with Subpart K of 29 CFR 1926 and Sections 4.2.2.1 and/or 4.2.2.8 of the HASP, as applicable
❑ Other *[specify]*				
EQUIPMENT DECONTAMINATION				
❑ Steam cleaner operation - burns				Operator shall use PPE as specified in Section 7
❑ Spread of contamination during equip steam cleaning				Install protective barrier(s) over/around steam cleaning decon unit to prevent migration of spray, especially on windy days
❑ Other *[specify]*				
MISCELLANEOUS				
❑ Falls from heights above 4'				Compliance with 29 CFR 1926.500, and as necessary, use of PPE specified in Section 7 for fall protection
❑ Fire/ explosion hazards while using compressed gas cylinders for instrument calibration				Handle cylinders with care (Refer to Safe Handling of Compressed Gases in Containers [CGA P-1-1984])
❑ Sanitation				❑ Showers and change rooms shall be provided on-site in the CRZ or SZ, and used by field team members working within EZ or CRZ, whenever the duration of hazardous waste operations (under 29 CFR 1926.65) will last ≥ 6 months. Showers shall meet requirements of 29 CFR 1926.51(f)(4). Change rooms shall meet requirements of 29 CFR 1926.51(i) ❑ At least one toilet shall be provided on site for ≤ 20 field team personnel unless transportation is readily available to nearby off-site toilet facilities
❑ Limited visibility/mobility				Sufficient illumination shall be provided according to Table D-65.1 of 29 CFR 1926.65. Illumination intensities shall be verified by monitoring specified in Table 4-4.1
❑ Uneven terrain, slips, trips, falls				Use caution and be observant while moving in areas of potential concern; minimize threat of slick surfaces

Hazard	Task(s)	Hazard Assessment	Hazard Assessment Rationale	Administrative & Engineering (A&E) Controls (Prevention/Mitigation Measures)
❑ Other, specify:				
Radiological Hazards				
❑ Alpha Radiation *(specify radioisotopes)*				Minimize exposure and maximize distance to source ❑ PERMIT REQUIRED; A&E controls shall be implemented in accordance with applicable LANL Radiological Work Permit (RWP); contact Field Unit ESH Representative to initiate permit process ❑ Other *[specify]*
❑ Beta/Gamma Radiation *(specify radioisotopes)*				Minimize exposure and maximize distance to source ❑ PERMIT REQUIRED; A&E controls shall be implemented in accordance with applicable LANL Radiological Work Permit (RWP); contact Field Unit ESH Representative to initiate permit process ❑ Other *[specify]*
High Explosives (HE) Hazards				
❑ High Explosives (HE)				*[[Specify requirements; contact DX-16 to determine site-specific requirements (e.g., training, remote operations, etc.)]*
Biological Hazards				
❑ General				Refer to Table 1 of the HASP for information concerning various general hazards associated with occupational exposure to toxic and/or hazardous biological agents
❑ Occupational Exposure to Bloodborne Pathogens				Refer to Table 1 and Section 4.2.2.2 of the HASP
Physical Health Hazards				
❑ Excessive Noise				Whenever voice(s) must be raised to communicate between two or more persons located ≤ 3 feet of each other noise level likely exceeding PEL; conduct noise monitoring per Section 6; also refer to Section 4.2.2.7 of HASP for additional requirements

Hazard	Task(s)	Hazard Assessment	Hazard Assessment Rationale	Administrative & Engineering (A&E) Controls (Prevention/Mitigation Measures)
Chemical Health Hazards				
❑ Chemical splashes - exposure to corrosives and/or substances toxic by skin absorption				❑ PPE (chemical protective clothing and/or eye/face protection) shall be used as specified for the corresponding task(s)/site(s) in Section 7 ❑ Portable emergency: ❑ Eyewash ❑ Shower ❑ Eyewash/Shower Emergency eyewashes and showers must be located within 10 seconds and not more than 100 feet of travel distance of any source of chemical splash that may be corrosive or moderately to severely irritating to body tissue. They must have a capacity to be able to provide continuous flushing for the duration of time necessary to sufficiently flush the most hazardous substance for which the device is being specified. They also shall be inspected and flushed at least weekly by the SSO or designee. Refer to ANSI Z358.1-1990 for further information. ❑ Field Team Personnel shall shower prior to leaving the CRZ or regulated/controlled area of contamination. Shower(s) shall be equipped with hot and cold water feeding a common discharge line. Waste waster shall be captured, contained, and tested and disposed according to the site-specific Waste Management Plan (Refer to *American National Standard for Sanitation in Places of Employment - Minimum Requirements* [ANSI Z4.1-1986])
❑ Airborne Toxic Dust, Vapors, and/or Fumes - General				First line of defense: implement engineering controls [e.g., local ventilation in accordance with 29 CFR 1926.55(b), 1926.57], and/or other applicable chemical-specific standard (Table 2 of the HASP) to limit airborne levels of contaminants to below action levels set in Section 6. Refer also to Section 6, 7 and Appendix C of this SSHASP and to Sections 6 and 7 of the HASP ❑ Other: *[specify]*
❑ Airborne levels of known toxic or radioactive contaminants necessitating use of Level C personal protective equipment (PPE)				First line of defense: implement engineering controls [e.g., local ventilation in accordance with 29 CFR 1926.55(b) and 1926.57] to limit airborne levels of contaminants to below action levels set in Section 6. LEVEL C Operations: Air-Purifying respiratory protective equipment shall be used by field team members only in accordance with a LANL approved Respiratory Protection Program and Section 7.1 of the HASP.
❑ Airborne levels of known toxic or radioactive contaminants necessitating use of Level B PPE, or potentially hazardous levels of unknown airborne toxic or radioactive contaminants				First line of defense: implement engineering controls [e.g., local ventilation in accordance with 29 CFR 1926.55(b) and 1926.57] to limit airbirne levels of contaminants to below action levels set in Section 6. LEVEL B Operations: Supplied-air respiratory protective equipment shall be used by field team members only in accordance with a LANL approved Respiratory Protection Program and Section 7.1 of the HASP, and site-specific SOP(s) developed for use of Level B respiratory protection which supplement this SSHASP and have been reviewed and approved by ESH-5; contact Field Unit HS Representative to arrange for preparation and review of Level B SOP(s)
❑ Other *[specify]*:				

5.0 SITE CONTROLS

In accordance with Section 5 of the HASP, the required site control measures are specified below for each task or group of tasks having different requirements. Any exceptions or deviations from requirements of the HASP are noted below. Site map(s) are provided in Appendix A to show where the following site control measures will be located. Since some zone or facility locations may change as site work progresses due to daily variability in site conditions and/or operations (e.g., wind or access), actual locations are to be explained to field team members by the SSO, or the FTL or JS during daily HS tailgate meetings and documented in the logbook kept by the SSO.

TABLE 5
SITE CONTROL MEASURES

❑ Not applicable; rationale:

[Atop the blank columns, enter the ID of each task where site control measures are required; tasks having the same control measures may be identified in the same column. Identify the required control measures by entering an "X" in the corresponding box below. Provided below are 23 blank columns. If fewer columns are necessary, delete excess columns and widen those retained. If more columns are necessary, work with your Field Unit HS Representative to modify the table appropriately (e.g., print additional columns on separate pages or use 8.5" x 14" paper).]

CONTROL MEASURES	TASK(S)																						
❑ **Exclusion Zone (EZ)**	Per _____ *[Specify applicable chemical-specific standard in Table 2 of the HASP; delete if not applicable. Wherever "Not applicable" is checked below, provide the rationale in this box. If not applicable at all sites, say so here and provide rationale.]*																						
Not applicable																							
Radiological Control Area																							
Radioactive Material Management Area (RMMA)																							
Regulated Area (per Table 3 of HASP)																							
Centralized location																							
Localized at work site																							
Negatively pressurized																							
Demarcated by:																							
Cones																							
Barrier Tape																							
Fence																							
Security Access																							
Enclosed structure																							
Other *[specify]*																							

CONTROL MEASURES	TASK(s)																						

Posting(s): ❑ Per LANL LS 107-02.0 ❑ Per Subpart G of 29 CFR 1926 ❑ Other Chemical-Specific Standard (Table 2 of the HASP); *specify:*
Description(s):

❑ **Contamination Reduction Zone (CRZ)**	Per _____ *[Specify applicable chemical-specific standard in Table 2 of the HASP; delete if not applicable. Wherever "Not applicable" is checked below, provide the rationale in this box. If not applicable at all sites, say so here and provide rationale.]*																						
Not applicable																							
Radiological Control Area																							
Radioactive Material Management Area (RMMA)																							
Centralized location																							
Localized at work site																							
Negatively pressurized																							
Demarcated by:																							
Cones																							
Barrier Tape																							
Fence																							
Security Access																							
Enclosed Structure																							
Other *[specify]:*																							

Posting(s): ❑ Per LANL LS 107-02.0 ❑ Per Subpart G of 29 CFR 1926 ❑ Other Chemical-Specific Standard (Table 2 of the HASP); *specify:*
Description(s):

❑ **Support Zone (SZ)**	Per _____ *[Specify applicable chemical-specific standard in Table 2 of the HASP; delete if not applicable. Wherever "Not applicable" is checked below, provide the rationale in this box. If not applicable at all sites, say so here and provide rationale.]*																						
Not applicable																							
Centralized Location																							
Localized at work site																							
Demarcated by:																							
Unnecessary																							
Cones																							
Barrier Tape																							
Fence																							
Security Access																							
Other *[specify]:*																							

CONTROL MEASURES	TASK(s)																						

Posting(s): ❑ Per LANL LS 107-02.0 ❑ Per Subpart G of 29 CFR 1926 ❑ Other Chemical-Specific Standard (Table 2 of the HASP); *specify:*
Description(s):

❑ **Equipment Staging Area**	Per _____ *[Specify applicable chemical-specific standard in Table 2 of the HASP; delete if not applicable. Wherever "Not applicable" is checked below, provide the rationale in this box. If not applicable at all sites, say so here and provide rationale.]*																						
Not applicable																							
Located at work site in SZ																							
Centralized location *[specify where]*																							

Posting(s): ❑ Per LANL LS 107-02.0 ❑ Per Subpart G of 29 CFR 1926 ❑ Other Chemical-Specific Standard (Table 2 of the HASP); *specify:*
Description(s):

❑ **Equipment Decon Pad/Facility**	Per _____ *[Specify applicable chemical-specific standard in Table 2 of the HASP; delete if not applicable. Wherever "Not applicable" is checked below, provide the rationale in this box. If not applicable at all sites, say so here and provide rationale.]*																						
Not applicable																							
Radiological Control Area																							
Radioactive Material Management Area (RMMA)																							
Located at work site EZ																							
Located at work site CRZ																							
Centralized location																							
Demarcated by:																							
Unnecessary																							
Cones																							
Barrier Tape																							
Fence																							
Security Access																							
Other *[specify]:*																							

Posting(s): ❑ Per LANL LS 107-02.0 ❑ Per Subpart G of 29 CFR 1926 ❑ Other Chemical-Specific Standard (Table 2 of the HASP); *specify:*
Description(s):

❑ **Temporary Waste Storage Area**	*[Wherever "Not applicable" is checked below, provide the rationale in this box.]*																						
Not applicable																							
Radiological Control Area																							

CONTROL MEASURES	TASK(s)																						
Radioactive Material Management Area (RMMA)																							
Located onsite																							
Located off-site																							
Demarcated by:																							
Cones																							
Barrier Tape																							
Fence																							
Security Access																							
Other *[specify]*:																							

Posting(s): ❑ Per LANL LS 107-02.0 ❑ Per Subpart G of 29 CFR 1926 ❑ Other Chemical-Specific Standard (Table 2 of the HASP); *specify*:
Description(s):

❑ **Support Trailer(s)**	*[Wherever "Not applicable" is checked below, provide the rationale in this box. If not applicable at all sites, say so here and provide rationale.]*																						
Not applicable																							
Located at work site in SZ																							
Centralized location																							
Access identified/limited by:																							
Unnecessary																							
Fence																							
Security Access																							
Other *[specify]*:																							

Posting(s): ❑ Per LANL LS 107-02.0 ❑ Per Subpart G of 29 CFR 1926 ❑ Other Chemical-Specific Standard (Table 2 of the HASP); *specify*:
Description(s):

❑ **Mobile Laboratory**	*[Wherever "Not applicable" is checked below, provide the rationale in this box. If not applicable at all sites, say so here and provide rationale.]*																						
Not applicable																							
Radiological Control Area																							
Radioactive Material Management Area (RMMA)																							

CONTROL MEASURES	TASK(s)																						
Located at work site SZ																							
Centrally located																							
Access identified/limited by:																							
Unnecessary																							
Fence																							
Security Access																							
Other *[specify]*:																							

Posting(s): ❑ Per LANL LS 107-02.0 ❑ Per Subpart G of 29 CFR 1926 ❑ Other Chemical-Specific Standard (Table 2 of the HASP); *specify*:
Description(s):

❑ Hand Wash Facility	Per _____ *[Specify either 29 CFR 1926.65(n) or 1926.51 or applicable chemical-specific standard in Table 2 of the HASP. Wherever "Not applicable" is checked below, provide the rationale in this box. If not applicable at all sites, say so here and provide rationale.]*																						
Not Applicable																							
Located onsite in SZ																							
Centrally located																							

Posting(s): ❑ Per LANL LS 107-02.0 ❑ Per Subpart G of 29 CFR 1926 ❑ Other Chemical-Specific Standard (Table 2 of the HASP); *specify*:
Description(s):

❑ Toilet Facility	Per _____ *[Specify either 29 CFR 1926.65(n) or 1926.51 or applicable chemical-specific standard in Table 2 of the HASP. Wherever "Not applicable" is checked below, provide the rationale in this box. If not applicable at all sites, say so here and provide rationale.]*																						
Not Applicable																							
Portable located onsite in SZ																							
Located off-site *[specify where]*																							

❑ Shower Facility	Per _____ *[Specify either 29 CFR 1926.65(n) or 1926.51 or applicable chemical-specific standard in Table 2 of the HASP. Wherever "Not applicable" is checked below, provide the rationale in this box. If not applicable at all sites, say so here and provide rationale.]*																						
Not applicable																							
Required for personnel decon																							
Optional for personnel comfort																							
Radiological Control Area (RCA)																							

CONTROL MEASURES	TASK(s)																						
Located at work site CRZ																							
Located at work site SZ																							
Centrally located																							
Access identified/limited by:																							
Unnecessary																							
Structured containment																							
Other *[specify]*:																							

Posting(s): ❑ Per LANL LS 107-02.0 ❑ Per Subpart G of 29 CFR 1926 ❑ Other Chemical-Specific Standard (Table 2 of the HASP); *specify*:
Description(s):

❑ **Clothing Change Facility**	Per _____ *[Specify either 29 CFR 1926.65(n) or 1926.51 or applicable chemical-specific standard in Table 2 of the HASP. Wherever "Not applicable" is checked below, provide the rationale in this box. If not applicable at all sites, say so here and provide rationale.]*																						
Not applicable																							
Required for personnel decon																							
Optional for personnel comfort																							
Located at work site SZ																							
Centrally located																							
Access identified/limited by:																							
Unnecessary																							
Structured containment																							
Other *[specify]*:																							

Posting(s): ❑ Per LANL LS 107-02.0 ❑ Per Subpart G of 29 CFR 1926 ❑ Other Chemical-Specific Standard (Table 2 of the HASP); *specify*:
Description(s):

❑ **Wind Direction Indicator(s)**	Shall be located onsite where readily visible to field team members (e.g., atop equipment mast/derrick). *[Wherever "Not applicable" is checked below, provide the rationale in this box. If not applicable at all sites, say so here and provide rationale.]*																						
Not Applicable																							
Located *[specify where if fixed location, ; or indicate if variable location]*																							

CONTROL MEASURES	TASK(s)																						
Flag																							
Anemometer																							
Other *[specify]*:																							
❑ **Other *[specify]*:**																							

6.0 EXPOSURE MONITORING AND CORRESPONDING ACTIONS

In accordance with Section 6 of the HASP, personnel exposure monitoring requirements, action levels, and the corresponding actions to be taken are specified in the tables in this section (Tables 6-1, 6-2, and 6-3) for each task or group of tasks having different requirements.

6.1 DIRECT-READING INSTRUMENTS

Requirements for exposure monitoring using direct-reading instruments and the corresponding action levels and response actions are specified in Table 6-1 for each task or group of tasks having different requirements, action levels or responses. These requirements, levels, and actions are set in accordance with Section 6 of the HASP. Any exceptions or deviations from requirements of the HASP are noted where applicable.

TABLE 6-1
DIRECT-READING INSTRUMENT REQUIREMENTS

Hazardous Condition/ Substance	Task(s)	Instrument	Procedure	Location and Frequency of Monitoring	Action Level(s)	Response Action(s)	Action Level Rationale
HEALTH PHYSICS							
❑ **Radiation** Gross α and gross β/γ contamination (specific radio-isotopes listed in Table 4-2)		❑ β/γ Eberline ESP-1 with HP-260 probe or equiv. ❑ α -Ludlum 139 with air proportional probe or equiv.	Per LANL RadCon Manual and training	❑ Drilling: As sample barrel comes out of borehole; after sample barrel is opened and prior to sampling soil ❑ Surface Sampling/Excavations: Excavated soil, ground surface prior to disturbance, and excavated soil/material	Background	Field team member trained in ESH-1 procedures performs surveys (soil, core, personnel, etc.) Intermittent ESH-1 coverage Large area swipes for α (2000 cm^2) counted using field alpha screening instrument; direct frisk for β/γ	Standard levels set by ESH-1
				❑ Non-intrusive Activities: Ground surface near source (as applicable based on potential for soil contamination) ❑ Personnel: Prior to exiting EZ, CRZ	> Background α < 500 cpm/probe area β/γ < 5,000 cpm/probe area	Notify ESH-1 of elevated readings Dedicated field team member trained in ESH-1 procedures performs surveys (soil, core, personnel, etc.) Increased intermittent ESH-1 coverage α swipes counted using Ludlum 2000 tray counter or equiv.; direct frisk for β/γ	Standard levels set by ESH-1
				❑ Equipment: Prior to decon and for release ❑ Other:	α > 500 cpm/probe area β/γ > 5,000 cpm/probe area	Work may only proceed according to approved RWP and with full-time onsite ESH-1 technician (or equiv.) in accordance with Sections 3.2.4 and 3.3.4 of the HASP.	Standard levels set by ESH-1

Hazardous Condition/ Substance	Task(s)	Instrument	Procedure	Location and Frequency of Monitoring	Action Level(s)	Response Action(s)	Action Level Rationale
PHYSICAL CONDITIONS							
❑ **Noise**		**Noise level meter**	❑ ER Project *Manual for Site HS Activities* ❑ Other *[specify]*	Only monitor non-LANL employees; contact Field Unit HS Rep. if LANL employees need monitoring Noise measurements required when voice must be raised to communicate between two persons located ≤ 3 feet of each other; monitor hearing zone(s) of employees affected by excessive noise 1st day of occurrence & whenever operations change warranting monitoring: initial measurement and at 30 minute intervals while excessive noise condition persists	❑ 85 dBA (Non-LANL employees only) ❑ 80 dBA (Hearing Conservation Program - LANL employees only) ❑ 84 dBA (Hearing protection required - LANL employees only)	≥ Action Level: Implement appropriate engineering control(s) per Table 4-3; if unable to lower noise levels below AL, demarcate/post zones of excessive noise and limit access only to employees having sufficient hearing protection training, medical surveillance, and hearing protection per this SSHASP	OSHA 29 CFR 1910.95 for non-LANL employees Per DOE and LANL requirements for LANL employees
PHYSICAL CONDITIONS (cont'd)							
❑ **Illumination**		*[Specify instrument, mfr. ,model, accessories, and settings - if any]*	*[Specify]*	*[Specify]*	*[Specify]*	*[Specify]*	*[Specify]*
❑ **Heat/Cold Stress**		*[Specify instrument, mfr., model, accessories, and settings - if any]*	*[Specify] [Refer to Table 1 of the HASP]*	*[Specify]*	*[Specify]*	*[Specify] [Refer to Table 1 of the HASP]*	*[Specify] [Refer to Table 1 of the HASP]*
INDUSTRIAL HYGIENE (CHEMICALS)							
❑ **Explosion, Oxygen Deficiency, Hydrogen Sulfide**		CGI *[Specify instrument, mfr., model, accessories, and settings]*	❑ ER Project *Manual for Site HS Activities* ❑ Other *[specify]*	❑ Drilling: Continuously during drilling near borehole ❑ Excavation/Trenching: Continuously near point(s) of excavation ❑ Confined-space entry; per permit and program requirements ❑ Other:	Explosivity: 10% LEL≤ x ≤ UEL 19.5% > O_2 > 22% in breathing zone (BZ) H_2S ≥ 5 ppm in BZ	Limit access to area(s) and allow for natural ventilation or implement appropriate engineering control(s) per Table 4-3 until action level(s) no longer violated Use of Level B PPE required for oxygen deficiency or exceedence of H_2S action levels (ALs) (**NOTE**: H_2S desensitizes nasal receptors and sense of smell becomers unreliable warning indicator)	Explosivity: DOE O_2: Per ANSI Z.88.2-1992 H_2S: 1/2 PEL

Hazardous Condition/ Substance	Task(s)	Instrument	Procedure	Location and Frequency of Monitoring	Action Level(s)	Response Action(s)	Action Level Rationale
❑ **Total Airborne Dust**		**Mini-ram** *[Specify instrument, mfr., model, accessories, and settings]*	❑ ER Project *Manual for Site HS Activities* ❑ Other *[specify]*	❑ Drilling/Soil Sampling: Continuously near point of dust generation; periodically in employees' breathing zones, & downwind/ upwind as needed to characterize source/dispersion ❑ Excavation/Trenching: Continuously near point(s) of excavation; periodically in employees' breathing zones, & downwind/ upwind as needed to characterize source/dispersion ❑ Confined-space entry; per permit and program requirements ❑ Other:	*[Specify]*	≥ action level (AL) in employee breathing zone implement dust suppression methods to control dust levels below AL If unable to lower levels below AL, demarcate/post zones of excessive exposure and limit access only to employees having sufficient chemical-specific PPE, training, and medical surveillance per this SSHASP	*[Specify]* *[Consider respirable fraction and toxicity also]*
❑ **Organic Vapors**, (specify):		PID/FID *[Specify instrument, mfr., model, lamp voltage, accessories, and settings]*	❑ ER Project *Manual for Site HS Activities* ❑ Other *[specify]*	❑ Drilling/Soil Sampling: Continuously near point(s) of drilling/sampling, periodically in employees' breathing zones, & downwind/ upwind as needed to characterize source/dispersion ❑ Excavation/Trenching: Continuously near point(s) of excavation; periodically in employees' breathing zones, & downwind/ upwind as needed to characterize source/dispersion ❑ Confined-space entry; per permit and program requirements ❑ Other:	*[Specify]*	Allow area(s) of concern to vent naturally or by implementing mechanical means per Table 4-3. If condition persists ≥ action level, further limit access to EZ to exposure monitoring personnel only *[Devise strategy to determine class(es) or specific types of contaminant(s) of concern (e.g., use of colorimetric detector tubes or portable GC, or collection and analysis of grab samples)]*	*[Specify]*

Hazardous Condition/ Substance	Task(s)	Instrument	Procedure	Location and Frequency of Monitoring	Action Level(s)	Response Action(s)	Action Level Rationale
❑ Airborne Vapors *(specify which)*		Colorimetric Tubes *[Specify colorimetric tube pump system and detector tube(s)]*	❑ ER Project *Manual for Site HS Activities* ❑ Other *[specify]*	❑ Drilling/Soil Sampling: Continuously near point(s) of drilling/sampling, periodically in employees' breathing zones, & downwind/ upwind as needed to characterize source/dispersion ❑ Excavation/Trenching: Continuously near point(s) of excavation; periodically in employees' breathing zones, & downwind/ upwind as needed to characterize source/dispersion ❑ Confined-space entry; per permit and program requirements ❑ Other: [**NOTE:** When action level for PID/FID is exceeded, then periodically to monitor worst case conditions and that maximum use limit (Protection Factor x PEL) is not being exceeded while Level C or B PPE is used]	*[Specify]*	If contaminant(s) cannot be classified and/or Level C filters are not approved for contaminant(s) or maximum use concentration (MUC) may be exceeded, then work may only proceed in Level B PPE (refer to Table 4-3) x ≤ PID/FID AL — Level D PID/FID AL ≤ x and < PF x detector tube AL — Level C detector tube AL ≤ x and < PF x detector tube AL — Level B PF = Protection Factor [**NOTE:** Respirators may only be used in accordance with Section 7.1 of the HASP]	*[Specify]*
❑ Hydrogen Cyanide		*[Specify instrument, mfr., model, accessories, and settings]*	*[specify]*	❑ Drilling/Soil Sampling: Continuously near point(s) of drilling/sampling, periodically in employees' breathing zones, & downwind/ upwind as needed to characterize source/dispersion ❑ Excavation/Trenching: Continuously near point(s) of excavation; periodically in employees' breathing zones, & downwind/ upwind as needed to characterize source/dispersion ❑ Confined-space entry; per permit and program requirements ❑ Other:	*[Specify]*	x ≥ AL — Level B (Also see notes in box above)	*[Specify]*

Hazardous Condition/ Substance	Task(s)	Instrument	Procedure	Location and Frequency of Monitoring	Action Level(s)	Response Action(s)	Action Level Rationale
❑ Mercury		Mercury Vapor Analyzer *[Specify instrument, mfr., model, accessories, and settings]*	❑ ER Project *Manual for Site HS Activities* ❑ Other *[specify]*	❑ Drilling/Soil Sampling: Continu-ously near point(s) of drilling/sampling, periodically in employees' breathing zones, & downwind/ upwind as needed to characterize source/dispersion ❑ Excavation/Trenching: Continuously near point(s) of excavation; periodically in employees' breathing zones, & downwind/ upwind as needed to characterize source/dispersion ❑ Confined-space entry; per permit and program requirements ❑ Other:	*[Specify]*	*[Specify]*	*[Specify]*
❑ Other *[Specify]*		*[Specify]*	*[Specify]*	*[Specify]*	*[Specify]*	*[Specify]*	*[Specify]*

6.2 PERSONAL DOSIMETRY

Requirements for personal dosimetry and the corresponding action levels and response actions are specified in Table 6-2 for each task or group of tasks having different requirements, action levels or responses. These requirements, levels, and actions are set in accordance with Section 6 of the HASP and with the chemical-specific standards listed in Table 2 of the HASP. Any exceptions or deviations from requirements of the HASP are noted where applicable.

TABLE 6-2
PERSONAL DOSIMETRY REQUIREMENTS

HEALTH PHYSICS (RADIATION) *[Refer to Section 6 of the HASP.]*

Hazardous Substance/ Condition	Task(s)	Action Level(s)	Dosimetry Requirement	Action Level(s) Rationale
❑ External Sources of Radiation Exposure		Potential to exceed 100 mREM/year dose limit	Monthly TLD Badge	10 CFR 835
❑ Plutonium		Potential to exceed 100 mREM/year dose limit	Urinalysis - Baseline and Termination *In Vivo* - Baseline and Termination	10 CFR 835
❑ Uranium		Potential to exceed 100 mREM/year dose limit	Urinalysis - Baseline and Every Two Weeks *In Vivo* - Baseline and Termination	10 CFR 835
❑ Tritium		Potential to exceed 100 mREM/year dose limit	Urinalysis - Baseline and Every Two Weeks	10 CFR 835
❑ Mixed Fission Products		Potential to exceed 100 mREM/year dose limit	*In Vivo* - Baseline and Termination Other: *[specify]*	10 CFR 835
❑ Unknown (uncharacterized sites)		Potential to exceed 100 mREM/year dose limit	*[To be determined by ESH-1 and ESH-12]*	10 CFR 835
❑ Other:		*[specify]*	*[To be determined by ESH-1 and ESH-12]*	*[specify]*

Hazardous Condition	Task(s)	Procedure	Instrument/ Supplies	Action Level(s)	Action Level Rationale	Response Action(s)
PHYSICAL CONDITIONS						
❑ **Noise**	In the hearing zone of employees incurring excessive noise levels per Table 6-1 monitoring	❑ ER Project *Manual for Site HS Activities* ❑ Other *[specify]*	Personal noise dosimeter(s)	Refer to Table 6-1		
INDUSTRIAL HYGIENE (CHEMICALS)						
❑ **Respirable Dust** *(specify which)*	*(specify)*	*(specify)*	*(specify)*	*(specify)*	*(specify)*	If PEL/TLV is met or exceeded in BZ implement dust suppression methods specified in Table 4-3 to control dust levels below the AL; if unable to get levels below AL, use of Level C or B PPE required
❑ **Halogenated Hydrocarbons** (e.g., chloroform, PCE, TCA, TCE)	*(specify)*	*(varies depending upon compound)*	*(specify)*	*(specify)*	*(specify)*	If contaminant(s) cannot be classified and/or Level C filters are not approved for contaminant(s) or maximum use concentration (MUC) may be exceeded, then work may only proceed in Level B PPE (refer to Table 4-3) x ≤ PID/FID AL Level D PID/FID AL ≤ x and < PF x detector tube AL Level C detector tube AL ≤ x and < PF x detector tube AL Level B [**NOTE:** Respirators may only be used in accordance with Section 7.1 of the HASP]
❑ **Mercury**	*(specify)*	❑ *NIOSH 6900* ❑ *other specify*	*(specify)*	*(specify)*	*(specify)*	*(specify)*
❑ **Hydrogen Cyanide**	*(specify)*	❑ *NIOSH 6010* ❑ *NIOSH 7904* ❑ *other specify*	*(specify)*	*(specify)*	*(specify)*	x ≥ AL Level B Insufficient warning properties for use of Level C
❑ **Arsenic (inorganic)**	*(specify)*	❑ 29 CFR 1926.1118 ❑ *NIOSH 7900* ❑ *other specify*	*(specify)*	*(specify)*	*(specify)*	*(specify)*

Hazardous Condition	Task(s)	Procedure	Instrument/ Supplies	Action Level(s)	Action Level Rationale	Response Action(s)
❑ Asbestos	*(specify)*	❑ 29 CFR 1926.1101 ❑ *NIOSH 7400* ❑ *NIOSH 7401* ❑ *other specify*	*(specify)*	*(specify)*	*(specify)*	*(specify)*
❑ Benzene	*(specify)*	❑ 29 CFR 1926.1128 ❑ *NIOSH 1501* ❑ *other specify*	*(specify)*	*(specify)*	*(specify)*	*(specify)*
❑ Beryllium	*(specify)*	❑ LANL AR 6-7 ❑ *NIOSH 7102* ❑ *other specify*	*(specify)*	*(specify)*	*(specify)*	*(specify)*
❑ Biological Micro-organisms	*(specify)*	❑ 29 CFR 1910.1030 ❑ *other specify*	*(specify)*	*(specify)*	*(specify)*	*(specify)*
❑ Cadmium	*(specify)*	❑ 29 CFR 1926.63 ❑ *NIOSH 7048* ❑ *NIOSH 7300* ❑ *other specify*	*(specify)*	*(specify)*	*(specify)*	*(specify)*
❑ Formaldehyde	*(specify)*	❑ 29 CFR 1926.1148 ❑ *NIOSH 3500* ❑ *other specify*	*(specify)*	*(specify)*	*(specify)*	*(specify)*
❑ Lead	*(specify)*	❑ 29 CFR 1926.62 ❑ *NIOSH 7300* ❑ *other specify*	*(specify)*	*(specify)*	*(specify)*	*(specify)*
❑ Vinyl Chloride	*(specify)*	❑ 29 CFR 1926.1117 ❑ *NIOSH 1007* ❑ *other specify*	*(specify)*	*(specify)*	*(specify)*	*(specify)*
❑ Other (specify)	*(specify)*	*(specify)*	*(specify)*	*(specify)*	*(specify)*	*(specify)*

6.3 AREA SAMPLING

Requirements for area sampling and the corresponding action levels and response actions are specified in Table 6-3 for each task or group of tasks having different requirements, action levels or responses. These requirements, levels, and actions are set in accordance with Section 6 of the HASP. Any exceptions or deviations from requirements of the HASP are noted where applicable. Note that the requirements of this table only pertain to occupational exposure monitoring. Environmental sampling requirements, if any, to evaluate spread of contamination to off-site locations should be provided in a site-specific document separate from this SSHASP.

TABLE 6-3
AREA SAMPLING REQUIREMENTS

❑ Not applicable; rationale:

Hazardous Condition/ Task(s)	Task(s)	Instrument/ Supplies	Location and Duration of Monitoring	Sampling/ Analytical Method	Action Level(s)/ Rationale	Response Action(s)
HEALTH PHYSICS (AIRBORNE RADIATION)						
❑ Gross α and β/γ contamination (repeat row for each radioisotope listed in Table 4-2, as necessary for different requirements)		*[specify]*	*[specify]*	Per Section 6 of the HASP and Radiological Surveillance Authorization Agreement (RSAA)	10% DAC/ 10 CFR 835	Stop work, institute engineering controls, respiratory protection, source containment per RWP.
INDUSTRIAL HYGIENE (CHEMICALS)						
❑ **Respirable Dust** *(include separate row for each of: metals, coal tar, and asbestos; respirable silica/quartz)*		*[specify]*	*[specify]*	*[specify]*	*[specify]*	*[specify]*
❑ **Halogenated Hydrocarbons** *(Include separate row for each class of chemical substances listed in Table 4-2 having different requirements)*		*[specify]*	*[specify]*	*[specify]*	*[specify]*	*[specify]*
❑ **Other** *[specify]*		*[specify]*	*[specify]*	*[specify]*	*[specify]*	*[specify]*

7.0 PERSONAL PROTECTIVE EQUIPMENT (PPE)

In accordance with Section 7 of the HASP, PPE requirements are specified below for each task or group of tasks having different requirements. Only personnel who are trained and qualified to use the equipment in accordance with Section 7 of the HASP and Section 10 of the HASP and SSHASP are allowed to use the equipment specified. Any exceptions or deviations from requirements of these sections are noted below.

TABLE 7
PERSONAL PROTECTIVE EQUIPMENT (PPE)

☐ Not applicable; rationale:

[Atop the blank columns, enter the ID of each task for which the PPE is required; tasks having the same PPE requirements may be identified in the same column. Identify the required PPE by entering an "X" in the corresponding box below. Don't forget PPE requirements for emergency/incident response. Provided below are 23 blank columns. If fewer columns are necessary, delete excess columns and widen those retained. If more columns are necessary, work with your Field Unit HS Representative to modify the table appropriately (e.g., print additional columns on separate pages or use 8.5" x 14" paper).]

PPE REQUIREMENTS	TASK(s)																						
☐ **Head**	(per 29 CFR 1910.135, ANSI Z89.1-1986, or Z89.2 for electrical shock protection) ☐ Not applicable *[provide rationale]*																						
Cap																							
Hard Hat																							
Other *[specify]*																							
☐ **Eyes**	(per 29 CFR 1910.133, ANSI Z87.1-1989) ☐ Not applicable *[provide rationale]*																						
Safety Glasses (with sideshields)																							
Cover Goggles *[specify Type 2 or 3]*																							
Chemical Goggles																							
Burning Goggles																							
Lens Shade No. *[specify]*																							
Other *[specify]*																							
☐ **Face**	(per 29 CFR 1910.133, ANSI Z87.1-1989) ☐ Not applicable *[provide rationale]*																						
Faceshield - Plastic Lens																							
Faceshield - Mesh Window																							
Welding Helmet																							
Fitted to Hard Hat																							

PPE REQUIREMENTS	TASK(s)																						
Lens Shade No. *[specify]*																							
Other *[specify]*																							
☐ **Body**	☐ **Not applicable** *[provide rationale]*																						
Thermal Vest																							
Apron *[specify material]*:																							
Coveralls																							
Jacket																							
Pants/Shirt																							
Bibs																							
Other *[specify]*:																							
TO BE LAUNDERED:																							
Cotton																							
Polyester																							
Insulated																							
Other *[specify]*:																							
DISPOSABLE:																							
Breathable, Non-Woven Polypropylene (e.g., Standard Tyvek® or Kleenguard General Protection)																							
Splash Protection (e.g., Tyvek® QC or Kleenguard Liquid Protection)																							
Chemical Resistant (e.g., Tyvek®/SARANEX® 23-P)																							
WELDING:																							
Leather																							
Flame-proof																							
Apron																							
Leggings																							
Chaps																							
Cape																							

PPE REQUIREMENTS	TASK(s)																						
Arm Guard																							
Foot Cover																							
Other *[specify]*:																							
TRAFFIC ATTIRE:																							
Orange Vest																							
OTHER: *[specify]*																							
☐ **Hands**	(per 29 CFR 1910.137 and 138, ASTM D 120-87) ☐ Not applicable *[provide rationale]*																						
INNER GLOVES:																							
None																							
Latex																							
Nitrile ≥ 4-mil thick (e.g., BEST N-DEX®-7005)																							
Other *[specify]*:																							
OUTER GLOVES:																							
None																							
Nitrile ≥ 12" lgth & 0.01" thick																							
Neoprene																							
PVC																							
Cotton *[specify thickness]*:																							
Lineman's - Rubber Insulating Class *[specify 1, 2, 3, or 4]*:																							
Other *[specify]*:																							
☐ **Feet**	(per 29 CFR 1910.136, ANSI Z41-1991) ☐ Not applicable *[provide rationale]*																						
☐ **SHOES** ☐ **BOOTS**																							
None																							
Steel-toed																							
Steel-metatarsal																							
Non-conductive																							
Leather																							

PPE REQUIREMENTS	TASK(s)																						
Neoprene																							
PVC																							
Polyurethane																							
Other *[specify]*:																							
☐ **COVERS:**																							
None																							
Neoprene																							
PVC																							
Polyurethane																							
Other *[specify]*:																							
☐ **Ears**	(per 29 CFR 1910.95, ANSI Z87.1-1989) ☐ Not applicable *[provide rationale]*																						
Plugs *[specify NRR]*:																							
Muffs *[specify NRR]*																							
Other *[specify]*																							
☐ **Respiratory Protection**	(per Section 7.1 of the HASP, 29 CFR 1910.134, and ANSI Z88.2-1992) ☐ Not applicable *[provide rationale]*																						
AIR-PURIFYING RESPIRATOR (APR) FACEPIECE:	*[In the corresponding box, specify the air-purifying elements to be used (e.g., organic vapor, HEPA, acid gas, ammonia, mercury, combination, etc.)]*																						
Half-face																							
Full-face																							
Powered Air-Purifying (PAPR)																							
SUPPLIED-AIR RESPIRATOR:	*[Provide supplemental site-specific standard operating procedure(s); contact Field Unit HS Representative to determine necessary content.]*																						
Pressure Demand																							
Continuous Flow																							
Other *[specify]*:																							

PPE REQUIREMENTS	TASK(s)																						
☐ **Fall Protection**	(per 29 CFR 1926.20, 27(d)(5), 104, 105, 250(b)2, 451(i)(8) and (p)(9), 500(g)(1-6), 951(b)) ☐ Not applicable *[provide rationale]*																						
Belt																							
Harness																							
Life Line																							
Lanyard and Hooks																							
Safety Nets																							
Ladder-Climbing Safety Device																							
Other *[specify]*:																							
☐ **Miscellaneous**	☐ Not applicable																						
Protective Flotation Device (per 29 CFR 1926.106)																							
Other *[specify]*:																							

8.0 DECONTAMINATION

In accordance with Section 8 of the HASP, personnel and/or equipment decontamination requirements are specified below for each task or group of tasks having different requirements. Any exceptions or deviations from Section 8 of the HASP are noted below.

TABLE 8
PERSONNEL AND EQUIPMENT DECONTAMINATION

☐ Not applicable; rationale:

[Refer to Section 8 of the HASP and determine the approach(es) to be used for personnel and/or equipment decontamination. Atop the blank columns, enter the ID of each task for which the decontamination requirements apply; tasks having the same decontamination requirements may be grouped in the same column. Identify the requirements by entering an "X" in the corresponding box below. Provided below are 23 blank columns. If fewer columns are necessary, delete excess columns and widen those retained. If more columns are necessary, work with your Field Unit HS Representative to modify the table appropriately (e.g., print additional columns on separate pages or use 8.5" x 14" paper).]

Personnel and Environmental Monitoring Equipment (EME)

☐ Not applicable; rationale:

DECON REQUIREMENTS	TASK(s)																						
☐ **Option 1 - Standard Approach Level D**	☐ Not applicable; rationale:																						
Wash Soap - *[specify]*																							
Wash Solvent - *[specify type and %]*																							
Aqueous Rinse																							
Rinse Solvent - *[specify]*																							
PPE to be Disposed																							
PPE to be Laundered[1]																							
Other *[specify]*:																							

Modifications to Model Decon Procedures (if any, describe and provide rationale):

[1] ☐ Laundry Management notified per Section 8.2.2 of the HASP.

DECON REQUIREMENTS	TASK(s)																						
☐ **Option 2 - Standard Approach Level C**	☐ Not applicable; rationale:																						
Wash Soap - *[specify]*																							
Wash Solvent - *[specify] type and %*																							
Aqueous Rinse																							
Rinse Solvent - *[specify type and %]*																							
PPE to be Disposed																							
PPE to be Laundered[1]																							
Other *[specify]*:																							
Modifications to Model Decon Procedures (if any, describe and provide rationale):																							
☐ **Option 3 - Standard Approach Level B**	☐ Not applicable; rationale:																						
Wash Soap - *[specify]*																							
Wash Solvent - *[specify] type and %*																							
Aqueous Rinse																							
Rinse Solvent - *[specify type and %]*																							
PPE to be Disposed																							
PPE to be Laundered[1]																							
Other *[specify]*:																							
Modifications to Model Decon Procedures (if any, describe and provide rationale):																							
☐ **Option 4 - Extensive Approach Level D**	☐ Not applicable; rationale:																						
Wash Soap - *[specify]*																							
Wash Solvent - *[specify type and %]*																							
Aqueous Rinse																							
Rinse Solvent - *[specify type and %]*																							
PPE to be Disposed																							

[1] ☐ Laundry Management notified per Section 8.2.2 of the HASP.

DECON REQUIREMENTS	TASK(s)																						
PPE to be Laundered[1]																							
Other *[specify]*:																							
Modifications to Model Decon Procedures (if any, describe and provide rationale):																							
☐ **Option 5 - Extensive Approach Level C**	☐ Not applicable; rationale:																						
Wash Soap - *[specify]*																							
Wash Solvent - *[specify type and %]*																							
Aqueous Rinse																							
Rinse Solvent - *[specify type and %]*																							
PPE to be Disposed																							
PPE to be Laundered[1]																							
Other *[specify]*:																							
Modifications to Model Decon Procedures (if any, describe and provide rationale):																							
☐ **Option 6 - Extensive Approach Level B**	☐ Not applicable; rationale:																						
Wash Soap - *[specify]*																							
Wash Solvent - *[specify type and %]*																							
Aqueous Rinse																							
Rinse Solvent - *[specify type and %]*																							
PPE to be Disposed																							
PPE to be Laundered[1]																							
Other *[specify]*:																							
Modifications to Model Decon Procedures (if any, describe and provide rationale):																							

1 ☐ Laundry Management notified per Section 8.2.2 of the HASP.
1 ☐ Laundry Management notified per Section 8.2.2 of the HASP.
1 ☐ Laundry Management notified per Section 8.2.2 of the HASP.

DECON REQUIREMENTS	TASK(s)																						
☐ **Other**	*[Provide a description of intended decon facility layout, procedures and equipment in this Section of the SSHASP and/or an Appendix. Also provide rationale.]*																						
Wash Soap - *[specify]*																							
Wash Solvent - *[specify type and %]*																							
Aqueous Rinse																							
Rinse Solvent - *[specify type and %]*																							
PPE to be Disposed																							
PPE to be Laundered[1]																							
Other *[specify]*:																							

Sampling and Heavy Equipment

☐ Not applicable; rationale:

☐ Per LANL-ER-SOP-1.08

☐ Other Procedure: *[Provide a description of intended decon facility layout, procedures and equipment/supplies in this Section of the SSHASP and/or an Appendix. Also provide rationale.]*

DECON REQUIREMENTS	TASK(s)																						
Sample Decon	☐ Not applicable; rationale:																						
Centralized Location																							
Localized at work site ☐ in EZ ☐ in CRZ																							
Wash Soap - *[specify]*:																							
Wash Solvent - *[specify type and %]*																							
Aqueous Rinse																							
Rinse Solvent - *[specify type and %]*																							
Other *[specify]*:																							

Exceptions to and/or deviations from LANL-ER-SOP-1.08 (if any, describe and provide rationale):

[1] ☐ Laundry Management notified per Section 8.2.2 of the HASP.

DECON REQUIREMENTS	TASK(s)																						
Sampling Equipment Decon	☐ Not applicable; rationale:																						
Centralized Location																							
Localized at work site ☐ in EZ ☐ in CRZ																							
Wash Soap - *[specify]*																							
Wash Solvent - *[specify type and %]*																							
Aqueous Rinse																							
Rinse Solvent - *[specify type and %]*																							
Other *[specify]*:																							
Exceptions to and/or deviations from LANL-ER-SOP-1.08 (if any, describe and provide rationale):																							
Heavy Equipment Decon	☐ Not applicable; rationale:																						
Centralized Location																							
Localized at work site ☐ in EZ ☐ in CRZ																							
Wash Soap - *[specify]*																							
Wash Solvent - *[specify type and %]*																							
Aqueous Rinse																							
Rinse Solvent - *[specify type and %]*																							
Other *[specify]*:																							
Exceptions to and/or deviations from LANL-ER-SOP-1.08 (if any, describe and provide rationale):																							

9.0 EMERGENCY/INCIDENT ACTION PLAN

Incident/emergency action requirements, equipment, and supplies are specified below for each task or group of tasks having different requirements. Response to an incident or emergency shall occur according to Section 9 of the HASP and this section. Any exceptions or deviations from requirements of the HASP are noted below.

In the event of an incident or emergency, the FTL or JS will function as the site emergency/incident coordinator, as necessary, and will arrange for immediate notification of LANL emergency response personnel to take control of the scene and/or arrange for immediate notification of appropriate authorities. Other key onsite incident/emergency response personnel are identified below. Only personnel who are trained and certified in accordance with Sections 7, 9, and 10 of the HASP and SSHASP are allowed to respond and use the equipment specified. Incident/emergency contacts and telephone numbers and a map indicating the route to the nearest hospital and medical clinic from each investigational site are included in Appendix D. Both these items shall be posted onsite where readily accessible to field team personnel. Site-specific muster areas shall be determined by the SSO prior to the start of field operations each day and shall be communicated to individuals onsite during the HS Tailgate meeting and as other individuals arrive at the site. Location(s) of muster areas may vary from day-to-day depending upon variable site operations and conditions, and shall be documented daily by the SSO or FTL.

9.1 ADJACENT FACILITIES OF CONCERN

[Describe the types of incidents likely at adjacent facilities, if any, that would influence or impact site operations and/or personnel, and the related means for field team personnel to be notified of such incidents. Also identify the types of incidents that may likely occur as a result of ER Project work, if any, that would be expected to influence or impact adjacent facilities, and the associated means for personnel at the adjacent facility to be notified of such incidents. Include the name, title and phone number for contacting the Facility Manager and Facility Operations Safety Representative at each adjacent facility of concern in the list of contacts in Appendix D.]

TABLE 9 INCIDENT/EMERGENCY ACTION REQUIREMENTS
❑ Not applicable; rationale:
[Atop the blank columns, enter the ID of each task where the corresponding requirement applies; tasks having the same requirements may be identified in the same column. Unless otherwise specified, identify the requirements by entering an "X" in the corresponding box below. Provided below are 23 blank columns. If fewer columns are necessary, delete excess columns and widen those retained. If more columns are necessary, work with your Field Unit HS Representative to modify the table appropriately (e.g., print additional columns on separate pages or use 8.5" x 14" paper).]
Incident Responders: *[Enter name, title, and employer of each trained and qualified person according to 29 CFR 1926.65(q) (especially paragraph (6)(ii)) who will be expected to respond to an incident per Section 9 of the HASP. If these people will vary by task, indicate this information for each different task.]* **First-Aid/CPR Provider(s):** *[Enter name, title, and employer of each certified person. If this person will vary by task indicate this information for each different task.]*

REQUIREMENTS	TASK(S)																						
Communications																							
Two-Way Radio																							
Cellular phone																							
Pager																							
Air Horn(S)																							
Other *[specify]*																							
Description of Air Horn Signals: *[e.g., one, two or three blasts, short or long mean what?]*																							
Hand/Body Signals																							
Description of Hand/Body Signals:																							
Site-Specific Restrictions: *[specify, if any]*																							
❑ **Incident Response Equipment**	*[Include PPE in Table 7, not here.]* ❑ Not applicable; rationale:																						
Industrial first-aid kit[1]																							
Bio. pathogen and waste disposal kit[2]																							
Antiseptic																							
Cold compress																							
Emergency decon solutions																							
Blanket																							
Splint materials																							
Stretcher(s)																							
Wire basket litter																							

1 The first-aid supplies shall be approved by a consulting physician and be kept in a weatherproof container. The contents are to be checked weekly and resupplied by SSO or designee. Contents shall meet the *American National Standard Minimum Requirements for Industrial Unit-Type First Aid Kits* (ANSI Z308.1-1978).

2 This kit shall be kept in a weatherproof container. Contents are to be checked weekly and resupplied by SSO or deligate. Contents shall include at least the following: *[specify]*

REQUIREMENTS	TASK(s)																						
Portable emergency eyewash[3] *[specify type and capacity]*																							
Portable emergency shower[3] *[specify type and capacity]*																							
Portable emergency eyewash/shower[3] *[specify type and capacity]*																							
Transport Vehicle *[Required if emergency medical attention not within 4 minutes response time]*																							
Other *[specify]*:																							
❑ **Fire Fighting Equipment**	*[Include PPE in Table 7, not here. In this box, enter name, title, and employer of each trained person. If this person will vary by task or site, indicate this information for each different task/site. In the corresponding box below, indicate where the equipment will be kept (e.g. EZ, CRZ, SZ, etc.)]* ❑ Not applicable; rationale:																						
Not applicable																							
A:B:C fire extinguisher *[specify capacity]*: ❑ 10 lb ❑ 12 lb ❑ 15lb ❑ 20 lb																							
Nonsparking tools																							
Other *[specify]*:																							
❑ **Spill Containment Equipment**	*[Include PPE in Table 7, not here. In the corresponding box, indicate where the equipment will be kept (e.g. EZ, CRZ, SZ).]* q Not applicable; rationale:																						
Not applicable																							
Absorbent *[specify type of material (e.g., vermiculite, sand, dirt, etc.) quantity, and the size/capacity]*																							
Spill control pillows *[specify quantity]*																							
Oil booms *[specify type, quantity, and the size/capacity]*																							

3 Emergency eyewashes and showers must be located within 10 seconds travel time and not more than 100 feet of travel distance of any source of chemical splash that may be corrosive or moderately to severely irritating to body tissue. They must have a capacity to be able to provide continuous flushing for the duration of time necessary to sufficiently flush the most hazardous substance for which the device is being specified (usually minimum of 15 minutes and 16 gallon capacity). They also shall be inspected and flushed at least weekly by the SSO or designee. Refer to ANSI Z358.1-1990 for further information.

REQUIREMENTS	TASK(s)																						
Shovel(s) *[specify type, quantity and size]*																							
Containers for contaminated equipment *[specify type, quantity, and the size/capacity]*																							
Other *[specify]*:																							
❑ **Other *[specify]*:**																							

10.0 TRAINING

Training requirements are specified below by job title for each task or group of tasks having different requirements. Personnel shall be trained in accordance with Section 10 of the HASP and as specified below. Any exceptions or deviations from requirements of the HASP are noted below. Personnel performing the roles indicated below shall have completed and have current documentation of the training specified. The SSO, or the FTL or JS, shall verify that personnel have met the training requirements prior to authorizing individuals to enter controlled zones of the work site.

TABLE 10
TRAINING REQUIREMENTS

(Sup = Supervisors; CP = Competent Person for that subject; R = Read training; C = Classroom training; F = Field training; AN = As needed per the HASP or applicable regulatory requirement depending upon the intended duties of the personnel role; ER = Employer required)

[Othr = Other categories - atop the columns below, replace "Othr" using titles in Table 4-1 and note corresponding acronym(s) in this block. Delete extra columns and widen remaining columns. Use codes ("R", "C", "F") to specify task-specific requirements in blank boxes and boxes with "AN".]

Applicable Task(s): *[Specify the training requirements for each personnel role identified in Tables 4-1 and 9 using the letter codes defined above. Repeat this row and specifications for each task or group of tasks for which different training is required. For the most part mandatory training typical of most HAZWOPER work has already been indicated below. Enter any other applicable training requirements specific to the indicated task(s).]*

Training Requirement	Personnel Role																						
	FPL	FTM	FTL	Sup	SSO	IHT	RCT	HPT	RSP	CP	Othr	Othr	Othr	Othr	Othr	Othr	Othr	Othr	Othr	Othr	Othr	Othr	Othr
HASP	R	R	R	R	R	R	R	R	R	R	AN	R	R	R	R	R	R	R	R	R	R	R	R
SSHASP	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
Pre- Job Start HS Briefing	F or C	F or C	F or C	F or C	F or C	F or C	F or C	F or C	F or C	F or C	F or C	F or C	F or C	F or C	F or C	F or C	F or C	F or C	F or C	F or C	F or C	F or C	F or C
Daily HS Tailgate Mtgs	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
☐ TA-Specific *[Provided by TA Rep. for all personnel working on site]*																							
General Employee Training (GET) - LANL provided only *[Required for anyone on site >10 consecutive work days]*	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Employer's Hazard Communication Program [29 CFR 1926.59(e)]	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Conduct of Operations & Occurrence Reporting	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
OSHA Rights & Responsibilities	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R

Applicable Task(s):

Training Requirement	Personnel																						
	FPL	FTM	FTL	Sup	SSO	IHT	RCT	HPT	RSP	CP	Othr	Othr	Othr	Othr	Othr	Othr	Othr	Othr	Othr	Othr	Othr	Othr	Othr
Health Physics Checklist Indoctrination	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN
Rad. Worker II	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN
40 hr. HAZWOPER	C	C	C	C	C	C	C	C	C	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN
24 hr. Supervised Fieldwork	F	F	F	F	F	F	F	F	F	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN
☐ 24 hr. HAZWOPER										AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN
☐ 8 hr. Supervised Fieldwork										AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN
8 hr. Annual Refresher	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN
8 hr. HAZWOPER Supervisor		C	C	C																			
☐ SSO					F/C																		
☐ IHT						F/C																	
☐ Health Physics Personnel							F/C	F/C	F/C														
☐ 1st Aid																							
☐ CPR																							
☐ First Responder Awareness Level																							
☐ First Responder Operations Level																							
PPE (per Section 7.1 of HASP)		F or C	F or C	F or C	F or C	F or C	F or C	F or C	F or C	F or C	F or C	F or C	F or C	F or C	F or C	F or C	F or C	F or C	F or C	F or C	F or C	F or C	F or C
☐ Fire Extinguisher Use [per 29 CFR 1926.150(c)(1)(xi)]																							
☐ Fire Fighting Equipment [29 CFR 1926.150]		R	R	R	R	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN	AN
☐ Hearing Conservation [Per Section 4.2.2.7 of HASP]																							
☐ Respiratory Protection - Level C [Per Section 7..1 of HASP and 29 CFR 1910.134(b)(1) and (e)(2)]																							

Applicable Task(s):

Training Requirement	Personnel																						
	FPL	FTM	FTL	Sup	SSO	IHT	RCT	HPT	RSP	CP	Othr	Othr	Othr	Othr	Othr	Othr	Othr	Othr	Othr	Othr	Othr	Othr	Othr
☐ Respiratory Protection - Level B [Per Section 7.1 of HASP and 29 CFR 1910.134(b)(1) and (e)(2)]																							
☐ Level B Equip. Supvr [Per Site-Specific SOP - Per Section 7.1 of HASP and 29 CFR 1910.134(b)(1) and (e)(2)]																							
☐ Plutonium Safety *[LANL]*																							
☐ Tritium Safety *[LANL]*																							
☐ Spot Test for High Explosives (HE) *[contact DX-16 at 7-4574]*																							
☐ High Explosives (HE) Identification/Hazard Awareness Video *[contact DX-16 at 7-4574]*																							
☐ RCRA Training																							
☐ DOT Training																							
Sanitation *[29 CFR 1926.51]*		R	R	R	R																		
☐ Materials Handling, Storage, Use, Disposal *[29 CFR 1926.250 and 252]*		R	R	R	R																		
Signs, Signals, Barricades *[29 CFR 1926.200]*		R	R	R	R																		
☐ Traffic Flagging and Safety *[29 CFR 1926.201]*																							
☐ Stairways, Ladders *[29 CFR 1926.1060(a) and 1053(b)(15) and 32(f)]*		R	R	R	R																		
☐ Tools - Hand and Power *[29 CFR 1926.302(e)(1)]*		R	R	R	R																		
☐ Excavation/Trenching Competent Person *[29 CFR 1926.651(k)(1) and 32(f)]*										C/F													

Applicable Task(s):

Training Requirement	Personnel																						
	FPL	FTM	FTL	Sup	SSO	IHT	RCT	HPT	RSP	CP	Othr	Othr	Othr	Othr	Othr	Othr	Othr	Othr	Othr	Othr	Othr	Othr	Othr
☐ Excavation/Trenching Protective Systems Competent Person *[29 CFR 1926.652(a)(ii) and 32(f)]*										C/F													
☐ Confined Space Entry *[per 29 CFR 1910.146(g)]*																							
☐ Confined Space Entry Supervisor *[per 29 CFR 1910.146(g) and (j)]*										C/F													
☐ Electrical Safety Awareness *[Subpart K of 29 CFR 1926]*										C/F													
☐ Lockout/Tagout (Booklet)																							
☐ Lockout/Tagout Red Control of Hazardous Energy Sources [per 29 CFR 1926.416(a)(4) and 417(a) and 32(m)]										C/F													
☐ Motor Vehicles, Mechanized Equipment, and/or Material Handling Equipment *[specify equip. type and training requirement per Subparts O and W of 29 CFR 1926]*		R	R	R	R					C/F													
☐ Forklift Safety *[per 29 CFR 1910.178(l)]*										C/F													
☐ Crane & Rigging Operator Safety [ANSI B30]																							
☐ Crane & Rigging Safety *[29 CFR 1926.251, 406, 550(a)]*										C/F													
☐ Hoists *[29 CFR 1926.406, 552]*										C/F													
☐ Conveyors *[29 CFR 1926.555 and ANSI/ASME B20.1b5.2a]*										C/F													
☐ Welding and Cutting *[29 CFR 1926.350(d) and 351(d) and 354(a)]*										C/F													

Applicable Task(s):

Training Requirement	Personnel																						
	FPL	FTM	FTL	Sup	SSO	IHT	RCT	HPT	RSP	CP	Othr	Othr	Othr	Othr	Othr	Othr	Othr	Othr	Othr	Othr	Othr	Othr	Othr
☐ Scaffolding *[29 CFR 1926.451(a)(3) and 32(f)]*										C/F													
☐ Arsenic - inorganic *[29 CFR 1926.1118]*																							
☐ Asbestos Worker *[specify applicable OSHA or EPA std.]*																							
☐ Asbestos Competent Person *[specify OSHA or EPA std.]*		C	C	C	C					C													
☐ Benzene *[29 CFR 1926.1128]*																							
☐ Beryllium *[LANL-AR 6-7]*																							
☐ Bloodborne Pathogens *[29 CFR 1910.1030]*																							
☐ Cadmium *[29 CFR 1926.63]*																							
☐ Formaldehyde *[29 CFR 1926.1148]*																							
☐ Lead *[29 CFR 1926.62]*																							
☐ Vinyl Chloride *[29 CFR 1926.1117]*																							
☐ Other (specify):																							

11.0 MEDICAL SURVEILLANCE

The medical surveillance requirements of this section have been established in accordance with Section 11 of the HASP, unless noted otherwise below.

TABLE 11
MEDICAL SURVEILLANCE REQUIREMENTS

❑ Not Applicable; rationale:

Hazard	Task(s)	Exposure Level Triggering Medical Surveillance Requirement	Requirement
❑ Hazardous Waste Operations		Potential for exposure to hazardous substances or health hazards ≥ PELs or published exposure limits during HAZWOPER work	29 CFR 1926.65(f)
❑ Arsenic (inorganic)		> 5 mg/m^3	29 CFR 1926.1118(n)
❑ Asbestos		≥ 0.1 fiber/cc	29 CFR 1926.1101(m)
❑ Benzene		≥ 0.5 ppm	29 CFR 1926.1128(i)
❑ Beryllium		> 0.5 mg/m^3	LANL AR 6-7 and TB 607
❑ Bloodborne Pathogens (Or Potentially Infectious Materials)		Any occupational exposure	29 CFR 1910.1030(f)
❑ Cadmium		≥ 2.5 mg/m^3 and all employees performing tasks involving cadmium (e.g., brazing, burning, cutting, painting, welding)	29 CFR 1926.1127(l)
❑ Formaldehyde		≥ 0.5 ppm	29 CFR 1926.1148(l)
❑ Hearing Protection		≥ 85 dBA	29 CFR 1910.95(g)
❑ Lead		≥ 30 mg/m^3	29 CFR 1926.62(j)
❑ Repiratory Protection		Use of respirators	29 CFR 1926.134
❑ Vinyl Chloride		> 0.5 ppm	29 CFR 1926.1117(k)
❑ Other *[specify]*			

12.0 QUALITY CONTROL & QUALITY ASSURANCE (QC/QA)

12.1 SITE INSPECTIONS

In accordance with Section 12 of the HASP, the FTL shall see that the following inspections are conducted and documented, and that appropriate actions are taken and documented to rectify identified deficiencies, if any.

TABLE 12
INSPECTION REQUIREMENTS

Inspection	Inspector	Task(s)
❑ Job Site, Material and Equipment (in accordance with 29 CFR 1926.20(b)(2))	SSO	
❑ General Sanitation (i.e., potable and non-potable water, toilets, washing facilities, eating and drinking areas, vermin control, and/or change rooms; in accordane with 29 CFR 1926.51)	SSO	
❑ Materials handling, storage, use and disposal (in accordance with 29 CFR 1926.250 and 252)	SSO	
❑ Signs, Signals and Barricades (in accordance with 29 CFR 1926.200)	SSO	
❑ Motor vehicles and mechanized equip. (in accordance with Subpart O of 29 CFR 1926)	SSO, QP or CP as required	
❑ Material handling equipment (e.g., rubber-tired scraper, loader and dozers] equipped with rollover protective structures and overhead protection (in accordance with Subpart W of 29 CFR 1926)	QP or CP as required	
❑ Excavations/Trenches(per 29 CFR 1926.651(k))	QP or CP as required	
❑ Excavations/Trenches Protective Systems (per 29 CFR 1926.652)	QP or CP as required	
❑ PPE (Section 7 and 29 CFR 1926.95)	User	
❑ Fall Protection (per 29 CFR 1926.20(b)(2) and ANSI A10.14)	QP or CP as required, and User	
❑ Respiratory Protective Equipment (Section 7 and 29 CFR 1910.134(f))	User	
❑ Incident/emergency response equipment (prior to each use and at least monthly)	SSO	
❑ Fire fighting equipment (per 29 CFR 1926.150(a) and (c))	SSO	
❑ Derricks (e.g., drill rigs) and Cranes (in accordance with Table 4-3 and per 29 CFR 1926.550(a)(5),(6) and 406(a))	QP or CP as required	
❑ Rigging (in accordance with Table 4-3 and per 29 CFR 1926.251(a))	QP or CP as required	
❑ Personnel hoists (at least weekly, per 29 CFR 1926.552(c)(17)(iii) and 406(a))	QP or CP as required	
❑ Material hoists (in accordance with 29 CFR 1926.552(b) and 406(a))	QP or CP as required	
❑ Conveyors (in accordance with 29 CFR 1926.555)	QP or CP as required	
❑ Stairways and Ladders (in accordance with Subpart X of 29 CFR 1926)	SSO, QP or CP as required	
❑ Tools - hand and power (in accordance with Subpart I of 29 CFR 1926)	User and SSO	
❑ Welding and cutting equipment (in accordance with Subpart J of 29 CFR 1926)	QP or CP as required	
❑ Electrical equipment (per 29 CFR 1926.403(b) and/.or 416(f)(8))	QP or CP as required	
❑ Scaffolding (in accordance with Subpart L of 29 CFR 1926)	QP or CP as required	
❑ Fork lifts (in accordance with 29 CFR 1910.178)	QP or CP as required	
❑ Other (specify):		

QP = Qualified Person; CP = Competent Person (per 29 CFR 1926.32(f) or (m))

13.0 RECORDKEEPING

In addition to recordkeeping requirements of Section 13 of the HASP, the HS records specified below shall be completed in accordance with Section 13 of the HASP and kept onsite as indicated below.

TABLE 13
RECORDKEEPING REQUIREMENTS

Record/Form	Requirement Reference	Keep Onsite
❑ HASP	HASP Section 1	X
❑ This SSHASP	HASP Section 1	X
❑ Completed Modification Forms	HASP Section 1	X
❑ SSOs Daily Logbook	HASP Section 13.1	X
❑ Documentation of Training Requirements	HASP Section 10	
❑ Documentation of Medical Surveillance	HASP Section 11	
❑ Exposure Monitoring Records	Section 6 of the HASP and applicable exposure monitoring methods in the ER Project *Manual for Site HS Activities*	X
❑ HS Inspection Records	HASP Section 12.1	X
❑ Other (specify):		

APPENDIX A

MAP(S) OF SITE LOCATIONS, ADJACENT FACILITIES AND SITE CONTROL ZONES/FACILITIES

APPENDIX B

HAZARDOUS SUBSTANCE - HAZARD ASSESSMENT

APPENDIX B

[illegible] HAZARDOUS SUBSTANCE - HAZARD ASSESSMENT

This table includes a health hazard assessment, and associated rationales, of each chemical product and site contaminant listed in Table 2-1. This hazard assessment was completed in accordance with Section 4.1 of the HASP.

TASKS(S): *[Refer to Section 4.2 of the SSHASP and/or Section 4.1 of the HASP for guidance. Enter the tasks(s) having the same data, if any, and complete this table by task for each substance listed in Table 2-1.]*

Substance	[illegible] Date[1] / Location		Hazard Assessment Rating/Rationale
RADIOLOGICAL SUBSTANCES			
[illegible] Knowledge			
Soil Sample Results			
Soil Gas Vapor Results			
Air Monitoring or Sampling Results			
Water Sample Results			

[1] Reference recsources where data reported, and either here or in the "location" column include a brief description of the sample location (e.g., borehole number, depth, etc).

TASKS(S): *[Enter the tasks(s) having the same data, if any, and complete this table by task for each substance listed in Table 2-2.]*			
Substance/ Synonym	**Maximum Data[1]**		**Hazard Assessment Rating/Rationale**
	Value	**Location**	
CHEMICAL SUBSTANCES			
Process Knowledge			
Soil Sample Results			
Soil Gas Vapor Results			
Air Monitoring or Sampling Results			
Water Sample Results			

APPENDIX C

CHEMICAL, PHYSICAL, AND TOXICOLOGICAL PROPERTIES OF HAZARDOUS CHEMICAL SUBSTANCES

APPENDIX C

PHYSICAL, CHEMICAL, AND TOXICOLOGICAL PROPERTIES OF HAZARDOUS CHEMICAL SUBSTANCES

[This table should include only the hazardous substances of occupational health concern (those listed in Table 4-2), which were assessed in Appendix B and resulted in an assessment of "possibly could occur", probably will occur", or "likely to occur" and a hazard severity of "minor", "major", or "catastrophic". This table is not all inclusive and only includes examples. Enter any missing data not already listed below.]

Substance/ Synonym(s)	Exposure Limit [1,2] (ppm)			Physical Characteristics [1]	Route(s) of Entry [1,3]	Signs/Symptoms of Toxicity [1,3]	Carcino-genicity [1,3]	Flash Point [1,3]	Vapor Press./ Density [1]	IP [1,4]	SC[5]
	PEL or REL	TLV	IDLH								
❑ CALIBRATION AND WELDING GASES For purposes of LANL ER work, examples of calibration gases are heptane, hexane, hydrogen, isobutylene, oxygen and pentane. Common welding gases include acetylene, oxygen and propane. For the most part, these gases are flammable and pressurized and could become a mini-torpedo if not handled carefully. The primary routes of exposure into the body are inhalation and skin contact/absorption. Symptoms of exposure include light headedness, nausea, headache, numb extremities, dermatitis, loss of appetite, frostbite (propane), chemical pneumonia, and giddiness.											
Heptane	500	400	750	Colorless liquid with gasoline like odor	Inhalation skin contact	Headache, giddiness, loss of appetite, nausea, dermatitis	Not Applicable (NA)	25°C	40 mm	9.90 eV	27
Propane	1,000	simple asphyxiant	2,100	Colorless, odorless gas	Inhalation Skin contact	Dizziness, disorientation, excitation, frostbite	N.A.	N.A.	> 1 atm	11.07 eV	22
Other [specify]											

1 *NIOSH Pocket Guide to Chemical Hazards*, U.S. Department of Health and Human Services, 1994.

2 *1994-1995 Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices*, American Conference of Governmental Industrial Hygienists, 1994.

3 *Hazardous Chemicals Desk Reference*, 3rd edition, Richard J. Lewis, Sr., Von Nostrand Reinhold, 1993.

4 HNu Photoionization Detector Guidance Information

5 Spill containment guide (page) number, *1993 Emergency Response Guidebook*, U.S. Department of Transportation, Research and Special Programs Administration, Office of Hazardous Materials Training and Initiatives (DHM-50), 1993.

Substance/ Synonym(s)	Exposure Limit [1,2] / IDLH[1] (ppm)			Physical Characteristics[1]	Route(s) of Entry [1,3]	Signs/Symptoms of Toxicity [1,3]	Carcino-genicity [1,3]	Flash Point [1,3]	Vapor Press./ Density [1]	IP [1,4]	SC[5]
	PEL or REL	TLV	IDLH								
❑ **CORROSIVES**											
For purposes of LANL ER work, [illegible] generally include acids, bases/caustics and inorganic metallic or halogen salts. Common acids include: acetic, citric, hydrochloric, nitric, perchloric, [illegible] sulfuric, and trichloroacetic (TCA). Common caustics include: ammonia, ammonium hydroxide, potassium hydroxide, sodium hydroxide and sodium [illegible]. Inorganic metallic salts include compounds such as chromates and permanganates. Inorganic halogen salts include compounds such as sodium chloride and potassium bromide which can be corrosive to metals and finishes but are not significantly harmful to bodily tissues when good hygiene practices are implemented. Primary routes of entry into the body are skin contact, inhalation and ingestion. Contact with corrosives can result in severe irreversible damage to skin, eyes and respiratory system. Symptoms of exposure include tissue burns; eyes, nose and throat irritation/inflammation; and/or excessive fluid in respiratory system.											
Nitric Acid	2 5 mg/m^3	2 5 2 mg/m^3	25	Colorless , yellow or red fuming liquid with an acrid, sufficating odor	Inhalation Ingestion skin contact	Eyes, skin and mucous membrane irritant, delayed pulmonary edema, bronchitis, pneumonitis	N.A.	N.A.	48 mm	11.95 eV	>40%: 44 ≤40%: 60
Sulfuric acid	1 mg/m^3	1 mg/m^3	15 mg/m^3	Colorless to dark brown, oily, odorless liquid	Inhalation Ingestion skin contact	Eyes, throat, nose irretant, pulmonary edema, bronchitis, skin and eye burns, dermatitis	N.A.	N.A.	5 mm	8.40 eV	39
Other *(Specify)*											
❑ **HYDROCARBONS (Halogenated)**											
Examples of halogenated hydrocarbons associated with LANL ER work are 1,2-Dichloroethylene, 1,1,1-Trichloroethane (methyl chloroform), Trichloroethylene, Trichloro-trifluoro ethane(Freon-113), and Vinyl Chloride. Generally, these compounds are moderately to highly volatile and are non combustible. The primary routes of exposure into the body are inhalation, ingestion and/or skin contact. Symptoms of exposure include skin, eyes, and upper respiratory irritation, liver, kidney, cardiac, motor activity, and gastrointestinal changes, anesthesia, irritability, and central nervous system depression.											
1,2-Dichloro-ethylene	200	200	1,000	*enter: appearance, color, odor thresh-hold*	Inhalation Ingestion	General anesthesia, liver and kidney changes	N.A.	39°F	*enter:*	9.65 eV	29
1,1,1-Trichloroethane (methyl chloroform)	350	350	700	*enter: appearance, color, odor thresh-hold*	Inhalation Skin contact Ingestion	Eye irritation; hallucinations motor activity changes; irritability; aggression; hypermotility; cardiac changes	Questionable Human Carcinogen (IARC)	none		11.00 eV	74
Trichloro-ethylene	100	50	1,000	*enter: appearance, color, odor thresh-hold*	Inhalation Ingestion	Eye effects; sleepiness; hallucinations or distorted perceptions; gastrointestinal changes; jaundice	Questionable Human Carcinogen (IARC)	89.6°F		9.45 eV	74
Trichloro-trifluoro-ethane (Freon-113)	1,000	1,000	2,000	*enter: appearance, color, odor thresh-hold*	Inhalation Skin contact Ingestion	Central nervous system depression; skin irritation	N.A.	N.A.	*enter:*	11.78	Not Listed

Substance/ Synonym(s)	Exposure Limit [1,2] / IDLH[1] (ppm)			Physical Characteristics[1]	Route(s) of Entry [1,3]	Signs/Symptoms of Toxicity [1,3]	Carcino-genicity [1,3]	Flash Point [1,3]	Vapor Press./ Density [1]	IP [1,4]	SC[5]
	PEL or REL	TLV	[illegible]								
Vinyl chloride	1	5	Not determined	*enter: appearance, color, odor thresh-hold*	Inhalation Skin contact Ingestion	Severe eye and skin irritant; causes skin burns by rapid evaporation and freezing; anesthetic at high concentrations	Confirmed Human Carcinogen (IARC) (liver and blood tumors)	17.6 °F		9.99 eV	17
Other *(Specify)*											
❑ **HYDROCARBONS (Non-Halogenated)** Examples of non-halogenated hydrocarbons associated with LANL ER work are acetone and methyl ethyl ketone (MEK). The primary routes of exposure into the body are inhalation, ingestion and skin absorption. Symptoms of exposure include eyes, nose and throat irritant, headache, dizziness and dermatitis.											
Acetone	1,000	750	2,500	Colorless, liquid with a fragrant, mint-like odor	Inhalation Ingestion Skin contact	Eyes, nose, throat irritant, headache, dizziness, dermatitis	N.A	0°F	180 mm	9.69 eV	26
2-Butanone (Methyl Ethyl Ketone [MEK])	200	200	3000	Colorless liquid with a moderately sharp, fragrant, mint- or acetone-like odor	Inhalation Ingestion Skin contact	Eyes, nose irritant, headache, dizziness, vomiting	N.A	16°F	71 mm	9.54 eV	26
Other *(Specify)*											
❑ **GASES** Examples of gases are hydrigen cyanide, hydrogen sulfide and methane. These gases are flammable and extremely volatile. The primary routes of exposure into the body are inhalation, ingestion and skin absorption. Symptoms of exposure include skin, eyes and respiratory system damage.											
Hydrogen Sulfide	10	10	300	*enter: appearance, color, odor thresh-hold*	Inhalation	Severe irritant to the eyes and mucous membranes; asphyxiant; chronic pulmonary edema; nervous system depression or paralysis; coma	N.A.	N.A. (gas)	*enter density:*	10.46 eV	13
Methane	Asphyxiant/flammable			*enter: appear-ance,, color*	Inhalation	Simple asphyxiant, very dangerous fire and explosion hazard	N.A.	368.6°F	*enter density:*	12.98 eV	compressed 17
Hydrogen Cyande	10 skin	4.7 C skin	50	*enter: appearance, color, odor thresh-hold*	Inhalation Skin Absorbtion Ingestion Skin contact	*enter:*	*enter:*	*enter:*	*enter:*	*enter:*	see guide
Other *(Specify)*											

Substance/ Synonym(s)	Exposure Limit [1,2] / IDLH[1] (ppm)			Physical Characteristics[1]	Route(s) of Entry [1,3]	Signs/Symptoms of Toxicity [1,3]	Carcino-genicity [1,3]	Flash Point [1,3]	Vapor Press./ Density [1]	IP [1,4]	SC[5]
	PEL or REL	TLV	[illegible]								
❑ METALS											
Metals associated with LANL ER [illegible] ude, though not be limited to lead, beryllium, barium, cadmium, chromium, copper, and mercury. Most metals pose a health hazard in their solid form, [illegible], with the exception of mercury vapor. The primary routes of exposure [illegible] ude inhalation, ingestion, and skin contact. Symptoms of exposure include eye, skin and, upper respiratory system irritation; headache, insomnia, m[illegible] ith, abdominal pain and tremors. Cancers of the lungs and bones are associated with metal intoxication.											
Lead	0.05 mg/m^3	0.05 mg/m^3 (Notice of Intended Change [NIC])	100 mg/m^3	*enter: appearance, color*	Inhalation Skin absorption (organic forms only) Ingestion	Loss of appetite, anemia, malaise, insomnia, headache, irritability, muscle and joint pains, tremors, faccid paralysis, hallucinations, muscle weakness	dependent upon compound	N.A.	N.A.	N.A.	53
Other *(Specify)*											
❑ MINERALS											
For purposes of LANL ER work, examples of minerals include asbestos and silica. Most minerals pose a health hazard in their solid form, especially as dusts. The primary routes of exposure into the body are inhalation and ingestion. Symptoms of exposure include impaired pulmonary function, cough wheeze, pneumoconiosis (amorphous silica), and interstitial fibrosis, dyspnea, finger clubbing (asbestos).											
Asbestos	0.1 fibers/cm 3	varies by type	N.A.	*enter: appearance, color*	Inhalation Ingestion	lung fibrosis, difficulty breathing; cough	Human Carcinogen (IARC) (lung cancer, mesothelioma)	N.A.	N.A.	N.A.	31
Other *(Specify)*											
❑ PETROLEUM-BASED HYDROCARBONS											
Examples of petroleum-based hydrocarbons associated with LANL ER work are Benzene, Toluene and Xylenes. which are found in most oils, lubricants, fuels and gasoline. Petroleum-based hydrocarbons material generally contain metal contaminants also. The primary routes of exposure into the body are inhalation and skin absorption/contact. Symptoms of exposure include eyes, skin and upper respiratory system irritation, giddiness, headache, confusion, nausea, staggered gait, and fatigue.											
Benzene	1 skin	0.3 skin (NIC)	500	*enter: appearance, color, odor thresh-hold*	Inhalation Skin absorption Ingestion	increased temperature; aesthetic resulting in excitation followed by depression; severe eye and moderate skin irritant	Human Carcinogen (IARC) (leukemia, Hodgkin's disease, lymphoma)	40°F	*enter:*	9.24 eV	27

Substance/ Synonym(s)	Exposure Limit [1,2] / IDLH[1] (ppm)			Physical Characteristics[1]	Route(s) of Entry [1,3]	Signs/Symptoms of Toxicity [1,3]	Carcino-genicity [1,3]	Flash Point [1,3]	Vapor Press./ Density [1]	IP [1,4]	SC[5]
	PEL or REL	TLV	[illegible]								
Toluene	200	50 skin	500	*enter: appearance, color, odor thresh-hold*	Inhalation Skin absorption/ contact Ingestion	Fatigue; dizziness; headache; motor activity changes; hallucinations; distorted perception; severe eye irritant; mild skin irritant	Teratogen - can deform embryo/ fetus	40°F		8.82 eV	27
Xylenes	100	100	900	*enter: appearance, color, odor thresh-hold*	Inhalation Skin contact Ingestion	Dizziness; excitement; drowsiness; staggering; nausea; vomiting; abdominal pain; severe eye irritant; mild skin irritant	N.A.	o - 63°F m - 84°F p - 81°F		o - 8.56 eV m - 8.56 eV p - 8.44 eV	27
Other *(Specify)*											
❑ **POLYCHLORINATED BIPHENYLS (PCBs)** PCB's are a series of technical mixtures consisting of many isomers and compounds that vary from mobile oily liquids to white crystalline solids and hard noncrystalline resins (e.g., PCB [42 % chlorine] and PCB [54 % chlorine]). The greater the chlorine content, the more toxic the PCB is likely to be. It is important to remember that there are other isomers of PCB's based on the chlorine content. However, for occupational exposure concerns other isomers are suspected carcinogens and have a NIOSH Recommended Exposure Limit (REL) of 0.001 mg/m^3. Also, toxicity is increased if exposure to carbon tetrachloride occurs at the same time. The primary routes of exposure into the body are inhalation, ingestion, and skin absorbtion or contact. Symptoms of exposure include chloracne, upper respiratory system irritation, nausea and vomiting, headache, dizziness, depression, and nervousness.											
PCB (42% Cl)	1 mg/m^3 skin	1 mg/m^3 skin	5 mg/m^3	Colorless to light colored, viscous liquid with a mild hydrocarbon odor	Inhalation Absorption Ingestion Skin contact	Eye irritant, chloracne, liver damage.	Suspected human carcinogen (IARC) skin and liver		0.001 mm		31
PCB (54 % Cl)	0.5 mg/m^3 skin	0.5 mg/m^3 skin	5 mg/m^3	Colorless to pale yellow, viscous liquid or solid with a mild hydrocarbon odor	Inhalation Absorption Ingestion Skin contact	Eye and skin irritant, acne-form dermatitis, liver damage	Confirmed human carcinogen (IARC) skin and liver		0.00006 mm		31
Other *(specify)*:											
❑ **OTHER** *(specify)*:											

APPENDIX D

EMERGENCY CONTACTS
AND
ROUTE(S) TO MEDICAL SERVICES

EMERGENCY CONTACTS AND PHONE NUMBERS

(post on-site in Support Zone)

MEDICAL EMERGENCY/FIRE:

Los Alamos Fire Dept.....LANL phone: **911** Cellular phone: **667-7080**

HAZARDOUS RELEASE/SPILL:

LANL HAZMAT Team (EM&R).....**667-6211**

LANL Occupational Medicine Clinic (ESH-2).....**667-0660**
Los Alamos Medical Center Hospital.....**662-4201**
Security OS/Pro Force.....**667-6534**
Los Alamos Police.....**662-8224**
LANL Health and Safety - ESH-5.....**665-7221**
LANL Radiation - ESH-1.....**667-7137**
TA/Facility Manager: *[enter name]*.....**phone no.**
TA/Facility Operations Safety Rep.: *[enter name]*.....**phone no.**
FPL: *[enter name]*.....**phone no.**
Alternate FPL: *[enter name]*.....**phone no.**
FTM: *[enter name]*.....**emerg. phone/pager no.**
FTL: *[enter name]*.....**emerg. phone/pager no.**
Field Unit HS Rep.: *[enter name]*.....**emerg. phone/pager no.**

Management Contacts:

Employer *[enter business name]* Contacts: Name(s) / (Phone No(s)

Employer *[enter business name]* Contacts: Name(s) / (Phone No(s)

Employer *[enter business name]* Contacts: Name(s) / (Phone No(s)

Employer *[enter business name]* Contacts: Name(s) / (Phone No(s)

EMERGENCY REPORTING INFORMATION:

When calling for emergency services, have the following information available to report:

- Site name/location/phone #
- Caller ID
- Nature of emergency
- Number of personnel involved
- Name and condition of affected employees
- Actions taken and assistance required

INSERT MAP OF ROUTE(S) TO MEDICAL SERVICES

LANL Occupational Medicine Clinic (ESH-2)

and

Los Alamos Medical Center Hospital

Los Alamos National Laboratory

ENVIRONMENTAL RESTORATION

University of California
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FAX 505-665-4747

U. S. Department of Energy
Los Alamos Area Office, MS A316
Los Alamos, New Mexico 87544
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FAX 505-665-4504

To/MS: Distribution
Date: March 28, 1995
Refer to: EM/ER:95-PCT-013

SUBJECT: PERMIT MODIFICATION REQUESTS

STATEMENT OF ISSUE

This policy is intended to identify the following for permit modification requests: types, procedures, and roles and responsibilities of the Environmental Restoration (ER) Project Office, the Environmental Management Policy and Public Involvement Office (EM/P&PI), Group ESH-19, and the Department of Energy's Los Alamos Area Office (LAAO).

SUMMARY OF POLICY

All permit modification requests will be routed from the ER Project Office and ESH-19 with LAAO for submittal to the Environmental Protection Agency (EPA). ESH-19 and the EM/P&PI Office will coordinate with LAAO on the issuance of public notice and conduct of public meetings.

DISCUSSION

Module VIII of the Laboratory's Resource Conservation and Recovery Act (RCRA) operating permit was issued by EPA in 1990 to address the Hazardous and Solid Waste Amendments (HSWA). The RCRA operating permit was issued by the New Mexico Environment Department (NMED) in 1989. The focus of Module VIII is corrective action although other HSWA regulations are addressed (e.g., waste minimization). Module VIII of the permit requires the Los Alamos National Laboratory (the Laboratory) to investigate the solid waste management units (SWMUs) identified in the permit to determine if they have released hazardous constituents identified in 40 CFR 261 Appendix VIII. EPA also has omnibus authority to require investigations and cleanup of releases of other constituents to the environment if EPA determines they present a substantial threat to human health or the environment.

All requests for modifications to Module VIII of the RCRA permit must be made to EPA Region 6. NMED has not yet received authorization from EPA to implement the corrective action program. When this occurs, all RCRA permit modification requests will be submitted to NMED.

There are three types of permit modifications: Class 1, Class 2, and Class 3. Class 1 permit modifications have a subset called Class 1 asterisk (*). All require public notice. A detailed explanation of each class of permit modification and the permit modification flow chart are attached.

In general, cases where the Laboratory is expanding their responsibility to EPA and the public (e.g., adding a SWMU to the permit) are deemed Class 1 permit modification requests. Other

class 1 examples are the correction of improper grammar and correction of misidentified SWMU numbers.

Class 1 modifications represent minimal change to the Laboratory responsibilities as required by the permit.

Class 1* permit modifications could include the rescheduling of an interim report date.

Class 2 permit modifications could include changes in the submittal schedule to EPA for an RFI Report or a change in quarterly groundwater monitoring analytes.

Expedited Cleanups (ECs) and the removal of SWMUs from the permit are Class 3 permit modification requests. They represent a major change in the Laboratory's responsibilities to EPA and the public as identified in the permit. Both Class 2 and 3 permit modification requests require that a public meeting be held.

It is important to note that EPA may disagree with the class of the permit modification as requested by the Laboratory. If this is the case, the Laboratory must resubmit the request after reclassification of the request as identified by EPA. The permit modification request will not move forward unless the EPA agrees with the class designated. The Laboratory must resubmit the permit modification request as directed by EPA.

The need for a permit modification will be identified by the ER Project Office, the Field Project Leaders (FPLs), Field Project Coordinators, or ESH-19. The preparation of the modification request will involve both the ER Project Office and ESH-19. The identifier of the need for a modification must contact the others as well as the EM/P&PI Office. The Stakeholder Involvement Office will be contacted by the EM/P&PI Office of the pending permit modification request and public notice and meeting requirements.

The finalized permit modification request will be transmitted from the ER Project Office and ESH-19 with LAAO to EPA. A page certifying the completeness and accuracy of the information in the request must accompany all permit modification requests to EPA. This certification must be signed by the ESH Division Director (Directors Policy 104 designates the ESH Division as the Office of Primary Responsibility).

The EM/P&PI Office and ESH-19 will coordinate with LAAO to ensure that public notice and public meetings occur within the time frames required by regulation. ESH-19 and LAAO will also contact EPA to alert them to the pending receipt of the modification request.

The P&PI Office will coordinate with the ER Project Office and LAAO to determine who will present information during the public meeting(s). The P&PI Office will collect any comments during the public meeting. The P&PI Office will distribute the comments within two weeks of the public meeting to ESH-19, the ER Project Office, and LAAO. LAAO, with the ER Project Office will forward the comments received from the public meeting to EPA.

LAAO will forward information on any action EPA takes on the permit modification request to the ER Project Office, the P&PI Office, and ESH-19.

ESH-19 will maintain a history of all permit modification requests as well as the official updated version of the permit.

Additional information on this policy memo can be obtained from Pat Shanley, ESH-19, 667-0663.

Sincerely,

Tracy Glatzmaier
ER Project Consistency Manager

Sincerely,

Courtland Fesmire
DOE/LAAO Regulatory Manager

TG/CF/bp

Attachment: General Permit Modification Requirements

Distribution:
G. Allen, FPL, CST-18, MS E525
B. Barnett, CIC-1, MS M773
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M. Gilgosch, FPC, LAAO, MS A316
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Environmental
Restoration

General Permit Modification Requirements

Presented below are the basic requirements for each class of permit modification request.

1.0 Class 1

1.1 Notify EPA within 7 days of the effective date of the permit modification. The notification must include the exact changes made to the permit and the reasons they were necessary.

Notify all individuals on the facility mailing list within 90 days of the change. (The facility mailing list has been complied by the Stakeholder Involvement Office and the ER Project's Policy and Public Involvement Group. It includes names of citizens and local and state officials interested in the activities conducted at the Laboratory.

1.2 Class 1*

Written prior approval of the modification must be obtained from EPA. All other procedures are the same as Class 1.

2.0 Class 2

2.1 A request is submitted to the EPA identifying that it is a Class 2 request and a description of the exact changes requested to be made to the permit. The rationale for the request must also be provided.

2.2 Seven days before or after the request is submitted, a notice of the permit modification request must be sent to the parties on the facility mailing list. Additionally, a notice of the request must be placed in local newspapers. The regulation requires a public comment period of 60 days which officially begins when the notice is placed in the newspaper.

2.3 The public notice must include the dates of public comment; the name and address of the EPA contact that the public may forward their comments to; the location of a date, time, and place for a public meeting on the request; the name and number of the Laboratory's and EPA's contact person. The location where the permit modifications request can be viewed along with the supporting documentation and the statement, "The permittee's compliance history during the life of the permit being modified is available from the Agency contact person" also must be provided.

Note: The facility mailing list notice should provide more than bare bones information required by the newspaper public notice.

The public meeting required must occur within 15 to 45 days after the public notice is printed in the newspaper. This is an information meeting for the public on this request. Other issues may be presented.

All comments from the public are to be directed to the EPA contact person.

Note: Coordination of all participants in the permit modification process prior to the public notice is necessary so no one is unprepared. Especially important is alerting the EPA contact person that the requests being made so they can address public inquiries. Arrangements with local repositories for distribution of ER documents supporting the modification request must be made as well as obtaining a meeting location and informing facility representatives of their required presence.

2.4 There are somewhat detailed and strict procedures for the EPA's response.

Within 90 days after the permit modification request is received by the EPA Director, EPA must:

a. Approve the modifications request with or without modifications and accordingly modify the permit.

b. Deny the request

c. Determine the request must follow the procedures for a Class 3 request;

d. Approve the request as a temporary authorization having a term up to 180 days.

e. Notify the Laboratory that a decision on the request will be made within 30 days.

If EPA selects option e, within 30 days EPA must notify if they have selected option a., b., c., or d.

If EPA does not respond within 120 days, the Laboratory has a 180 day temporary authorization. If EPA responds within this 180 day temporary authorization period in a negative fashion, the authorization is void.

If EPA does not respond to the Laboratory within 50 days of the conditional 180 day temporary authorization, the Laboratory must within 7 days of that time, inform the facility mailing list and any commentors that the permittee has been temporary authorized to implement the modification request; and that unless the EPA Director acts on the request, the Laboratory is granted the modification request. If the Laboratory fails to notify the mailing list within the required 7 days, the permit authorization is delayed 50 days.

3.0 Class 3

The same notification requirements to EPA are applicable for a Class 3 permit modification request as outlined in Section 2 with the difference: identify to the EPA Director and public that a Class 3 permit modification is being requested.

After the 60 day public comment period initiated by the Laboratory's request, the EPA must grant or deny the request per the regulations found in 40 CFR Part 124. There is no time constraint in the regulations as to when the EPA must respond to the request. 40 CFR Part 124 present the regulations for issuing a new permit or the issuance of a revised permit based on major modifications to the original permit.

As required in 40 CFR Part 124, the EPA must revise the permit and reissue a draft permit which incorporates the changes. If the EPA does not agree with the request, it is possible the Laboratory will be notified the EPA denies the request and no further action is required by EPA. If the EPA drafts a modified permit, they notify the public and facility mailing list as outlined in the Class 2 permit format. The differences are that this is a Class 3 permit modification, only those parts of the permit being requested for modification are open to comment, and the time frame for the public comment period is 45 days.

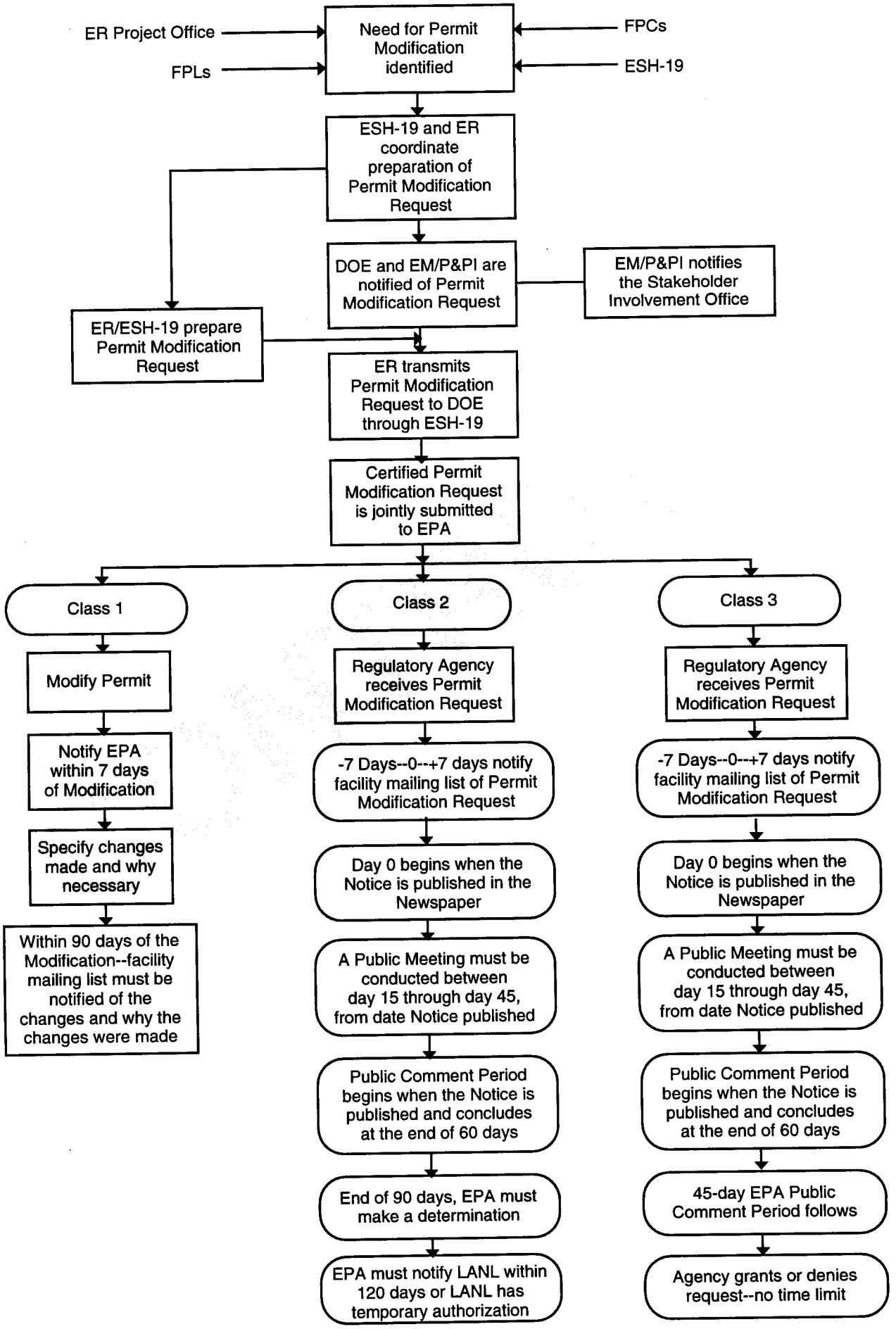
The EPA will notify the Laboratory if they grant or deny the request for the Class 3 permit modification based on their information and/or public comment. There is no regulatory requirement addressing the time frame in which EPA can determine to issue a new permit or deny the permit request. If the request is denied, there is no change in the permit. If EPA reissues the permit, it will obtain the permit modification requested by the Laboratory or may include modification to these requests. The effective dates of the reissuance of the permit do not affect the overall life of the permit. The permit was issued in April 1990. It will expire on December 22, 1999. The reissuance of the permit does not effect the expiration date as the entire permit was not open to modification.

EPA may disagree with the classification the Laboratory designates a permit modification request. In such cases EPA will so notify the Laboratory.

Additional examples of the types of permit modification requests and their respective classes can be found at 40 CFR 270.42, Appendix I. Additional information the permit modification process is available in the Federal Register, Volume 53, Number 188, September 28, 1988.

Questions on the permit modification process can be directed to ESH-19 or the ER Project Office.

PERMIT MODIFICATION



Los Alamos National Laboratory

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To/MS: Distribution
Date: March 28, 1995
Refer to: EM/ER:95-PCT-015

SUBJECT: NO FURTHER ACTION CRITERIA POLICY

STATEMENT OF ISSUE

The Los Alamos National Laboratory's (the Laboratory's) Environmental Restoration (ER) Project and the Environmental Protection Agency (EPA), Region 6, have developed a consistent set of criteria for determining no further action (NFA) for potential release sites within the Laboratory's ER Project. The intent of this policy is to ensure that the criteria are interpreted and implemented consistently by all those involved in ER activities.

SUMMARY OF POLICY

A site can be designated for NFA if it meets one or more of the criteria listed below. The specific criteria used to determine when NFA is appropriate are detailed, with some examples. These examples are not inclusive and if questions arise as to the appropriate criteria for a specific potential release sites (PRSs) or other questions, contact one of the Project Consistency Team members. At this time, these criteria will be used for designating NFA in Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) work plans, RFI reports or other similar documents. As necessary, additional criteria for NFA proposals will be provided in future Project Consistency Team policies.

DISCUSSION

The purpose of this policy is to present the NFA criteria agreed upon with EPA and to present examples for using these criteria to determine whether a site can be proposed for NFA. The examples given in this document are by no means inclusive and should be taken as broad guidelines within which proposals for NFA can be developed. The decision criteria discussed here apply initially during the evaluation of archival information and development of the RFI work plans. They will apply again at each point where new data or information become available including screening assessment data. Any reference to screening action levels (SALs) should be interpreted to pertain both to human health SALs and ecological SALs. Sites for which NFA determinations were made prior to development of ecological SALs may need to be re-screened against ecological SALs. For those sites where EPA has reviewed and has agreed that the unit can be proposed for removal from the Hazardous and Solid Waste Amendments (HSWA) Module of the Laboratory's RCRA Part B operating permit, the necessity for ecological SAL screening will be at the discretion of the regulator(s).

A request for NFA for any PRS can be made to the EPA based on the criteria presented. If approved, a modification to the HSWA Module of the Laboratory's RCRA Part B operating permit to delete the site from the HSWA Module will be put forward for public comment. The criteria here will be used for all solid waste management units (SWMUs) identified in the HSWA permit as well as units not identified in the permit, referred to by the Laboratory's ER Project as areas of concern (AOCs). SWMUs and AOCs are collectively referred to as PRSs. In using a consistent set of criteria, the ER Project can ensure to the EPA, the New Mexico Environment Department, the Department of Energy, the public, and other interested stakeholders, that the same standards were used in investigating and determining NFA is appropriate for any potentially contaminated sites within the Project.

A determination that further investigation is required at a given site is not a mandate for remedial action, but merely an indication that more information or further evaluation is required. The results of any additional investigation may potentially lead to a proposal of NFA at a future point or alternatively a Corrective Measures Study or other action may be necessary.

NFA Criterion 1. The site has never been used for the management (that is, generation, treatment, storage, or disposal) of RCRA solid or hazardous wastes and/or constituents, or other Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) hazardous substances. Also falling under Criterion 1 are those PRSs that cannot be located or may have been found never to have existed, duplicate PRSs, and those that are located within and therefore investigated as part of another PRS.

Examples/Explanations: For purposes of the HSWA Module of the RCRA permit, units falling under Criterion 1 may have been mistakenly identified as SWMUs in an earlier study. If a unit has only a radionuclide component, then the site may be requested for an NFA determination, and a permit modification request may be submitted to remove it from the HSWA Module. The unit may still be investigated as an AOC by the ER Project.

NFA Criterion 2. No release to the environment has occurred.

Definition of release: "Release" means any spilling, leaking, pouring, emitting, emptying, discharging, injecting, pumping, escaping, leaching, dumping, or disposing of hazardous wastes (including hazardous constituents) into the environment.

Examples/Explanations: Units falling under Criterion 2 are those where no release has occurred, or where a release of any hazardous constituents to the environment may be unlikely due to the engineering (secondary containment or overflow prevention) or management (inspection or inventory) controls. For example, if a unit is completely contained within a building with no migration route to the environment, a visual inspection of the unit and examination of engineering drawings if available, may be satisfactory for documentation of no release.

NFA Criterion 3. The PRS is regulated or closed under a different authority which addresses corrective action.

Examples/Explanations: Non-land-based treatment, storage, and disposal facilities (such as containers or tanks) should not be considered under RCRA corrective action, because requirements under interim status, the Laboratory's RCRA operating permit, and RCRA generator requirements adequately address releases from these units.

Temporary storage areas in use since 1980 (less-than-90 days and satellite storage areas) must operate according to 40 CFR 262, which requires that the units be routinely inspected and closed according to 40 CFR 265. To avoid further consideration by the ER Project, engineering and management controls must be present. If there is evidence of a possible release, whether visual staining, vapor releases, or analytical data indicating a release has occurred (and remediation has not been accomplished), and if the unit qualifies under the HSWA Module or under CERCLA, it may undergo corrective action measures under the ER Project.

Releases to surface water through a storm sewer are regulated under the national pollutant discharge system (NPDES) storm water program, and releases through other NPDES-permitted outfalls are also exempt from RCRA. However, an outfall may be permitted under the NPDES program, and still be required to be investigated under RCRA corrective action authority. The NPDES permit addresses only the actual water discharge from the outfall, and does not address corrective action or remediation of material deposited at the outfall over time. In this instance, the soil at the outfall may need to be sampled.

If a regulated unit is being closed under RCRA authority, then this site will normally not be investigated under the HSWA program.

Even though it may be more expedient and convenient to address all release pathways under corrective action, the State of New Mexico will ultimately have to approve the closure plan for the regulated unit. The EPA can, however, require corrective action beyond closure, if warranted.

NFA Criterion 4. The PRS has been characterized or remediated in accordance with current applicable state or federal regulations, and the available data indicate that contaminants of concern are either not present or are present in concentrations that would pose an acceptable level of risk under the projected future land use. The determination of acceptable risk and future land use has considered stakeholder involvement.

Examples/Explanations: An underground storage tank for which certification of closure has been received from NMED may be requested for NFA under Criterion 4. Another example would be a one time spill that has been cleaned up in accordance with applicable standards, such as the Spill Prevention Control and Countermeasures (SPCC). A third example would be an expedited cleanup or voluntary corrective action performed in accordance with an approved plan.

Determination that a contaminant is "not present" will be made by comparison with background data. Determinations of "acceptable level of risk" will be based on subsequent comparisons with SALs. Constituents exceeding SALs can be further evaluated in risk assessments based on projected future land use scenarios.

CONTACT PERSON: Tracy Glatzmaier (505) 665-2613

Sincerely,

Tracy Glatzmaier
ER Project Consistency Manager

Sincerely,

Courtland Fesmire
DOE/LAAO Regulatory Manager

TG/CF/bp

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Los Alamos National Laboratory

ENVIRONMENTAL RESTORATION

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Date: April 12, 1996
Refer to: EM/ER:95-PCT-016-R1

SUBJECT: ACCELERATED CLEANUP PROCESS

STATEMENT OF ISSUE

The Los Alamos National Laboratory's (Laboratory's) Environmental Restoration (ER) Project, the US Environmental Protection Agency (EPA) Region 6, and New Mexico Environment Department (NMED) have worked together to improve processes designed to accelerate the cleanup of historical waste sites. These processes allow for the quick removal of contamination, reducing health and environmental risks associated with past Laboratory operations. The accelerated cleanup of these sites will minimize costs, while enhancing schedule performance of the Laboratory's ER Project by removing sites from the Resource Conservation and Recovery Act facility investigation (RFI)/corrective measure study (CMS) process in early stages.

Currently, the ER Project estimates that over 90% of the potential release sites (PRSs) that do not qualify for a no further action determination will be investigated and/or remediated following an accelerated cleanup process. The two remediation strategies designed to implement accelerated cleanup of sites at the Laboratory are voluntary corrective actions (VCAs) and expedited cleanups (ECs). The VCA process addresses sites with no controversial issues or which merely involve good facility management practices, while the EC process addresses those Hazardous and Solid Waste Amendments (HSWA) PRSs with more complex issues that may require risk-based cleanup decisions. The remaining PRSs within the Project will likely require a full CMS.

SUMMARY OF POLICY

The ER Project shall use one of the two remediation strategies, VCA or EC (described in detail below), to implement the accelerated cleanup process.

DISCUSSION

In general, future land use scenarios are based on the Laboratory's long-term strategic planning document. The ER Project identifies industrial use for all

current Laboratory operations within Laboratory boundaries and residential land use for those sites outside of Laboratory boundaries. In some cases, a different scenario (e.g., recreational) may be proposed. Each individual VCA/EC plan must identify the appropriate land use scenario.

The initial criteria used to evaluate candidate sites for either accelerated cleanup process include:

- the potential remedy is obvious and can be readily applied;
- the remedy will be a final resolution in order to prevent releases or migration of contaminants from the site in the future;
- previous sampling data and/or archival data are available to adequately identify constituents of concern; or proven field screening techniques are available for a limited set of contaminants;
- adequate treatment, storage, and disposal (TSD) capacity is available for all expected waste types including mixed wastes;
- the proposed remedy is not worse for the ecosystem, worker safety or public health, than the problem;
- uncertainties can be handled by contingencies in the accelerated cleanup plan;
- the estimated cost of remediation is expected to be less than the cost of moving forward with further data collection and/or data analysis and risk assessment (i.e., the site is expected to fail a preliminary risk assessment).

These initial evaluation criteria are common for identifying candidate sites for accelerated cleanup utilizing VCAs or ECs. However, as outlined in the following sections, the implementation of each respective approach is distinct.

Voluntary Corrective Actions

The VCA process is intended to address small-scale PRSs with relatively low-risk contamination problems where an obvious remedy may be implemented with a minimum of administrative requirements. Cleanup of these sites as a VCA outweighs the cost and schedule requirements to complete a risk-based cleanup with formal public involvement. These sites, typically cleaned up as part of normal facility housekeeping or best management practices, may include stained soils at small waste or materials storage areas, construction debris accumulation piles, or one-time historical spills of materials such as paint, solvents, or oils.

In addition to the five criteria previously outlined, the list of candidate sites must then be evaluated to determine if the following VCA criteria are met.

1. Cleanup levels are based on background concentrations, promulgated standards, or previously determined risk-based levels.

2. Estimated cost is determined to be reasonable for the planned action.
3. Estimated time to complete field activities is within a reasonable time frame (generally < 6 months).

From this evaluation, the ER staff working with the US Department of Energy (DOE/LAAO) field project coordinators (FPCs) reviews and updates the preliminary list of candidate sites for VCA. These candidate sites may include, but are not limited to:

- all PRSs that are not in the HSWA permit;
- some PRSs that are in the HSWA permit which meet all of the above VCA criteria;
- rad-only sites; and
- sites with promulgated remediation criteria [e.g., polychlorinated biphenyl spills, asbestos disposal sites (TSCA), underground storage tanks (NMED UST Regulations), and nonsystematic releases] (e.g., spill cleanup criteria typically addressed by Spill Prevention Control and Countermeasures Plans).

Although formal public involvement is not necessary because these sites are based on established levels and regulatory criteria, ER Project public meetings may provide a forum for discussion and public participation for pending VCAs. VCA plans approved by DOE will be implemented to the extent allowed by funding levels. The acknowledgment of the approval shall be implied by the signing of the field work authorization section of the VCA Checklist and Field Work Authorization Form (Attachment 1).

The ER Project has developed a VCA Process decision logic (Figure 1) which depicts the flow of activities and decisions that follow a determination that a site meets the criteria for VCA. Details of each step are provided following the figure.

1. Generate a VCA plan.

Working with DOE, generate a short, but comprehensive VCA plan. This plan is one of the keys to successful implementation of a VCA. A fully developed VCA plan should include: cleanup levels; data collection plans to guide cleanup (if needed to define extent or address any other uncertainties that may affect the implementation of the remedy); the proposed remedy and contingency plans; criteria for applying the cleanup levels, and a verification sampling plan. By planning to deal with uncertainties through either identifying the need for additional data collection, and/or developing contingency plans, the site manager should be in a better position to get agreement from the public, and ultimately (after completed) the regulators. Contingencies should be developed to address any deviations from the current understanding of the site conceptual

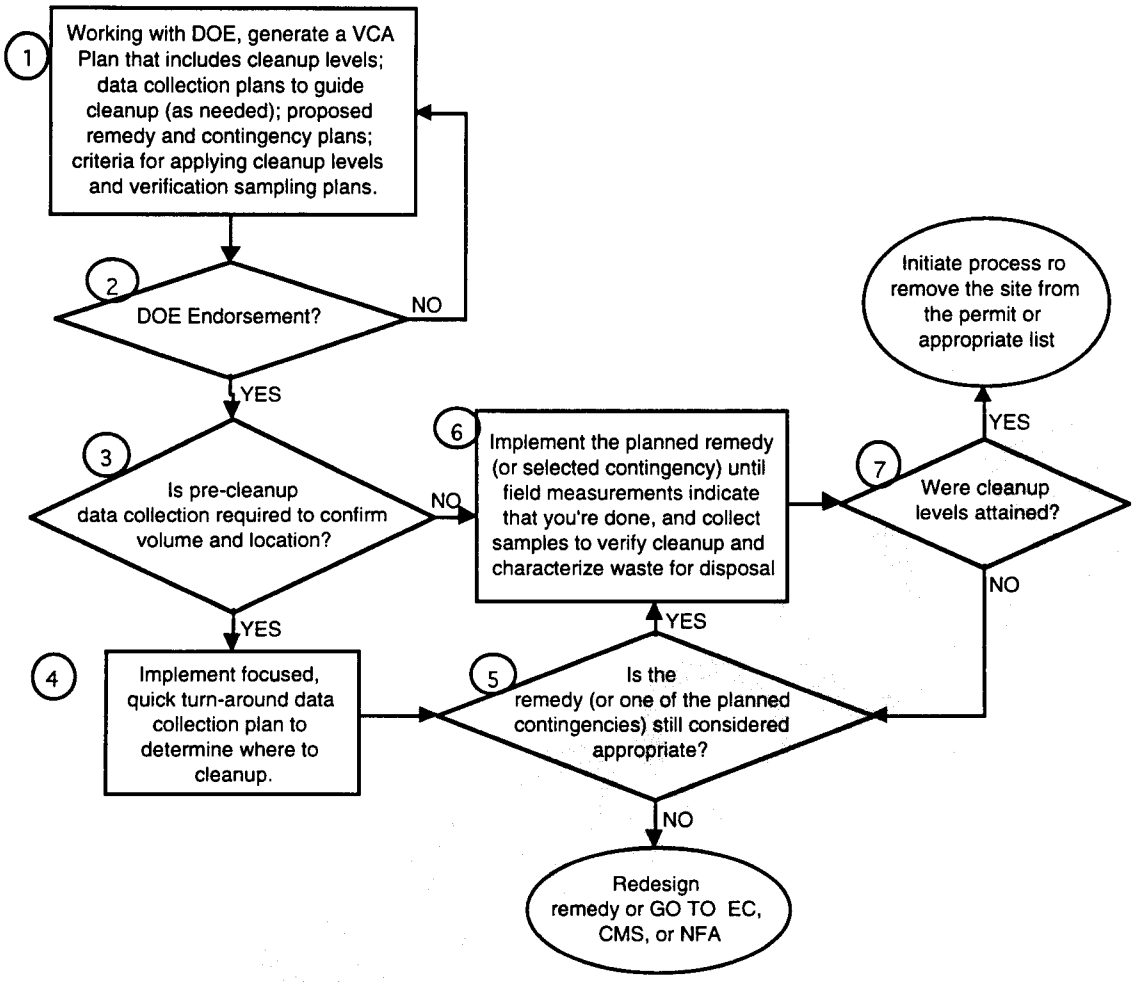

Figure 1: Voluntary Corrective Action Process Decision Logic

model that may impact the ability for the selected remedy to succeed. For example, data may be needed to confirm the COPC list, to better define the volume of contamination requiring cleanup, or to better characterize the physical nature of the problem to confirm the appropriateness of the selected remedial alternative. In general, pre-cleanup data collection efforts should be designed whenever there is uncertainty about the volume, location or nature of the material to be remediated.

In addition to specifying cleanup levels, specific instructions on how they are to be applied are needed. For example, if compliance with cleanup levels is to be based on an average concentration, the VCA plan must state over what area or volume the average will be formed. If a t-test will be used to verify the adequacy of the cleanup, the power and significance required from this test should be specified. Finally, a carefully designed verification plan, consistent with the understanding of how the cleanup levels will be applied should be presented. With the implementation of this plan, post-cleanup should provide the data

needed to demonstrate that the cleanup is complete with a stated level of confidence. Generation of the kind of VCA plan described above will require the Laboratory to change or add to what is currently being done. The Data Quality Objective (DQO) process, or its equivalent, should be used to guide the planning teams' efforts in coming up with the pre-cleanup data collection and/or verification sampling plans.

2. DOE endorsement.

VCA plans require DOE endorsement, but as proposed herein, do not require regulator or public approval. By involving DOE in the development of the VCA plan, the approval process should be expedited.

3. Is pre-cleanup data collection required?

Typically, sites selected for VCA will be adequately characterized to design and implement the required cleanup. This level of characterization, however, is not a requirement for being considered appropriate for VCA. If the site COPCs are known, the relative size of the problem is thought to be understood, and the remedy is obvious, the site may have been selected for VCA , despite the fact that additional data are needed to focus the cleanup effort. In these cases, the VCA plan will include the design for pre-cleanup data collection. If possible, field measurements will be used to guide the cleanup effort. Confirmatory analysis or broad-scan analysis to confirm the absence of other COPCs may be required. Therefore, the answer to this question will generally be provided in the VCA plan itself. If for any reason the VCA plan does not include pre-cleanup data collection plans, and the answer to this question is "yes," a plan will be developed prior to proceeding.

4. Implement focused, quick-turnaround data collection to determine where to cleanup.

This data collection activity should be distinguished from data collected during the confirmatory stage of the cleanup. Data generated from this effort will be used to confirm the appropriateness of the site for VCA, and to determine the nature and extent of contamination to focus the cleanup effort.

5. Is the remedy (or one of the planned contingencies) still considered appropriate?

Using the data generated from (4) above, confirm the appropriateness of the selected remedy. If data indicate that the remedy is not going to work as expected (e.g., if the waste volume is larger than expected, if the waste composition is different from expected, or if some physical property of the contaminated media does not lend itself to the selected remedy), then this step provides an "out." It is also conceivable that further data collection could reveal that the problem is not as bad as first expected, and NFA could be proposed.

Assuming that data reveal that the planned remedy (including any contingencies) is no longer considered appropriate, a determination will be made (based on these new results) about whether an alternative approach to accelerated action is appropriate. If this alternative still meets the criteria for an VCA, the VCA plan will be rewritten with DOE involvement, which puts you back to box #1 of the VCA logic diagram. If the alternative requires a more extensive measure such as an EC, and DOE is no longer willing to "go at risk," an EC plan will be developed, which puts you into box #2 of the EC decision logic. If these data reveal that the problem is more complex, and the proposed action will not be able to result in a final remedy for the site, then this will lead you back to the accelerated RFI decision logic at either decision diamond #8 or #14, wherein a determination is made as to whether the site is appropriate for an Interim Action, or should be treated in a more conventional mode (reference RCRA Facility Investigation Process Policy, 96-PCT-006).

6. Implement the planned remedy until field measurements show you are done.

Data should be collected during remedy implementation for several purposes. First, to confirm that the remedy is working as planned. Second, to determine if any deviations form the conceptual model appear that would require a contingency plan to be put into action. Third, to ensure that worker health and safety is not being impaired due to cleanup operations. Finally, to determine when it is time to implement the verification sampling plan to confirm cleanup. During the implementation of the action, refer to the Stopping Criteria Policy which denotes conditions under which the VCA will be terminated.

7. Were cleanup levels attained?

Evaluate the verification samples to confirm that the site meets the cleanup criteria in the manner specified in the VCA plan. These data are critical, since they will serve as the basis for a request to modify the Laboratory's permit to remove a PRS from the list if the PRS is on the HSWA permit. As such, the public will review the outcome of the VCA and has an opportunity at that time to comment on the adequacy of the cleanup (reference Reconsidering and/or Stopping Work on Accelerated Cleanups, 96-PCT-004).

Expedited Cleanups

The EC process is intended to address only solid waste management units (SWMUs) identified in the HSWA permit, however, the remedy is more complex than for a VCA. In general, these SWMUs meet the initial evaluation criteria, yet likely exceed the specific VCA criteria. These units may require a detailed risk assessment to establish cleanup levels prior to remedy implementation, but the remedy selection is obvious and would not benefit from a full CMS. This EC process allows for regulatory and public review of remedy selection prior to implementation.

The ER and DOE staff must review and update the preliminary list of candidate units (from SWMUs in the HSWA permit) for EC. These candidate units may include, but are not limited to:

1. SWMUs where cleanup levels are based on a risk assessment including, but not limited to, those units with multiple contaminants of concern resulting in complex risk assessment issues from cumulative effects.
2. SWMUs that are more complex requiring longer periods of time to remediate and more money, for example, those units with a history of continuous releases likely resulting in larger volumes of contaminated media.

EC plans may be developed for several SWMUs where the cleanup approach is similar and the approach employs similar concepts. To address several SWMUs within a single EC plan, the following criteria must be analogous: SWMU types (i.e., firing sites, septic tanks, etc.), cleanup criteria (future land use, etc.), and remedial field operations and activities. When an EC plan addresses multiple units, a description of unit similarities as well as the specific details associated with each individual unit (unit number, size, contaminants of concern, etc.), must be outlined in addenda to the plan.

ECs must follow the process described in 40 CFR Part 270.42(c) for a Class III Permit Modification. Once an EC plan is developed, EC procedures require public involvement and regulator review, and approval of characterization and cleanup criteria prior to site remediation. It is important to note, that if for any reason, it appears the permit modification will not be completed in time for allocated funds to be spent, the ER Project must request temporary authorization to proceed with the EC process. Upon receipt of approval of temporary authorization or the permit modification from the regulator, the approval letter must be attached to the EC Plan. Anytime the Laboratory and the DOE believe that an EC should go forward without regulator approval (because of potential for lost funding, etc.), Attachment 2 must be completed by both parties, and attached to the EC plan.

The ER Project has developed an EC Process decision logic (Figure 2) which depicts the flow of activities and decisions that follow a determination that a site meets the criteria for EC. Details of each step are provided, following the figure.

1. Is the DOE willing to go "at risk" for the site (e.g., less than 100k within a field season)?

The first step on the EC logic diagram is to confirm that the site should go through the EC process instead of the VCA process. This determination will be made in conjunction with DOE who will consider the projected cost and time required to implement the action. Sites that fall under a specific regulatory authority that will determine the course of action also may be appropriate for VCA.

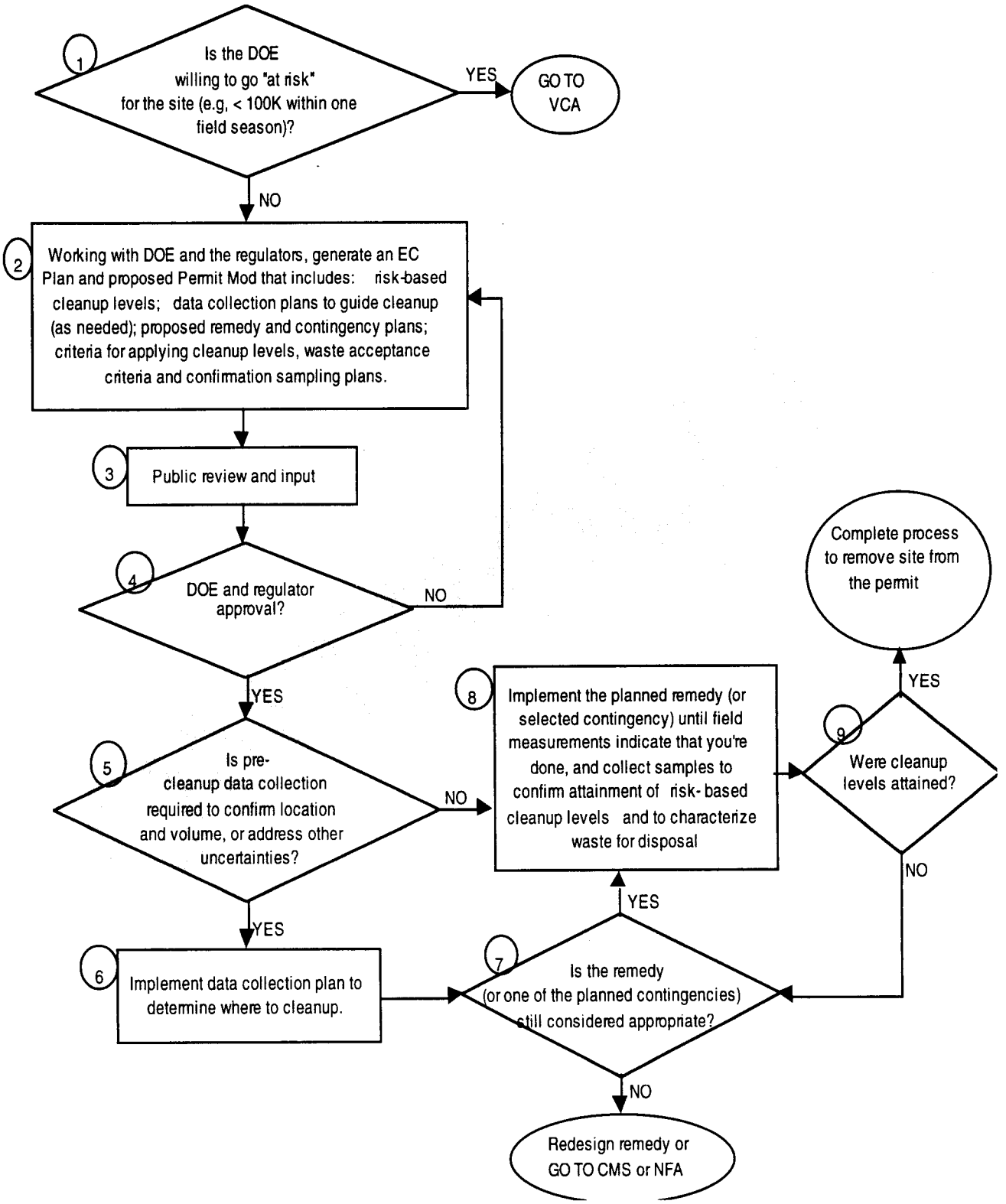

Figure 2: Expedited Cleanup Process Decision Logic

2. Generate an EC plan.

Working with DOE and the regulators, generate an EC plan that addresses the complete rationale for performing the cleanup as an EC. A fully developed EC plan should include: site-specific risk-based cleanup levels; data collection plans to guide cleanup (if needed to define extent or address any other uncertainties that may affect the implementation of the remedy); a complete description of theproposed remedy including contingency plans; an explanation of why the remedy was selected; criteria for applying the risk-based cleanup levels and a detailed verification sampling plan. In addition, the plan should include the proposed cost and timeframe associated with conducting the EC, including the costs associated with waste disposal.

By planning to deal with uncertainties through either identifying the need for additional data collection, and/or developing contingency plans; the Laboratory should be in a better position for getting permit modifications accepted by thepublic and the regulators. Contingencies should be developed to address any deviations from the current understanding of the site conceptual model that may impact the ability for the selected remedy to succeed. Pre-cleanup data collection efforts should be designed whenever there is uncertainty about the volume, location or nature of the material to be remediated. In addition to specifying cleanup levels, specific instructions on how they are to be applied are needed. For example, since compliance with risk-based cleanup levels is to be based on an 95% upper confidence level (UCL) of the average concentration within an exposure unit, the EC plan must spell out how these determinations will be made. If a t-test will be used to verify the adequacy of the cleanup, the power and significance required from this test should be specified. Finally, a carefully designed verification plan, consistent with the understanding of how the cleanup levels will be applied should be presented. With the implementation of this plan, post-cleanup should provide the data needed to support the certification of cleanup required to remove the site from the Laboratory's permit.

To derive risk-based cleanup levels, the Laboratory will need to go through the same basic steps as would be required to conduct a baseline risk assessment, only the documentation should be greatly reduced. The regulators will be provided with the values and equations used to derive the cleanup levels which they can then confirm were calculated correctly and enter into discussions about any input parameter values they do not understand or agree with.

Generation of the kind of EC plan described above will require the Laboratory and the regulators to change or add to what is currently being done. The DQO process, or its equivalent should be used to guide the planning teams' efforts in coming up with the pre-cleanup data collection and/or verification sampling plans. An effective means of incorporating regulator input during the planning process must be developed and implemented.

3. Public review and input.

ECs differ from VCAs in that the plans must be subjected to public review and input. The Laboratory and DOE must host a meeting to get public input to the proposed permit modification needed to conduct the EC. At this time, the planned approach should be presented and written plans made available for public comment. The Laboratory will proactively engage the public and obtain meaningful, representative input.

4. DOE and regulator approval.

EC plans require approval by the regulators, in addition to DOE. By involving these parties in the planning process, this review should be a determination that the agreed upon endpoints have been adequately documented, rather than presenting plans for the first time for their review. Given this is accomplished, the review process should be greatly expedited. If approval is not immediately granted, and the regulator issue comments, the Laboratory will work with them to resolve all outstanding issues to the extent possible, prior to implementing any actual remediation. The Laboratory recognizes that the cleanup levels recommended in the EC plan are subject to regulator approval, however, by agreeing ahead of time on the technical assumptions for the project, the Laboratory can anticipate the regulators concerns and build them into the plan the first time.

5. Is pre-cleanup data collection required?

Typically, sites selected for EC will be adequately characterized to design and implement the required cleanup. This level of characterization, however, is not a requirement for being considered appropriate for EC. If the site COPCs are known, the relative size of the problem is thought to be understood, and the remedy is obvious, the site may have been selected for EC, despite the fact that additional data are needed to focus the cleanup effort. In these cases, the EC plan will include the design for pre-cleanup data collection. If possible, field measurements will be used to guide the cleanup effort. Confirmatory analysis or broad-scan analysis to confirm the absence of other COPCs may be required. Therefore, the answer to this question will generally be provided in the EC plan itself. If for any reason the EC plan does not include pre-cleanup data collection plans, and the answer to this question is "yes," a plan will be developed prior to proceeding. Inclusion of this data collection effort should increase regulator comfort, in that it provides an "out," and recognizes when additional data are required to perform the cleanup correctly.

6. Implement data collection plan to determine where to cleanup.

This data collection activity should be distinguished from data collected during the confirmatory stage of the cleanup. Data generated from this effort will be used to confirm the appropriateness of the site for EC, and to determine exactly where to begin to cleanup.

7. Is the remedy (or one of the planned contingencies) still considered appropriate?

Using the data generated from (6) above, confirm the appropriateness of the selected remedy. If data indicate that the remedy for one reason or another is not going to work as expected (e.g., if the waste volume is larger than expected, if the waste composition is different from expected, or if some physical property of the contaminated media does not lend itself to the selected remedy), then this step provides an "out." It is also conceivable that further data collection could reveal that the problem is not as bad as first expected, and NFA could be proposed based on the additional findings.

Assuming that data reveal that the planned remedy (including any contingencies) is no longer considered appropriate, a determination will be made (based on these new results) about whether an alternative approach to accelerated action is appropriate. If this alternative still meets the criteria for an EC, the EC plan will be rewritten with DOE input, which puts you back to box #2 of the EC logic diagram. If these data reveal that the problem is more complex, and the proposed action will not be able to result in a final remedy for the site, then this will lead you back to the accelerated RFI decision logic at either decision diamond #8 or #14, wherein a determination is made as to whether the site is appropriate for an Interim Action, or should be treated in a more conventional mode (reference Accelerated RCRA Facility Investigation Process Policy, 96-PCT-006).

8. Implement the planned remedy until field measurements indicate you're done, and collect samples to confirm attainment of the cleanup levels and to characterize waste for disposal.

Data should be collected during remedy implementation for several purposes. First, to confirm that the remedy is working as planned. Second, to determine if any deviations form the conceptual model appear that would require a contingency plan to be put into action. Third, to ensure that worker health and safety is not being impaired due to cleanup operations. Finally, to determine when it is time to implement the verification sampling plan to confirm cleanup. During the implementation of the action, refer to the Stopping Criteria Policy which denotes conditions under which the EC will be terminated (reference Reconsidering and/or Stopping Work on Accelerated Cleanups, 96-PCT-004).

9. Were cleanup levels attained?

Evaluate the verification samples to confirm that the site meets the cleanup criteria in the manner specified in the EC plan. Typically, this decision will be based on the 95% UCL of the average over an exposure unit consistent with the future land use designated for the site. As such, a remedy could be considered complete even if there are areas where values exceeding cleanup levels are present.

Facilitating VCA and EC Activities

For all accelerated cleanups, prior to mobilizing for field work, the ER Project Office will provide a 10-day notification to the regulators for the purpose of allowing them to split samples with the Laboratory.

The ER Project Office and Field Project Leaders will work with Waste Management to establish specific waste characterization criteria and ensure adequate TSD capacity exists for each waste type prior to generation. The ER Project Office will also group candidate sites for VCA and units for EC to ensure that uniform, consistent, and well-documented decision processes are applied, with a minimal amount of associated paperwork. This approach allows characterization/cleanup processes to be streamlined, provides consistency when addressing similar or recurring problems, and results in economical use of limited resources.

Field screening and/or analytical laboratories for verification/confirmation samples (with not less than 10 percent of the confirmatory samples submitted for fixed laboratory analyses) will be used in order to expedite the receipt of analytical results, whenever possible.

ER Project Quality Assurance/Quality Control and analytic documentation requirements must be followed. Appropriate site-specific documentation and plans must be prepared and implemented, and a readiness review (see ER-AP-5.1, R1) will be conducted for these accelerated cleanups.

Additionally, when possible, VCAs and ECs will be implemented in accordance with existing Laboratory-wide documentation (e.g., National Environmental Policy Act).

This policy was developed and reviewed with extensive input from various field unit, project office, and DOE personnel.

CONTACT PERSON: Dave McInroy (505) 667-0819

Sincerely,

Tracy Glatzmaier
Environmental Restoration

Sincerely,

Bonnie Koch
Los Alamos Area Office

TG/BK/bp

Attachment: (1) VCA Checklist and Field Work Authorization Form
(2) EC Field Work Approval Form

Distribution:
G. Allen, CST-18, MS E525
K. Armstrong, EM/ER, MS M992
W. Cox, SNL
A. Dorries, TSA-11, MS K557
M. Gilgosch, LAAO, MS A316
T. Glatzmaier, DDEES/ER, MS M992
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O. Wilton, ESH-5, MS K494
RPF, MS M707

Information Copy:
T. Baca, EM, MS J591
D. Griswold, AL, ERD, MS A906
N. Naraine, EM-453, HQ

Attachment 1

Voluntary Corrective Action (VCA) Checklist and Field Work Authorization Form

Voluntary Corrective Action (VCA)
Checklist and Field Work Authorization Form

PRS No. _____ HSWA or AOC

_____ COPC(s) defined.

_____ Nature and extent defined or field screening method available to guide where not defined.

_____ Remedy is obvious.

_____ Time for removal is less than 6 months.

_____ Remedy is final.

_____ Land use assumptions straightforward.

_____ Treatment, Storage, Disposal Facilities are available for waste type and volume.

_____ Cleanup cost is reasonable for the planned action, and meets accelerated decision logic criterion for decision to proceed with VCA.

Explain criteria not checked above._____

_____

_____

Through reviewing the above criteria associated with this site, I believe that a VCA is the appropriate Accelerated Cleanup approach.

FPL _____ Date _____

FPC _____ Date _____

The undersigned have reviewed the final plan and believe that it fully satisfies the appropriate Accelerated Cleanup approach.

FPL _____ Date _____

FPC _____ Date _____

Through reviewing the VCA Plan, for site(s) _____, and believing that the above criteria have been met, I authorize the fieldwork to proceed.

DOE ER Program Manager_____ Date_____

Attachment 2

Expedited Cleanup Field Work Approval Form

EXPEDITED CLEANUP
FIELD WORK APPROVAL FORM

This form must be completed prior to starting remediation field work in accordance with Expedited Cleanup Plans, unless the EC has been approved in writing by NMED and all comments addressed.

I, _____, DOE-LAAO, **APPROVE** the field work as proposed in the accompanying Expedited Cleanup Plan for Potential Release Site(s) _____, TA-___.

I, _____, DOE-LAAO, **DO NOT APPROVE** the field work as proposed in the accompanying Expedited Cleanup Plan for Potential Release Site(s) _____, TA-___.

The following reasons reflect the decision for disapproval:

Signed:_____ Date:_____

Los Alamos National Laboratory

ENVIRONMENTAL RESTORATION

University of California
Environmental Restoration, MS M992
Los Alamos, New Mexico 87545
505-665-4557
FAX 505-665-4747

U. S. Department of Energy
Los Alamos Area Office, MS A316
Los Alamos, New Mexico 87544
505-665-7203
FAX 505-665-4504

To/MS: Distribution
Date: July 5, 1995
Refer to: EM/ER:PCT-95-022

SUBJECT: UNEXPECTED ENCOUNTER OF GROUNDWATER DURING ENVIRONMENTAL RESTORATION (ER) ACTIVITIES

STATEMENT OF ISSUE

The Environmental Protection Agency (EPA) and the New Mexico Environment Department (NMED) have requested to be informed when any "unexpected" occurrences of groundwater is encountered during ER field activities.

SUMMARY OF POLICY

The Field Project Leaders (FPLs) will immediately call Dave McInroy who will notify Barbara Driscoll of EPA and Steve Yanicak of NMED-Agreement In Principle (AIP). In addtion, the FPLs will generate a notification letter that groundwater was "unexpectedly" encountered during ER field activities. The ER Project office will review the letter and notify the EPA and AIP. The NMED HRMB, the Department of Energy/Los Alamos Area Office, the Los Alamos National Laboratory's Water Quality and Hydrology Group (ESH-18), and the Records Processing Facility will be copied.

DISCUSSION

This procedure will ensure consistent reporting to external and internal organizations of any "unexpected" groundwater encounters by the ER Project. The notification letter will contain at a minimum: a brief description of the activities which led to the encounter; the date, depth, description of geologic formation, and a brief explanation of why the groundwater was encountered. The letter should also contain the name and number of the point of contact should further information be required.

CONTACT PERSON: Dave McInroy, (505) 667-0819.

Sincerely,

Tracy Glatzmaier
ER Project Consistency Manager

Sincerely,

Courtland Fesmire
DOE/LAAO Regulatory Manager

TG/CF/bp

Distribution:
G. Allen, FPL, CST-18, MS E525
B. Barnett, CIC-1, MS M773
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C. Rofer, FPL, EES-1, MS D462
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P. Shanley, ESH-19, MS K498
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E. Trollinger, FPC, LAAO, MS A316
O. Wilton, ESH-5, MS K494
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To/MS: Distribution
Date: July 5, 1995
Refer to: EM/ER:PCT-95-025

SUBJECT: MANAGEMENT OF INVESTIGATION DERIVED WASTE

STATEMENT OF ISSUE

All sampling investigations conducted by the Environmental Restoration (ER) Project produced investigation derived waste (IDW). The ER Project must manage IDW in a consistent and protective manner and in compliance with applicable regulatory and Los Alamos National Laboratory (Laboratory) requirements.

SUMMARY OF POLICY

All investigations conducted by the ER Project that produce IDW will manage the IDW in accordance with the approach outlined in this document. In addition, the investigations will also follow the following Laboratory procedures and plans: Spill Prevention Control and Counter Measures Plan; Radioactive Materials Management Area Plan; AR 10-3, Hazardous and Mixed Waste; AR 10-9 Waste Profile Form; and ESH-18 Notice of Intent requirements. The ER Administrative Procedure, AP 5.3, will be revised to incorporate all approaches in this policy.

DISCUSSION

IDW is generated as a result of conducting sampling investigations at solid waste management units (SWMUs) and other areas of concern (AOCs). The investigations are conducted to determine whether or not a Resource Conservation and Recovery Act (RCRA) hazardous waste or constituents, or other potentially harmful materials, have been released to the environment. If release to the environment has occurred, or is likely to occur, that release will be assessed to determine if remediation is warranted.

At the Laboratory, these investigations are being conducted by the ER Project. The regulatory driver for these investigations is the Laboratory's RCRA permit. The portion of the permit that requires the investigation is Module VIII, also known as

the Hazardous and Solid Waste Amendments (HSWA) permit and is administered by the Environmental Protection Agency (EPA).

The Laboratory is also investigating SWMUs and AOCs where potential radiological contamination is the only concern. This is an important distinction as such sites are not subject to RCRA requirements because regulatory authority for radiological waste is under the Department of Energy, not with the EPA or the New Mexico Environment Department (NMED). The Laboratory is pursuing the investigation of potentially radiologically contaminated sites in concert with its investigation of sites potentially contaminated with hazardous waste or constituents. The Laboratory has taken this approach because radiological contamination also may present a threat to human health and the environment and such sites must be assessed to determine if remediation is warranted.

General Investigation Approach

SWMUs and AOCs have been identified at the Laboratory on the basis of record searches and personnel interviews. If a site was known or suspected to have managed solid waste, hazardous waste or constituents, or radiological constituents, it was identified as a SWMU or AOC in the 1988 and 1990 SWMU Reports.

EPA reviewed the 1988 SWMU Report and used it to identify in Module VIII those SWMUs and AOCs for which the Laboratory must submit RCRA Facility Investigation (RFI) Work Plans. The SWMUs and AOCs identified in Module VIII are addressed in RFI Work Plans. The plans also include other SWMUs and AOCs described in the SWMU Reports but not identified in the permit. These plans provide additional information on the SWMUs and AOCs based on further archival investigation on the sites, visual inspection of the sites and, in some cases, more personnel interviews with employees who worked at the sites. Based on this additional information collected, the RFI Work Plans provide one of the following: a sampling and analysis plan for each site; a recommendation for deferral of the investigation for the SWMU or AOC; or a proposal for no further action for the site. Those units for which sampling and analysis plans were presented in the RFI Work Plans are the focus of the information presented below.

The sampling and analysis plans presented in the RFI Work Plans for each site identify the type of sampling to be conducted, the number of samples to be collected, sample collection locations, and the type of analyses to be performed on each sample. The sampling and analysis plans are designed to determine whether or not there has been a release of hazardous waste or constituents to the environment. The sampling and analysis plans were designed based on the information collected on each SWMU and AOC. For example, if a high degree of certainty exists on the potential contaminants of a SWMU, the more focused the sampling and analysis plan. The less known about a SWMU, the more generic the approach. When a

generic approach is used, the analytical suite to be conducted is broad to ensure that any possible contaminant is detected.

The information available on a SWMU or AOC is what guides the management of any environmental media handled or waste produced during the field investigation. If the information available for a site does not indicate that a RCRA hazardous waste will be generated, the environmental media and waste will be managed in a protective manner until analytical results are available to accurately characterize the media and waste. Specifically, if containers are used to store the media or waste they will be labeled as a best management practice, "Pending Analysis;" the date the media or waste first went into the container will be identified; the analyses being conducted; and the names of persons responsible for the container. The containers will be stored in a protective manner and meet all requirements for storage under the Laboratory's Spill Prevention Control and Countermeasures Plan. The storage location should be selected based on the usability of the storage site.

If available information indicates that a hazardous waste will be generated during a site investigation, it will be managed as a RCRA hazardous waste per Laboratory Administrative Requirement 10-3 if environmental media or waste are removed from the SWMU boundary. In addition to the labeling information in the previous paragraph, the container will also be labeled "Hazardous Waste." The waste will be stored in a <90 day storage area[1] which will be registered with the Laboratory's ESH-19 group. Inspections of the <90 day storage area will be conducted on a weekly basis and inspection forms submitted to ESH- 19. If hazardous waste must be stored in the <90 day storage area for greater than 90 days, a written request by the generator will be submitted to ESH- 19 at least two weeks before the 90 days are exceeded to request a 30-day storage extension at the site. The extension request must identify the reason the waste cannot be moved to a RCRA permitted or interim status unit at the Laboratory. ESH-19 will prepare a written request for extension and submit the request to NMED.

Information collected during the site investigation will be used to expand acceptable knowledge for the site and to ensure that the environmental media handled or waste generated are being appropriately managed. Visual staining, odors, and field instrument readings may require that all media waste and other waste generated during the investigation be managed as hazardous waste.

The decision for managing the materials and wastes generated during the investigation are documented on the Waste Management Checklist. This checklist must be completed by a person designated by the Field Project Leader (FPL) before field work begins. The checklist is reviewed by CST-17, the waste management group responsible for customer service, and ESH-19, the hazardous and solid waste

[1] A satellite accumulation area may be established if the amount of waste to be stored is < 55 gallons, is not acutely toxic, and is under the control of the generator.

group responsible for regulatory compliance. The checklist is approved when signed by representatives of both CST- 17 and ESH- 19. The checklist may be appended after field work is complete and analytical data is available. Groups CST-17 and ESH- 19 review and approve the amendment, if prepared, which will determine how to further manage the materials and wastes generated. The waste management group will not pick up waste that is not accompanied by the required waste profile form (WPF) and chemical waste disposal request (CWDR) for which a waste management checklist is on file at CST-17.

Types of Environmental Media (Indigenous)

Borehole cuttings, soil, rock, sediment and groundwater which are displaced during investigations at SWMUs and AOCs are environmental media (indigenous materials) and not wastes as long as the media remains within the SWMU boundary. Environmental media which contains hazardous waste and is managed outside the SWMU boundary will be managed as hazardous waste.

Management of Environmental Media

Management of soil, rock, and sediment includes the following:

- The indigenous solid will be placed back in the SWMU or AOC when possible. Prior to taking this action, the following must be considered.
    - The indigenous environmental media may not cross the boundary of the SWMU or AOC.[2]
    - The return of the media does not enhance potential for contaminant migration.

The environmental media will not be returned to its point of origin if:

- The source of the media is a borehole in hydraulic communication with groundwater or surface water;
- The environmental media could be construed to be refuse in a water course, or could potentially exceed the New Mexico Water Quality Standards;

[2] A SWMU or AOC boundary is defined by the type of unit that is being investigated. For example, if the SWMU is a spill area, the boundary is the extent of the contamination. If the SWMU is a discrete unit, such as a tank, the SWMU boundary is currently defined as the physical form of the tank and the extent of the contamination unless it is a RCRA-regulated unit. If the unit is RCRA-regulated, any contamination which has migrated from the unit is not considered part of the SWMU.

- The environmental media encountered was not what was anticipated to be encountered (e.g., gross visual contamination noted, strong odor noted, field instruments determine contamination present).

Management of Solid Indigenous Material Which Must Be Containerized

It may not be possible to return environmental media to its point of origin, e.g., when a borehole is completed as a monitoring well. The investigator may not know if the placement of drill cuttings around the surface of the SWMU or AOC will enhance the potential for contaminant migration. In such cases, the drill cuttings should be containerized. The containerized cuttings will be stored within the boundary of the SWMU or AOC when possible. The containers will be marked as "Pending Analysis;" date material first placed in container; what analytical tests are being conducted on containerized material; and the persons responsible for the container.

If the media is stored outside the SWMU, environmental media that is known or suspected to contain hazardous waste will be labeled "Hazardous Waste" and stored in a <90 day storage area. If the storage area is located within the SWMU or AOC of origin a <90 day storage area does not need to be established. Environmental media which does not cross a unit boundary is not considered generated. A 30 day extension for storage will not be made to NMED if analytical data is unavailable to characterize the waste in less than 90 days and the drum will not be labeled "Hazardous Waste."

Management of Indigenous Liquids

The management of groundwater generated during an investigation will generally require that it is containerized unless there is existing data which indicates that no hazardous constituents or radiological constituents are present over background in the purged groundwater. Receipt of analytical data, which contributes to acceptable knowledge, will allow the appropriate characterization and future management of the containerized water. Water from well purging must not be discharged to the ground surface unless a notice of intent (NOI) has been filed and approved by NMED for that discharge. Contact ESH-l8, the Water Quality Group to file an NOI.

Waste Introduced During Investigations (Nonindigenous)

To conduct a field investigation, materials are usually brought to the site that may ultimately contribute to the wastestream. These introduced materials include personal protective equipment (PPE) in the form of tyvek, sampling gloves, drill rigs, sample augers, field instruments, hand-held auger, decontamination tubs, plastic tarps, planchets, stainless steel spoons and bowls, decontamination fluids and others. The introduced materials are wastes when they cannot be reused for their intended purposes and are discarded. The subsequent management of these wastes

depends on the material itself and what it was used for. If the material never came in contact with hazardous waste, it may be managed as solid waste.

If the introduced materials contacted hazardous waste or potentially hazardous waste, they must be containerized and analytical results must be obtained to characterize that waste. However, if the introduced material did not contact hazardous waste, it may be managed as solid waste. For example, tyvek that never contacted hazardous waste which has been torn and is no longer useable can be managed as solid waste if the wearer of the tyvek knows they did not contact contaminated media or waste.

Radiologically contaminated waste must be managed per the requirements of the Radioactive Materials Management Area (RMMA) Plan. The RMMA applies whenever radioactive materials or wastes are expected to be encountered or generated.

Decontamination liquids are managed in appropriate containers, such as "Tuff Tanks" or bunged 55-gallon containers. Management of these liquids which are not suspected or known to have contacted RCRA hazardous waste must at a minimum comply with the Laboratory's Spill Prevention Control and Countermeasures Plan until analytical data are available to determine how to characterize the liquid. Contaminated liquids cannot be discharged to the ground or a wastewater treatment facility unless approval has been granted from ESH-18. Discharges to the ground may require the filing of an NOI with NMED. Discharges to wastewater treatment facilities must meet all the requirements of the Laboratory's National Pollution Discharge Elimination System permit and all applicable waste acceptance criteria. Liquids cannot be directly discharged to a water course.

Sincerely,

Tracy Glatzmaier
Environmental Restoration

Sincerely,

Court Fesmire
Los Alamos Area Office

TG/CF/bp

Attachment: Management Of Investigation Derived Waste Flowchart

Environmental
Restoration

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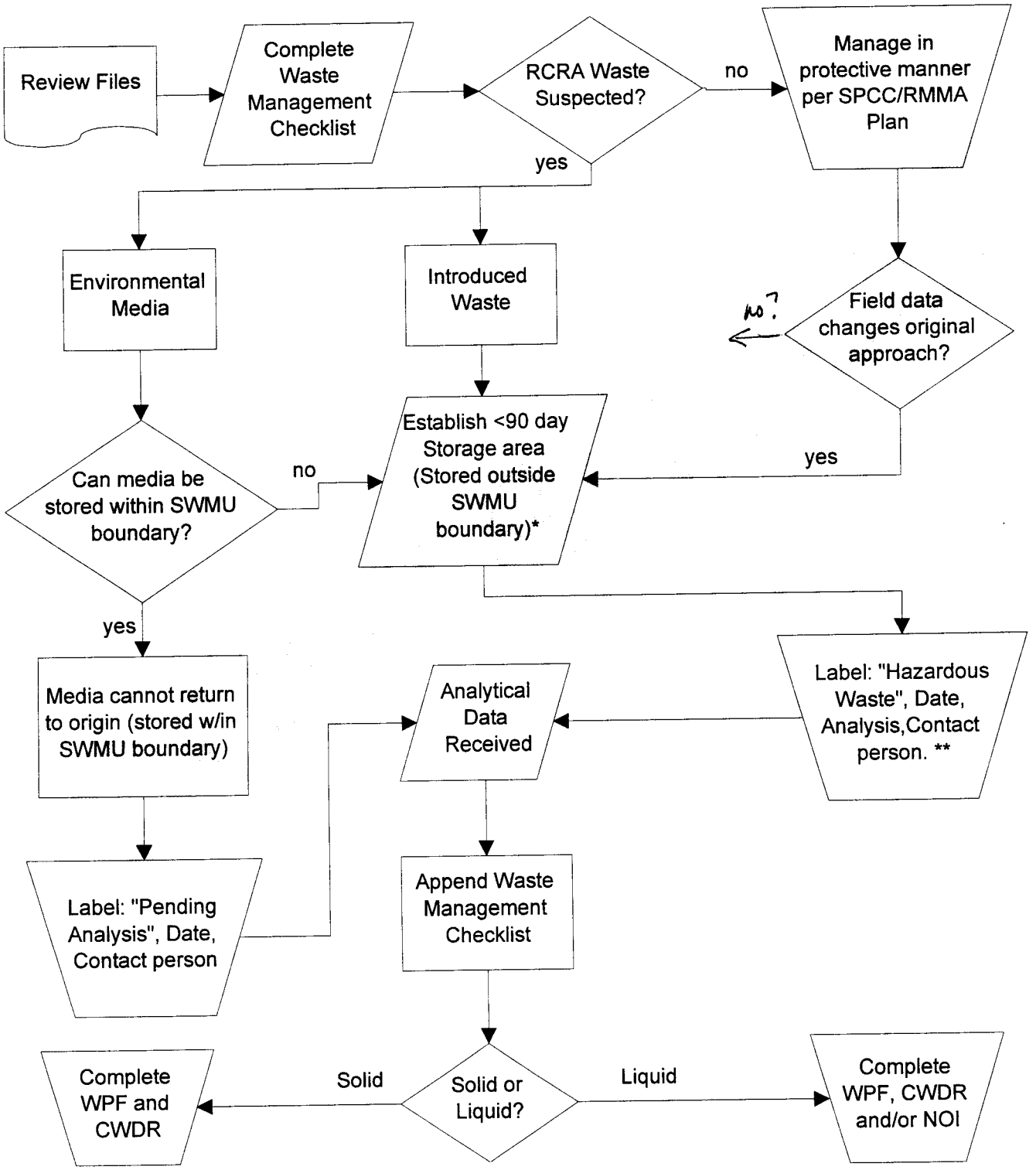
Management of Investigation Derived Waste



* Extensions for storage greater than 90 days must be submitted to ESH-19

** Unless waste had no contact with hazardous waste and can be managed as solid waste. A waste profile form is still required.

5/5/95

Los Alamos National Laboratory

ENVIRONMENTAL RESTORATION

Environmental Restoration

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Date: April 12, 1996
Refer to: EM/ER:95-PCT-029-R1

SUBJECT: ACCELERATED CLEANUP PLANS AND REPORTS

STATEMENT OF ISSUE

The New Mexico Environment Department (NMED), the Environmental Protection Agency (EPA), and the Department of Energy (DOE) require plans and reports that document accelerated cleanup [voluntary corrective actions (VCAs) and expedited cleanups (ECs)]. In keeping with the Environmental Restoration (ER) accelerated cleanup process policy (EM/ER:95-PCT-016-R1) to minimize costs and enhance schedule performance, all plans, reports, and associated documentation should be consistent, succinct, accurate, and timely.

SUMMARY OF POLICY

The ER Project will adhere to the policy guidelines regarding scope, content, and format of final VCA and EC plans and reports outlined below.

DISCUSSION

General Information

The ER Policy on the Accelerated Cleanup Process (reference EM/ER:95-PCT-016-R1) explains the criteria for VCAs and ECs. VCA plans are reviewed and approved by DOE, with information copies provided to the regulators and the public. As such, they should be limited in size, but provide sufficient detail to adequately present the intent of the activity. In contrast, EC plans must be reviewed and approved by the regulators with input from the public. These plans need to be more comprehensive and provide detail equivalent to the level of an Resource Conservation and Recovery Act Facility Investigation (RFI) Report (see RFI Report Format, 96-PCT-011).

Similarly, if the Potential Release Site (PRS) is listed on the Hazardous and Solid Waste Amendments (HSWA) Module of the Laboratory's RCRA operating permit and a VCA is performed, the VCA Report needs to provide detail on the characterization phase as well as the cleanup activity equivalent to that in an RFI Report. However, for PRSs not on the HSWA permit where a VCA was performed, the reports do not need to have as detailed information, but must contain enough information for DOE to approve the cleanup. In addition, because the EC plans contain detailed information, the EC reports require less information but must contain enough information

for the regulators to approve the cleanup and remove the site from the permit. All plans and reports must follow the guidelines presented below.

Any standard software application can be used to prepare and publish final documents. All final accelerated cleanup plans and reports must include a shaded cover page and headers and footers in a format consistent with the example in Attachment 1. Subsequent changes to plans or reports require revision numbers on the cover sheet and footers. Each document must be assigned an LA-UR number from FSS-16. All documents should be spiral bound with clear plastic covers. Electronic copies should be retained by the field units (FUs).

When documents have been approved and are ready to be distributed, the Project Office will format the final cover letters and standard distribution lists, which include copies to NMED, EPA Region 6, and public repositories. The Field Project Leaders (FPLs) or their designee, are responsible for providing the Project Office with the necessary information and any additional names (not on standard distribution) for the distribution list. The FPLs are also responsible for making the designated number of copies (see Deliverables Chart, EM/ER:96-203) and distribution of the copies.

Accelerated Cleanup Plans

- VCA plans must follow the outline indicated in Attachment 2.

- DOE must formally agree with designation of the site as a VCA before the VCA plan is prepared. FPLs must work closely with DOE Field Project Coordinators (FPCs) during the VCA plan development to ensure concurrence before any plans are submitted. Multiple PRSs for a given technical area (TA) and field season should be included in a single VCA plan if the scope of work and waste management procedures are going to be similar and it makes sense to combine the PRSs into a single plan.

- The VCA Checklist and Field Work Authorization Form (Attachment 3) must be completed and signed by both the FPL and FPC. The first signature, provided before the plan is written, shows concurrence with the criteria listed, and the second shows agreement that the plan satisfies the VCA approach. Approval of the final plan, authorizing field work to proceed, is given by the DOE ER Program Manager.

- The dates for permit modification and public comment must be taken into consideration for the delivery schedules when writing an EC plan. In addition, a two-page fact sheet on the plan must be presented to the regulators for their concurrence prior to formal submittal of the permit modification, prior to EC plan development (see Attachment 4). The regulators have 45 days in which to respond to the plan and provide temporary authorization, if requested by the Laboratory.

- EC plans should provide detailed information regarding site background and environmental setting, plan rationale (including any risk assessment calculations) and project management. The contents and format for an EC plan are provided in Attachment 5.

- All draft plans must include the interaction of the FPC and other appropriate reviewers, routing, and certification (see Deliverables Chart, EM/ER:96-203).

- If the DOE and Laboratory decide to proceed at risk prior to regulator approval of EC plans, an EC Field Work Approval Form must be signed by the DOE ER Program Manager and must be included with the final plan (see Attachment 6).

Accelerated Cleanup Reports

Final reports summarizing the scope of activities for the accelerated cleanups should be written in clear, concise, technical style consistent with the outlines provided in Attachment 7 for VCA reports and Attachment 8 for EC reports.

- All draft reports must include the interaction of the FPC and other appropriate reviewers, routing, and certification (Guidance document under development, EM/ER:96-202).

- Each VCA report must include, as Appendix E, a Certificate of Completion (Attachment 9) signed and dated by the respective FPL. HSWA VCA reports require routing sheet signatures and certification before final approval (see Deliverables Chart).

- Each EC report must include, as appendices, an Acceptance Inspection Checklist, a color photograph, and a Certification of Completion signed by an independent reviewer and the FPL (see Attachment 8).

This policy was developed and reviewed with extensive input from various field unit, project office, and DOE personnel.

CONTACT PERSON: Dave McInroy (505) 667-0819.

Sincerely,

Tracy Glatzmaier
Environmental Restoration

Sincerely,

Bonnie Koch
Los Alamos Area Office

TG/bp

Attachments:
(1) Cover Sheet, Footer and Header Format
(2) VCA Plan Contents
(3) VCA Checklist and Fieldwork Authorization Form
(4) EC Plan Contents
(5) EC Plan Fact Sheet
(6) EC Field Work Approval Form
(7) VCA Completion Report Contents

(8) EC Completion Report Contents
(9) VCA Certificate of Completion

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N. Naraine, EM-453, DOE-HQ

Attachment 1

Sample Cover Sheet and Sample Header and Footer Format

NOTE: List PRSs only if there are ~8 or less (use your own judgement. To save space, list similar numbers together [e.g., 33-010(a,b,g) or if applicable, xx-000(a-d)]

Voluntary Corrective Action Plan
for
Potential Release Sites at TA-33

33-010(a,b,g), Canyon-Side Disposal Area
33-010(d), Surface Disposal Area
33-011(b), General Storage Area

Field Unit 3

Environmental Restoration Project

November 1995

A Department of Energy
Environmental Cleanup Program

Los Alamos
NATIONAL LABORATORY

LA-UR-##

Attachment 2

Voluntary Corrective Action Plan Contents

Voluntary Corrective Action Plan Contents

1.0 INTRODUCTION

1.1 Site Type and Description

This section includes a physical description of the site and discussion of industrial processes associated with the site. A detailed map of the site showing RFI sample locations, nature and extent (if known), and area to be remediated can be shown here. This same map can be referenced in other sections.

This section should be brief and where possible use generic descriptions (e.g., for container storage areas, septic tanks, etc.).

1.1.1 Operational History

Discussion of the operational history must identify contaminants of potential concern (COPCs). This subsection should be PRS-specific and not discuss the entire Technical Area. Refer to previous RFI Work Plans and/or Reports wherever possible.

1.1.2 COPCs and Rationale for Proposed Remedial Action

Briefly summarize the confirmation of COPCs through field investigation. Provide a rationale for the proposed corrective action and a brief description of the proposed action.

2.0 SITE CHARACTERIZATION

This section briefly summarizes all available site characterization information to ensure DOE is in agreement with allowing the remedial action to proceed. If characterization information is limited, so state.

2.1 RFI Information/Other Decision Data

This subsection includes a summary of historical field investigations, archival information, and RFI sampling results. Provide RFI analytical results in table form (Annex 7.2), with comparisons to SALs and sample location identification numbers that correspond to an attached site map (Annex 7.3); summarize or interprete the data in this section.

2.2 Nature and Extent of Contamination

This subsection presents the current understanding of the nature and extent of contamination at the site. This information should also describe how nature and extent was determined (e.g., via field screening with XRF, or fixed laboratory data, etc.) If nature and extent has not been defined, provide a concise statement describing limitations in the data acquired to date. (e.g., We believe

that the extent has been bound on three sides of this unit, but the data revealed that the west side of the unit leading toward the canyon edge is questionable.) Site maps must also illustrate clearly the boundary of the media known to be contaminated, both vertically and horizontally.

If necessary, describe any additional sampling and analysis necessary to fill voids in the nature and extent determination. Use the sampling and analysis plan format provided in the RFI Report Guidance. (If necessary, attach SAP as an attachment in Section 9.0).

3.0 PROPOSED REMEDY

3.1 Description of the Proposed Remedial Action

This section briefly describes activities required to implement the VCA, including depth of excavations, removal of contamination, stabilization of debris, etc. Indicate, where applicable, that Spill Prevention Control and Counter Measures Plans, stormwater plans, air pollution control procedures, etc. will be followed and note that these plans can be provided upon request.

3.2 Basis for Cleanup Levels

This subsection includes all land use assumptions and should be a generic standardization statement (see example provided below).

> "PRS X-XXX lies within DOE-owned land on a mesa top. The area is removed from public access roads. In the foreseeable future, the land is anticipated to be used exclusively for Laboratory (industrial) operations."

If risk information is necessary, it should be discussed in this subsection, and any risk assessment calculations, etc. provided in Annex 7.1. This includes all human health and ecological-risk concerns and assumptions leading to proposed cleanup levels. At a minimum, a qualitative ecological-risk evaluation should be performed to ensure that the VCA achieved the final remedy for the site. This subsection and Annex should be developed by your human health and ecological-risk assessors. Based on risk assessments or other methods, clearly state the cleanup levels. If a risk calculation was not performed, provide a statement as to why one was not necessary for the site (e.g., promulgated cleanup levels, trash removal only, etc.)

3.3 Site Restoration

Describe briefly how the site will be restored following completion of the VCA, e.g., backfilling, regrading, reseeding, fence replacement, etc. (see example provided below).

> "When sample results confirm that the site has been remediated in accordance with this plan, the excavated

area will be returned to the original grade and revegetated. Backfill material will consist of clean backfill obtained from the Laboratory maintenance contractor."

4.0 WASTE MANAGEMENT

4.1 Estimated Types and Volumes of Waste

Provide an estimate of all waste types and volumes (see example table provided below). Include waste characterization/strategy requirements and all uncertainties in determination of waste types and volumes.

Item	Waste Type	Anticipated Volume
Sampling waste/PPE	solid - potential haz	1 ft^3
Contaminated soils	solid - hazardous	20-30 yd^3
Decontamination water	liquid - potential haz	150 gal

4.2 Method of Management and Disposal

Describe the planned method and location of waste disposal. Confirm that treatment, storage, and disposal (TSD) capacity is adequate for the amount and type of waste generated. Where applicable, state how the waste will be managed prior to disposal.

5.0 DESCRIPTION OF CONFIRMATORY/VERIFICATION SAMPLING

This section describes in detail the confirmatory/verification sampling scheme. Discuss the analytical methodology to support the final decision, including the numbers of fixed laboratory samples versus field screening samples. The data gathered should be adequate to support the decision that No Further Action will be necessary at this PRS.

6.0 ESTIMATED TIME TO COMPLETE THE ACTION AND UNCERTAINTIES

This section includes the time frame anticipated to complete the activities described in sections 3.0 through 5.0. Include any uncertainties and "at risk" assumptions in this estimate, especially the lack of adequate data on nature and extent, and any other possible situations that could arise to delay completion of the action (e.g., regulatory agencies, equipment, additional waste characterization requirements, lack of adequate waste TSD capacity, etc.) Provide a statement as to how costs and waste generation associated with the VCA will be reasonably limited to estimates provided in the plan.

7.0 ANNEXES

7.1 Risk-Based Cleanup Level Assumptions and Calculations

Where applicable.

7.2 RFI Analytical Results

Use table examples provided in RFI Report Guidance.

7.3 Implementation SOPs

Site applicable Environmental Restoration Standard Operating Procedures, Volumes I and II, November 17, 1993, Los Alamos National Laboratory.

7.4 Quality Assurance Plan

See Quality Assurance Project Plan for Environmental Restoration, February 1995 revision, Los Alamos National Laboratory.

7.5 Site-Specific Health and Safety Plan

See Los Alamos National Laboratory Environmental Restoration Project Health and Safety Plan, February 11, 1995, Los Alamos National Laboratory.

7.6 Waste Management Checklist

7.7 VCA Checklist and Field Work Authorization Form

Attachment 3 of PCT-029-R1.

7.8 Cost Estimate

Provide costs to complete the action in this section (see example provided below). Include contingencies that DOE needs to approve the entire plan up front. Be sure to identify situations that may be encountered so you don't have to go to DOE for a subsequent approval.

Pre-Field Activities $_____

Field Activities

Waste Management Disposal $_____
(State any assumptions with waste type.)

Sampling/Analytical $_____

Post-Field Activities $_____

TOTAL ESTIMATED COST $_____

8.0 REFERENCES

9.0 ATTACHMENTS

Attachment 3

Voluntary Corrective Action Checklist and Field Work Authorization Form

Voluntary Corrective Action (VCA)
Checklist and Field Work Authorization Form

PRS No. _____ HSWA or AOC

_____ COPC(s) defined.

_____ Nature and extent defined or field screening method available to guide where not defined.

_____ Remedy is obvious.

_____ Time for removal is less than 6 months.

_____ Remedy is final.

_____ Land use assumptions straightforward.

_____ Treatment, Storage, Disposal Facilities are available for waste type and volume.

_____ Cleanup cost is reasonable for the planned action, and meets accelerated decision logic criterion for decision to proceed with VCA.

Explain criteria not checked above._____

_____

_____

Through reviewing the above criteria associated with this site, I believe that a VCA is the appropriate Accelerated Cleanup approach.

FPL _____ Date _____

FPC _____ Date _____

The undersigned have reviewed the final plan and believe that it fully satisfies the appropriate Accelerated Cleanup approach.

FPL _____ Date _____

FPC _____ Date _____

Through reviewing the VCA Plan, for site(s) _____, and believing that the above criteria have been met, I authorize the fieldwork to proceed.

DOE ER Program Manager_____ Date_____

Attachment 4

Example of an Expedited Cleanup Plan Fact Sheet

Expedited Cleanup Plan Fact Sheet

Field Unit X
SWMU _____

Date

1.0 SWMU Description

Location: TA-XX Type: Description of unit

Wastes Disposed: _____

Contaminants of Concern: _____

2.0 Site Investigations

Pre-RFI ( ) RFI Phase I ( ) RFI Phase II ( ) (Check applicable spaces)

Analytical Results Available:

Metals:	Primary Contaminants:	(e.g., lead 2500 ppm)
Organics:	Primary Contaminants:	(e.g., 2-butanone 24 ug/l, cis-1-2-dichloroethylene 660 ug/l, trichloroethane 200 ug/l
Rad:	Primary Contaminants:	(e.g., Pu^{239} 22.5 pCi/g)
Other:	Primary Contaminants:	(list other contaminants, if any)

3.0 Waste Types to be Generated by Cleanup (place an "X" in the appropriate column(s) for waste type; indicate anticipated waste volumes; indicate any treatment methods, and indicate anticipated disposal method).

WASTE TYPE	HAZ	RAD	MIXED	Volume-ft^3	Method of Treatment	Method of Disposal	
						LANL	Off-site
PPE	X						
Soil Cuttings							
Decon Liquid	X						
Purge Water							
Debris							
Sludge	X						
Bulk Soil							

4.0 Scope of Work for Expedited Cleanup

Rationale for Performing EC: Provide 2-3 sentences explaining the rationale behind performing the EC. For example: "Analytical results from the RFI indicate VOC contamination above SALs. The VOC contamination is limited to a 12' x 13' area and is confined to the soil only. The _____ contamination at a level of _____ is driving the cleanup."

Description of Proposed EC: Provide 2-3 sentences explaining the description of the EC. For example, "The contaminated soil will be removed by backhoe. Hand-held contaminants will be used to guide the excavation."

Proposed Cleanup Standards or Methodologies: Provide 2-3 sentences describing the cleanup standards and/or methodologies used in the EC. For example, "The soil will be cleaned to _____ ppm (or other applicable units) for the _____ contamination. Obtaining this level of cleanup will ensure no human health risk will remain at the site under an industrial land use scenario."

NOTE: this text is for example only.

5.0 Cost and Schedule

Estimated costs of:

LANL Staff	_____
Subcontractors	_____
Sample Analysis	_____
Waste Treatment Storage, Disposal	_____
Total	_____

Planned Start Date: _____ Planned Field Completion Date: _____

Verification Report Date: _____

Attachment 5

Expedited Cleanup Plan Contents

EXPEDITED CLEANUP PLAN CONTENTS

NMED APPROVAL LETTER

ACRONYMS

TABLE OF CONTENTS

1.0 INTRODUCTION
1.1 Detailed Description of SWMU
1.1.1 Operational History
1.1.2 Physical Setting
1.2 Assumptions

2.0 RESULTS OF QUALITY ASSURANCE/QUALITY CONTROL ACTIVITIES
2.1 Inorganic Analysis
2.2 Organic Analysis
2.3 Radiochemistry Analysis

3.0 RESULTS OF INVESTIGATION(S)
3.1 Summary of Investigations Prior to RFI
3.2 Field Investigation
3.3 Summary and Evaluation of Results
3.3.1 Background Comparison
3.3.2 Evaluation of Organic Constituents
3.3.3 Human Health Assessment
3.3.3.1 Screening Assessment
3.3.3.2 Risk Assessment
3.3.4 Preliminary Ecological Assessment
3.4 Conclusions and Recommendations
3.5 Sampling and Analysis Plan (follow RFI format, if needed, to generate a SAP to define nature and extent).

4.0 EXPEDITED CLEANUP
4.1 Overview and Rationale
4.2 Permitting, Approval, and Notification Requirements
4.2.1 Regulatory Notification/Permit Modifications
4.3 Cleanup Activities
4.3.1 Description of the Proposed Remedial Action
4.3.2 Basis for Cleanup Levels
4.4 Waste Management Issues
4.4.1 Characterization of Materials for Disposal
4.4.2 TSD Plans for Waste
4.5 Verification Plan
4.6 Site Restoration Plan
4.7 Final Inspection
4.8 Final Report

5.0 PROJECT MANAGEMENT
5.1 Staff and Resource Requirements

5.2 Detailed Schedule (including Gantt chart)
5.3 Stakeholder Notifications

6.0 REFERENCES

7.0 ANNEXES
7.1 Implementation SOPs
7.2 Quality Assurance Plan
7.3 Health and Safety Plan
7.4 Waste Management Plan
7.5 Records Management Plan
7.6 Public Involvement Plan
7.7 Cost Estimates

TABLES

Anticipated Waste Volumes

FIGURES

Location of the PRS
Conceptual Exposure Model for the PRS
Schedule
Verification Sample Locations

ATTACHMENT

NMED Approval Letter (once plan is approved)

Attachment 6

Expedited Cleanup Field Work Approval Form

Expedited Cleanup Field Work Approval Form

This form must be completed prior to starting remediation field work for Expedited Cleanups that do not have a NMED-approved plan.

I, _____, DOE-LAAO, APPROVE the field work as proposed in the accompanying Expedited Cleanup Plan for SWMU_____.

I, _____, DOE-LAAO, DO NOT APPROVE the field work as proposed in the accompanying Expedited Cleanup Plan for SWMU_____.

The following reasons reflect the decision for disapproval:

Signed:_____ Date:_____

Attachment 7

Voluntary Corrective Action Completion Report Contents

Voluntary Corrective Action Completion Report Contents

1.0. INTRODUCTION

Briefly include a discussion on the following material:

- Review process history of site for background (one to two sentences should be adequate, (the RFI Work Plan can be referenced for more detail), what it indicates about the process knowledge and COPCs found at the site, and any other document such as an RFI Report that may already exist and provide detail on this topic. Include a generic description of the site.

- Review of Type of Site *(briefly explain reasoning for selection of site type)*

  - HSWA or non-HSWA
  - Solid Waste (e.g., trash removal)
  - Site falls under promulgated cleanup level (UST, PCB, etc.)
  - Rad Only
  - Other

- Site Match of VCA Criteria:

  Briefly reiterate why a VCA was appropriate; the VCA Plan may be referenced for detail with regard to the criteria in the VCA checklist.

2.0 SITE CHARACTERIZATION PRIOR TO REMOVAL

For HSWA SWMUs, this section should be similar in level of detail to various sections of Chapter 5 of the RFI Report; for non-HSWA SWMUs the information can be provided at slightly reduced detail. For some VCAs, the information may be avialable in an RFI Report; if so, reference the report and just summarize the detail.

Follow Chapter 5 outline for RFI Reports.

3.0 REMEDIAL ACTIVITIES AND RESULTS OF CONFIRMATORY SAMPLING

3.1 Risk Calculations and/or Cleanup Level Derivation

This section provides a brief review since the VCA plan should contain the calculations and/or assumptions used to set PRGs for the VCA. If the need

arose during the activity to default to a different cleanup level, a detailed explanation covering the following should be included:

- Review land use assumptions.
- Review why cleanup level was changed and how new cleanup level was derived.
- Review how cleanup level is adequate for covering human health and eco-risk concerns if not risk derived.

3.2. Remedial Implementation

This section is meant to be mostly rhetorical. Include the following in a discussion:

- Review when and where activities took place.
- Include map showing boundaries of removal if this was the remedy (this map should be dual purpose and also show the locations for confirmatory sampling which is covered in the next section).
- Discussion of screening methods used to guide remedy.
- Discuss site restoration.
- Describe any deviations from the VCA Plan.

3.3 Confirmatory Sampling

- Review sampling locations referencing map described above in 3.1.
- Note any deviations from the VCA Plan in analytical test methods.
- Table of results

Include a discussion of the range of results in relation to the detection limit for the test methods and the PRGs in this section. Reference table in Appendix D which shows a match of sampling data with the PRGs. Include the following in the table:

- Follow basic format of RFI Report tables including a field for sample location ID, value of result, background or detection level and PRG.
- Conclusions
- Indicate if VCA was not completed and why (examples: the contamination was much more extensive than originally anticipated, a new contaminant of concern was discovered, or amount of wast generated would have been

more than could be managed appropriately). Include discusion of condition of site when left.

- Briefly asses, via discussion of confirmatory sampling results, the success of the VCA action.

4.0 WASTE MANAGMENT

4.1 Report on any deviations from the VCA Plan concerning the following:

- Volume
- Review actual volume removed; compare actual to projected and describe any differences and why differences resulted.
- Type of waste and waste characterization methods.
- Disposal location and schedule.
- Waste minimization activities (if any) such as volume reductions, recycling, and waste avoidance.

4.2 Waste Characterization Data

Report waste characterization data using a table format.

5.0 REFERENCES

APPENDICES

A. QA/QC

Similar to Chapter 4.0 of the RFI Report, discuss any problems associated with the following (report level of validation requested for each sample type):

1. Screening Data
2. Confirmatory Sampling Data
3. Waste Characterization Data

B. Indicate that RFI Characterization Data (data discussed in Chapter 2.0 above) are available in FIMAD and/or provided upon request.

C. Before and after cost comparison.

Present a table format of costs for the life cycle of remediation, including waste management.

D. Confirmatory Sampling Results Table.

E. Certification of Completion.

Attachment 8

Expedited Cleanup Completion Report Contents

Expedited Cleanup Completion Report Contents

1.0 Summary of Expedited Cleanup

1.1 Overview
- -PRS number
- -Description of unit
- -Period of operation
- -Associated contaminants
- -Reference Class 3 permit modification request for EC

1.2 Expedited Cleanup
- -Description of cleanup activities (brief)
- -Period of time cleanup took place

2.0 Sampling and Analysis

- -Method
- -Analytes detected or not in relation to cleanup objectives
- -QA/QC

3.0 Site Restoration

- -Description of effort undertaken to return the site to pre-disturbed conditions
- -Regrade
- -Revegetation efforts

4.0 Modifications to EC Plan

- -Area closed in accordance with approved plan
  - -cleanup levels achieved
- -Area closed with minor deviations
  - -list minor technical deviations
  - -cleanup levels achieved

5.0 Waste Management

5.1 Quantities and types of wastes generated
- -Actual volumes and types of wastes listed
- -Management of the waste generated e.g., <90-day storage, rolloffs, drums, etc.

5.2 Treatment, Storage, and Disposal
- -Final disposition of the waste

5.3 Waste Minimization Efforts
-Recycling efforts
-Waste avoidances

6.0 Outstanding Items From the Acceptance Inspection

-No outstanding items
-Reference Appendix B completed by an independent party
-Based on inspection the action is certified (Appendix D)

7.0 Problems Encountered and Lessons Learned

-Health and safety, cost avoidances, time savers, etc.

8.0 Conclusion

Formal request to remove this site from the HSWA Permit

9.0 REFERENCES

Appendices

Appendix A Analytical Data

- Provide summary tables of data
- Indicate the data are available on FIMAD and/or by request

Appendix B Acceptance Inspection Checklist

- An appropriate checklist should be developed by the FPL, the FPC, and the independent reviewer.
- Example attached

Appendix C Photographs

- 1 - 8x10 color photo of work being performed with narrative at bottom

Appendix D Ecological Risk Assessment (Include as Appendix D only if needed)

Appendix E Certification of Completion

- Example attached

SAMPLE

Appendix B

Acceptance Inspection Checklist

Unit Number and Description

(PRS #) [e.g., Septic Tank]

_____ Regulators and DOE notified at least 10 days in advance of field work.

_____ Verification samples and confirm integrity of tank.

_____ Tank contents removed and containerized.

_____ Tank inlet and outlet plugged.

_____ Tank interior washed.

_____ Wash liquid collected and containerized.

_____ All waste generated is characterized and managed appropriately.

_____ Tank backfilled.

_____ Site restored.

Reviewer David McInroy

Signature _____

SAMPLE

Appendix E

Certification of Completion

I certify that all the work pertaining to the Expedited Cleanup (EC) of SWMU _____ has been completed in accordance with the Department of Energy approved EC Plan entitled_____. Based on my personal involvement or inquiry of the person or persons who managed this cleanup, a review of all the data gathered, and a visit to this site, to the best of my knowledge and belief, all criteria have been met or exceeded. I believe that the completion of this EC is protective to both human health and the environment. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

_____ _____

(Name) Date signed
Field Unit ___ Field Project Leader
Environmental Restoration Project
Los Alamos National Laboratory

_____ _____

Dave McInroy Date signed
Regulatory Compliance Manager, Independent Review
Environmental Restoration Project
Los Alamos National Laboratory

Attachment 9

Voluntary Corrective Plan Certification of Completion

Certification of Completion

I certify that all the work pertaining to the voluntary corrective action _____ has been completed in accordance with the Department of Energy approved VCA plan entitled VCA Plan for Potential Release Site (#) (description). Based on my personal involvement or inquiry of the person or persons who managed this cleanup, a review of all data gathered and a visit to the site, to the best of my knowledge and belief, all criteria of the plan have been met or exceeded. I believe that the completion of this VCA is both protective to human health and the environment. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

_____ _____

Field Unit ____ Field Project Leader
Environmental Restoration Project
Los Alamos National Laboratory

Date Signed

Los Alamos National Laboratory

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Date: August 9, 1995
Refer to: EM/ER:95-PCT-030

SUBJECT: SHORT FORM SITE-SPECIFIC HEALTH AND SAFETY PLAN (SSHASP) FOR VOLUNTARY CORRECTIVE ACTIONS AND EXPEDITED CLEANUPS

STATEMENT OF ISSUE

In order to comply with the Department of Energy and other federal and state agencies in maintaining a safe and healthful work environment at Los Alamos National Laboratory, and at the same time to promote consistency, efficiency, and cost reduction in the Environmental Restoration (ER) Project, the Health and Safety (H&S) Team developed a Short Form SSHAP for use on certain ER projects.

SUMMARY

Subject to specific applications and limitations and pending further notification, the Short Form SSHASP is to be utilized as applicable to ER Project accelerated cleanups. The form must be approved by the ER Project Field Unit H&S Representative and ESH-1.

DISCUSSION

In general, the use of the Short Form SSHASP is approved based on the following conditions:

- the scope of work is well defined;
- there are a limited number of tasks;
- the tasks are of limited duration; and
- the potential for exposure to physical, biological, radiological, and chemical hazards is minimal based on health and safety professional judgment.

The contact person for information is Oliver Wilton. He can be reached at 665-2950. You may also call the ER Project Field Unit H&S Representatives.

Sincerely,

Tracy Glatzmaier
Environmental Restoration

Sincerely,

Court Fesmire
Los Alamos Area Office

TG/CF/bp

Attachment: ER Project Short Form SSHASP

Distribution:
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O. Wilton, ESH-5, MS K494
RPF, MS M707

Environmental
Restoration

Los Alamos National Laboratory

ER PROJECT SHORT FORM SSHASP

*SSHASP Number*_____

*Location*_____ *Field Unit*_____

*Task Name*_____ *Date*_____

*SSO Approval*_____ *Date*_____

*Field Project Leader Approval*_____ *Date*_____

*Field Unit HS Rep. Approval*_____ *Date*_____

*ESH-1 ER/D&D Team Leader*_____ *Date*_____

*Subcontractor HS Approval*_____ *Date*_____

*Facility Representative Concurrence*_____ *Date*_____

Key Personnel

*Facility Representative*_____ *Phone/Pager*_____

*Field Team Manager*_____ *Phone/Pager*_____

*Field Team Leader*_____ *Phone/Pager*_____

*Site Safety Officer*_____ *Phone/Pager*_____

*RCT/HPT/RSP (circle)*_____ *Phone/Pager*_____

*Field Unit HS Representative*_____ *Phone/Pager*_____

*ESH-1 Oversight*_____ *Phone/Pager*_____

Task Description

_____

_____

_____

_____

_____

_____

Hazard Analysis

List all chemical, biological, physical, and radiological hazards associated with this task <u>including hazard assessment ratings</u> (ER Project HASP, Appendix C).

Chemical:_____

_____

_____

Biological:_____

_____

_____

Physical:_____

_____

_____

Radiological:_____

_____

_____

_____

List all other associated Special Work Permits/Procedures and Number_____
(include RWP, SWP, CSP, LO/TO, Spark/Flame, etc.)

_____

Will task affect other LANL operations, other employees, or other tasks? No_____Yes_____

If yes, explain precautions taken and contacts notified_____

_____

_____

Hazard Controls

Engineering/Administrative Controls, Special Equipment, etc._____

_____

_____

_____

Additional Comments Attached: Yes___No___

PPE (Personal Protective Equipment)

Head_____
Face & Eye_____
Gloves_____
Hearing_____
Body_____
Foot_____
Respiratory: Type of Respirator_____Type of Cartridge_____

_____

Additional Protection/Comments_____

_____

Monitoring

List all personnel and area monitoring to be performed for this task, including action levels and equipment to be used, and any dosimetry requirements.

Chemical:_____

_____

_____

_____

_____

Biological:

Physical:

Radiological:

Site Control

Describe how site access and control will be maintained. Attach a site map.

Decontamination

Describe how decon will be performed and which option will be used (ER Project HASP, Section 8).

Spill Containment

Unless site personnel are trained to the first responder operations level, all site spills will be handled by LANL Emergency Management and Response (EM&R).

Emergency Response

Attach an emergency call-out list and a route to ESH-2/LAMC.

First-Aid/CPR Provider:

Communications:

Incident Response Equipment:

Fire Extinguishing Equipment:

Medical Surveillance

List all medical surveillance required for this task (ER Project HASP, Section 11).

Training Requirements

Attach a copy of an appropriate training matrix (ER Project HASP, Section 10).

Participant Acknowledgment: (Per ER Project HASP, Sections 1.2 and 10.1.3)

Pre-job Conference: ***Date/Initials***_____

Printed Name	**Z Number**	**Signature**	**Date**

Los Alamos National Laboratory

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Date: April 12, 1996
Refer to: EM/ER:96-PCT-002

SUBJECT: MANAGEMENT OF SAMPLES RETURNED FROM ANALYTICAL LABORATORIES

STATEMENT OF ISSUE

Some samples will be returned from analytical laboratories once the laboratories have finished performing an analyses. The discussion below is presented to provide guidance on sample material which may have been already received or for those that may be received in the future.

SUMMARY OF POLICY

The Environmental Restoration (ER) Project will follow the policy guidelines regarding the management of all returned sample material.

DISCUSSION

The 90-day clock for temporary storage starts on the day sample is received from the analytical laboratory and the sample is determined to no longer be of value as sample material. If possible, it should be combined with like waste at the potential release site (PRS) or storage area.

After a sample has been used for its intended purpose, it no longer enjoys an exclusion under Resource Conservation and Recovery Act (RCRA) [40 CFR 261.4(d)]. Returned sample material must be managed as a solid waste unless it is uncontaminated environmental media (e.g., clean soil). If the returned sample material is a RCRA hazardous waste, it must be managed per RCRA regulations.

The returned samples will be:

- uncontaminated environmental media (e.g., soil, water),
- nonhazardous environmental media (e.g., soil or water with contaminants above site background),[1]

[1]Site background means background for the potential release site where the sample was collected. It is acceptable to use Laboratory-wide background values as site-specific values if site-specific information is not available.

- low-level waste (e.g., radioactive soil),
- RCRA hazardous waste [e.g., soil analytical values > toxicity characteristic leaching procedure (TCLP), water sample preserved to a pH<2], or
- RCRA mixed waste (e.g., radioactive soil with analytical values ultimately > TCLP).

Management requirements for the returned sample material is dependent on the characterization of the sample material. In general, the returned samples will be characterized based on the analytical results obtained from the sample. Information on the PRS must be considered when reviewing the analytical data. All returned sample material containers must be labeled with: the date returned and "Pending Analysis," or Waste Determination.

Uncontaminated Environmental Media

Based on laboratory analytical results, sample material that is soil, sediment, rock, or water that does not contain any hazardous constituents above site background or added radioactivity may be returned to the PRS where it was collected. Water must not be discharged to a PRS at a rate exceeding six gallons per day. Alternatively, a Waste Profile Form (WPF[2]) may be completed and the sample material managed as a solid waste.

Nonhazardous Environmental Media

Soil sample material that contains hazardous constituents above site background can be managed one of two ways. The soil sample may be returned to the location where it was collected. Alternatively, the returned sample can be managed as a solid waste and profiled as such. Care should be taken when exercising the first option. For example, if sample material is from a borehole that indicated elevated levels of hazardous constituents at depth, but not at the site surface, the constituents in the soil will have a greater chance of migration if placed on the surface and may be considered as a potential pollutant source under the National Pollutants Discharge Elimination System Storm Water General Permit. Additionally, the soil may be considered "refuse in a watercourse" under the New Mexico Water Quality Control Commission Regulations, if the PRS is located near a stream or wash. If there are any questions or you are uncertain regarding how to proceed, check with the ER Project Office (Dave McInroy), ESH-19 (Pat Shanley), or ESH-18 prior to returning material to the PRS.

When possible, the sample material should be added to the same waste stream that generated the sample and stored with other waste generated during the investigation.

---

[2]The WPF must be completed [following Administrative Requirements 1(ARs) 0-3 and 10-9] using analytical data and information on past site history of the PRS being sampled. For example, if the PRS is a location where solvents were used in the past and solvent constituents are detected in the sample, the sample may be a RCRA listed waste. Care should be taken to compare the constituents detected with the list of listed constituents in 40 CFR 261 Appendix VII. Assistance in determining whether or not the waste is a listed waste is available from ESH-19.

If the sample is a liquid, a WPF shall be completed. Contacting ESH-18 and CST-13 is required to determine if the water can be discharged to the Technical Area (TA) 50 industrial wastewater line or sanitary wastewater system. All appropriate waste acceptance criteria must be met. Liquid samples with hazardous constituents present should never be discharged to a watercourse or the site.

RCRA Hazardous Waste

Returned sample material which is hazardous (i.e., RCRA characteristic or listed waste), including waters that have been preserved prior to analysis to a pH <2, must be managed as RCRA hazardous waste. All appropriate RCRA regulations for storage and labeling must be followed and a waste profile form completed.

If a liquid sample was acidified to a <2 pH, it is at minimum a RCRA corrosive waste (D002). The amount of D002 waste generated must be tracked, as the volume of all hazardous waste managed at the Los Alamos National Laboratory must be reported in the Biennial Report.[3] The sample may be neutralized to remove the D002 characteristic[4] and then managed as a special waste under the New Mexico Solid Waste Management Regulations. The WPF must be completed.

Radiologically Contaminated Samples

Returned sample material that is radiologically contaminated but is not classified as RCRA hazardous waste should be managed per ARs 10-2/10-5. This is true for every case. If the waste is liquid, contact ESH-18 and CST-13 to determine if the waste can be discharged to an industrial drain line serving TA-50 wastewater treatment plant.

Mixed Waste Samples

Returned sample material that is radiologically contaminated and is listed or characteristic RCRA hazardous waste should be managed as a mixed waste. All appropriate RCRA regulations for storage and labeling must be followed and a waste profile form completed.

Laboratory Introduced Contaminants

Sampling analysis may add solvents during digestion or extraction procedures, introducing an F or D code waste to the waste sample. This is especially a concern if the waste sample may otherwise have only been low-level waste.

It is possible that sample material that the analytical laboratory determines is mixed waste, or is identified to the analytical laboratory as mixed waste, which has been digested or extracted with hazardous chemicals, will be returned. To date, no such returned samples from ER activities have been received and this is anticipated to be a limited waste stream. If such sample material is returned, care must be taken to identify each constituent added to the sample (e.g., methylene chloride, acetone, nitric

---

[3] This is a requirement in our RCRA facility permit and 40 CFR 264.75.

[4] Information, guidelines, and requirements on generator treatment is available from ESH-19, Michelle Cash. Generator treatment must occur in a <90 day storage area.

acid) to ensure the appropriate "F" or "D" code (RCRA listed or characteristic waste code) is ultimately assigned to the waste on the WPF. Returned digested or extracted samples must not be combined with other wastes from the PRS. Special care should be taken to ensure that these type of returned samples do not get returned to the point of generation which would result in the adding of contaminants to the environment. These wastes will be RCRA hazardous and must be managed as RCRA hazardous waste including completion of a WPF.

This policy was developed and reviewed with extensive input from various field unit, project office, and DOE personnel.

Sincerely,

Tracy Glatzmaier
Environmental Restoration

Sincerely,

Bonnie Koch
Los Alamos Area Office

TG/BK/bp

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A. Pratt, EES-13, MS J521
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E. Trollinger, LAAO, MS A316
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Date: April 12, 1996
Refer to: EM/ER:96-PCT-003

SUBJECT: ENVIRONMENTAL RESTORATION (ER) PROJECT INTERACTION WITH WASTE MANAGEMENT

STATEMENT OF ISSUE

The ER Project Office, the Chemical and Mixed Waste Management Group (CST-5), and the Hazardous and Solid Waste Group (ESH-19) have been working together to improve the process for management and disposal of ER Project-generated wastes. This policy is intended to identify the protocol for interactions between ER Project personnel and CST-5 and ESH-19.

SUMMARY OF POLICY

The ER Project will use the Waste Management Coordinators (WMC), assigned to each specific field unit , as the first line of communication and interaction with the Waste Services and Hazardous and Solid Waste Groups. The WMCs assist the waste generators with waste management activities and are the link between the generator and all waste management organizations. As needed, WMCs will have the assistance of CST-5 for technical issues and will seek advice from ESH-19 for regulatory compliance issues. CST-5 will assist the WMC to ensure consistency of waste management services by interaction with appropriate personnel based upon the specific need.

DISCUSSION

The following presentation of waste management-related roles and responsibilities for the ER Project serve to ensure appropriate interactions between the field unit and waste management-related activities. This policy was developed in consultation with CST-5 and ESH-19.

Chemical and Mixed Waste Management (CST-5)

The CST-5 contact is responsible for review and approval of Waste Characterization Strategy Forms (WCSFs) and can provide assistance in the preparation of these documents. This person also serves as a focal point for submittal of Waste Profile Forms (WPFs) and Chemical Waste Disposal Requests (CWDRs).

Additionally, knowledgeable personnel from various aspects of waste management provide service and information to WMCs through the Waste Services. Waste Services personnel are available to work with WMCs to promote a better understanding of waste generation and proactive waste management activities by:

- becoming familiar with the waste-generating operations of the ER Project;
- responding to requests and concerns about waste management;
- providing guidance on waste management plans prepared by the field units to ensure compliance with waste disposal procedures and regulatory requirements;
- reviewing and approving CWDRs and the waste management sections of standard operating procedures (SOPs);
- assisting with the waste packaging and transportation of waste; and
- coordinating the efforts of other Los Alamos National Laboratory entities to determine management options for non-routine wastes.

ER Hazardous and Solid Waste Group (ESH-19)

ESH-19 provides answers to questions regarding regulatory compliance issues. Also reviews and provides comments regarding the adequacy of the WCSF and can provide assistance in preparation of the WCSF.

Field Project Leader

The field project leader (FPL) retains the ultimate responsibility as waste generator for the ER Project, but may designate other Project personnel to act on his/her behalf as waste generator. The FPL ensures that a trained WMC is assigned to the waste-generating activity. The FPL also ensures that the field team leader (FTL) is trained in the management of wastes generated during ER activities.

Field Team Leader

The FTL is responsible for on-site field activities. With the assistance and expertise of the WMC, the FTL directs the waste management, including waste segregation, documentation, testing, storage, and disposal.

Waste Management Coordinator

The WMC is the individual with the overall functional responsibility for wastes generated within the field unit. The WMC is the primary waste management point-of-contact for the ER field unit and provides a full range of waste-related support and services. The roles and responsibilities of the WMC include the following.

- Acts as primary waste management liaison between the field unit, CST-5, and ESH-19.
- Coordinates the resolution of waste management issues on behalf of the field unit.
- Coordinates the transportation of waste from the ER site.
- Assists the waste generator with the completion of WCSF, WPF, and CWDR.
- Represents the field unit during audits and assessments.
- Helps waste generators ensure regulatory compliance at hazardous, mixed, and radioactive waste storage areas.
- Initiates actions to prevent and eliminate noncompliance with regard to the waste management issues.
- Helps the FPL comply with the requirements of Laboratory policies, U.S. Department of Energy Orders, and state and federal regulations. These requirements include those of the U.S. Department of Transportation, Environmental Protection Agency, the facility's Resource Conservation and Recovery Act Permit, and best management practices.
- Provides information to waste generators so they are aware of applicable regulations regarding radioactive, chemical, hazardous, and mixed waste.
- Is responsible for the operations associated with <90-day storage areas and satellite accumulation areas.
- Helps prepare and review waste management sections of SOPs, waste minimization plans, and other related documentation.
- Attends required training and quarterly WMC meetings.
- Attends periodic Waste Information Exchange (WIX) meetings, as required by the ER Project Office.
- Tracks status of WPFs and CWDRs through access to the CST-5 database.

Waste Generator

The waste generator, with the help of the WMC, is responsible for the following.

- Responsible for all waste from time of generation to final disposal.
- Ensures accurate completion of the WCSF, the WPF, and the CWDR.

- Initiates and signs waste management documentation, as appropriate or required.

- Completes Laboratory- and Project-required waste management training.

ER WMC Team Leader

The ER WMC Team Leader is appointed by the ER Project Manager and acts as the primary point- of-contact for issues relating to ER waste issues and to the ER WMC program. Other responsibilities include:

- working with the ER WMCs, CST-5, and ESH-19 to facilitate communication between these entities;

- organizing and hosting regular WIX meetings to facilitate communication between ER Project personnel, CST-5 and ESH-19;

- interfacing with all levels of management to ensure that this program effectively meets the needs of the Project and of the Laboratory; and

- coordinating and giving guidance to the WMCs.

This policy was developed and reviewed with extensive input from various field unit, project office, and DOE personnel and in consultation with CST-5 and ESH-19.

CONTACT PERSON: Larry Maassen at (505) 667-1691 of the ER Project Office.

Sincerely,

Tracy Glatzmaier
Environmental Restoration

Sincerely,

Bonnie Koch
Los Alamos Area Office

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EM/ER:96-PCT-003

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Date: April 12, 1996
Refer to: EM/ER:96-PCT-004

SUBJECT: RECONSIDERING AND/OR STOPPING WORK ON ACCELERATED CLEANUPS

STATEMENT OF ISSUE

Unforeseen circumstances often surface during the implementation of Expedited Cleanups (ECs) or Voluntary Corrective Actions (VCAs), therefore, a framework for assessing whether to continue with an EC or VCA follows. The Los Alamos National Laboratory's Environmental Restoration (ER) Project has developed a common sense method for evaluating ECs and VCAs while in progress.

SUMMARY OF POLICY

During the conduct of ECs or VCAs, it is important to plan a framework for assessing whether a potential release site (PRS) EC/VCA is flawed to the extent that continuing the EC or VCA should be reconsidered. This determination may be complicated by factors that are not readily apparent. It is important to the ER Project success that, when implementing an EC or VCA, we carefully ensure that the pursuit of accelerating a remediation does not tempt us to ignore emerging problems during field work. Any-time information becomes available that indicates the site conceptual model may be off target, the Field Project Leader (FPL) should evaluate whether to continue. If the additional information warrants it, work will be stopped.

DISCUSSION

We must maximize the opportunity to reconsider or stop work before it becomes a safety hazard, a professional embarrassment, or a bottomless pit for scarce resources, such as budget dollars or waste disposal capacity.

If one or more factors change the prevailing site conceptual model, then consider the consequences of the change(s) and stop work if the change warrants it. When stopping work is determined to be the appropriate action, it is crucial to have a plan that describes safe shutdown for the site EC or VCA operation. One should consider the safety of workers and trespassers, the safe storage of wastes generated to

date,and a shutdown configuration that ensures that existing site conditions do not further mobilize contaminants or provide enhanced pathways for off-site migration.

The following criteria provide a framework; it is not a prescriptive solution to the problem of determining whether to stop work on ECs or VCAs. The examples provided are not intended to be an exhaustive listing of all possible changes, only an indication of changes that have been frequently encountered.

WASTE - Changes in type, volume, disposal capacity, disposal location, etc.

- If the composition of waste is different than anticipated and there is limited capacity for the site waste, such as mixed wastes, or
- If field conditions indicate that the volume of waste will be more than 50% [1] of the initial estimate, or
- If the disposal or treatment capacity for the site waste changes and would require waste storage for more than 90 days.

COST - Changes in available budget, total cost of project, etc.

- If the current budget is significantly reduced while operations are underway at an EC or VCA, the FPL must evaluate and decide whether the revised budget supports continuation of the work, or
- If site findings indicate that the cost for completing the EC or VCA are going to increase by more than 50% of the initial estimate, or
- If sites are prioritized similarly, those sites with increasing costs may go down in project priority due to added costs, because the ER project would accomplish fewer EC/VCAs.

LEVEL OF PROBLEM UNDERSTANDING - Changes in contaminant type or level, job difficulty, etc.

- If the waste constituents change and impact the selected treatment/disposal alternatives, or
- If changes to the extent of contaminant movement or changes to the contaminant transport mechanism affect the overall job difficulty, or

[1] Initial estimates of engineering costs are typically only good within a range of + or - 50%. The relationship of waste management volume to waste management costs is usually linear, so that if volume increases 50%, then so do costs. However, if one is not producing hazardous, mixed, or PCB wastes, it may be more cost effective to stay mobilized and remove the other waste types being generated.

- If the impact of continuing the action creates a greater problem (e.g., regulatory, public relations, ecological, etc.) than stopping work.

RESOURCES - Changes in knowledge, expertise, equipment, services, etc.

- If new or additional site data cause the site problem to change from understood/ documented site historical and/or characterization data, or
- If the remediation equipment needed for the changed site problem is unavailable, or
- If the expertise of available staff does not match the changed site problem, or
- If the sensitivity or analytical detection limits of available analytical methods for the changed site problem do not meet the revised site cleanup requirements.

SAFETY - Changes in engineering plan or risk to remedial site worker, laboratory worker, or off-site citizen, etc.

- If additional site findings suggest a new or greatly increased risk of an acute or chronic nature to remedial site worker, Laboratory worker, or off-site citizen, or
- If a change to the remedial engineering plan, such as the depth of excavation, differs from the site safety plan, or
- If completing an EC or VCA by end of the fiscal year appears to compromise safety.

"LAUGH" TEST - Question the appropriateness of what is being done.

- If you doubt that your actions are consistent with common sense, or
- If you think you are being asked to do something off-target.

This policy was developed and reviewed with extensive input from various field unit, project office, and DOE personnel.

EM/ER:96-PCT-004

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Date: April 12, 1996
Refer to: EM/ER:96-PCT-005

SUBJECT: INTERIM ACTION PROCESS

STATEMENT OF ISSUE

The Los Alamos National Laboratory's (Laboratory's) Environmental Restoration (ER) Project recognizes that in many instances it will be appropriate to perform interim actions (IAs) at sites where a complete cleanup such as a voluntary corrective action (VCA) or expedited cleanup (EC) are not currently appropriate. The overall goal of an IA is to achieve near-term positive environmental results by lowering risk or stabilizing problems where final remedies are not currently practical or possible. Stabilization is accomplished through those activities that are intended to manage, control, or abate contaminant threats to human health and/or the environment from releases, and/or to prevent or limit the further spread of contaminants while long term or final remedial solutions are pursued. In some cases, IAs will take the form of Best Management Practices (BMP) to prevent exposure, lower risk, stabilize a problem, or prevent contaminants from spreading or moving off site. In other cases, IAs will involve source removals or engineering actions that will accomplish these same objectives while also lowering the overall cost of cleaning up a site. In both cases, IAs are not intended, or designed, to be the final remedy.

SUMMARY OF POLICY

The ER Project will propose and implement IAs at sites that are either too complex to move toward a final remedy at this time, or where early partial solutions can significantly reduce the risk associated with the site, prevent further contamination through source stabilization, or offer long-term cost savings. Through the use of IAs, the ER Project can achieve significant risk reduction benefits without waiting to complete a corrective measures study (CMS) to arrive at a decision concerning the final remediation of the site.

At any time during the corrective action process, regulators can impose a requirement to implement an interim measure to address an imminent threat to human health or the environment. The process for implementing interim measures is not addressed by this policy.

DISCUSSION

The accelerated Resource Conservation and Recovery Act Facility Investigation (RFI) decision logic is used to evaluate sites during the characterization phase of the remedial process (reference). At several points in that process, questions are raised to determine, based on the current state of knowledge, sites that are appropriate for accelerated cleanup, IA, or no further action (NFA). Sites may be considered appropriate for **interim action** if all of the following are true:

1. sufficient information about contaminants and the environmental setting are known, but the site fails one or more specific accelerated cleanup action criteria;

2. near-term opportunities exist for significant risk reduction, prevention of further contamination or migration of contaminants, and/or long-term cost savings;

3. appropriate technologies are available to deal with the known contaminants;

4. proposed action will not impede or be inconsistent with expected approach for final remedy;

5. IA is not worse for ecosystem, worker safety or public health than the problem; and

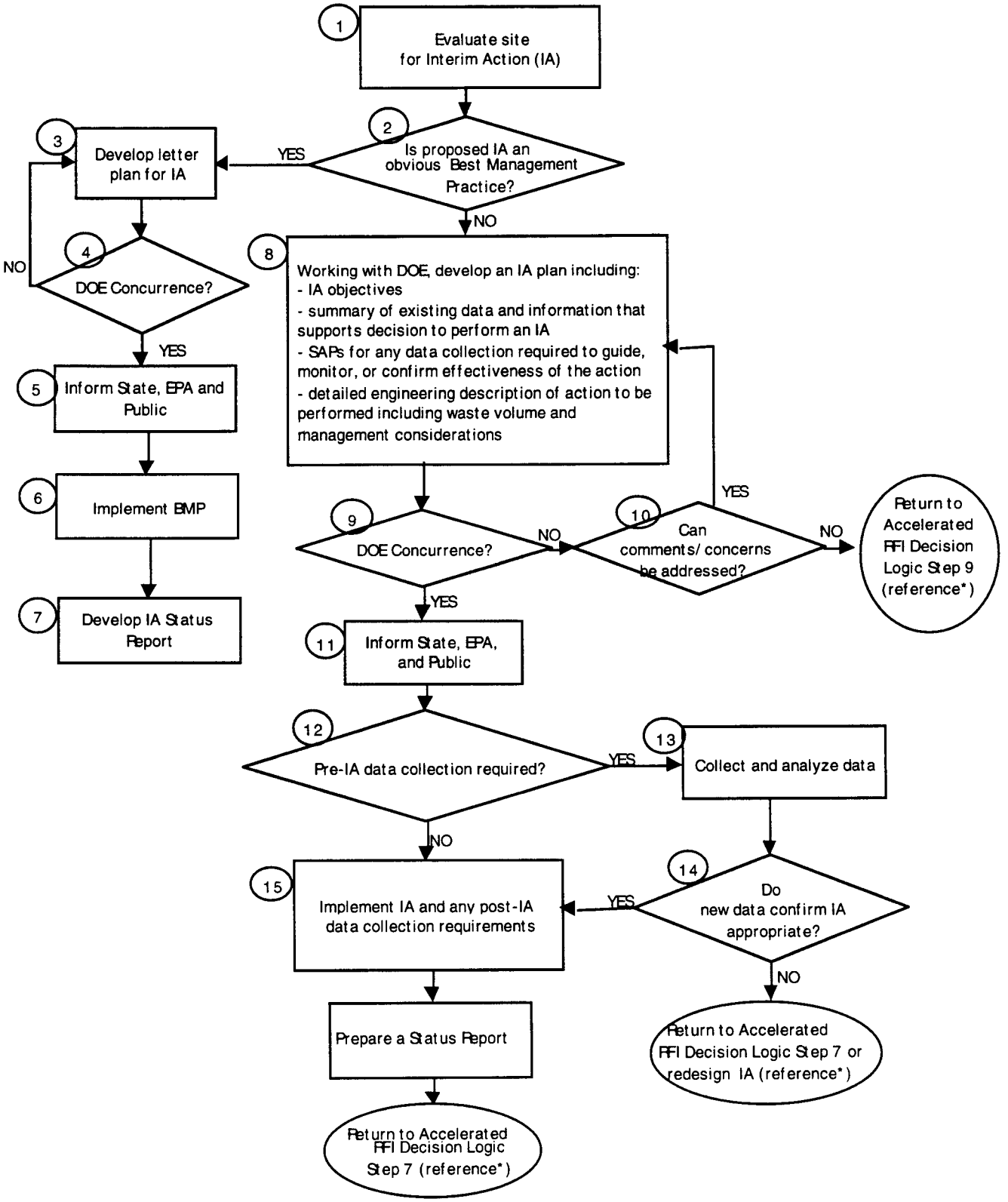
6. if waste is generated, adequate waste treatment, storage or disposal capacity is available (including mixed waste if applicable).

Examples of IAs include:

- grouting drain lines
- pumping contaminated septic systems
- fencing
- removing surface contamination to prevent run off
- removing hot spots
- stabilizing mobile contaminants in place
- using jute mats (or similar stabilization devices) to control erosion
- site stabilization and source control (e.g., plume capture)
- nontime-critical removal actions

The ER Project will use the following decision logic when proposing and implementing IAs. The details of each step are provided, following the figure.

INTERIM ACTION DECISION LOGIC



*See Accelerated RFI Process Policy, 96-PCT-006.

Interim Action

1. Evaluate the site for IA.

Prior to preparing any formal plan to support a proposal for an IA, the site, which has been determined to meet the criteria for IA will be carefully evaluated. This evaluation should include determining what the IA would involve, the rationale for the proposed action, and the determination of whether the proposed action warrants some form of peer review. This evaluation does not require a written report, but may trigger the development of briefing slides or summary fact sheets to support the peer review process. Prior to proceeding, a determination will be made that the action is the responsibility of the ER Project.

2. Is proposed IA an obvious BMP?

Most IAs will be obvious actions that fall into the realm BMP. BMPs are typically low-tech, cost-effective engineering practices designed to control the movement or lessen the consequences of environmental problems. For example, erosion control measures (e.g., vegetation), fencing, or even removal of a single well-defined source such as the pumping of a septic tank, would be considered as BMPs. If a proposed IA is either expected to require a significant length of time to perform, and/or is a complex engineering solution or source removal, it should not be treated as a BMP. Likewise, if the proposed action will require additional data collection, it is probably inappropriate to treat it as a BMP.

3. Develop a letter plan for IA.

For BMP IAs, work with Department of Energy (DOE) (and the DOE Oversight Bureau when possible) to develop a short plan in the form of a letter. The requirements for the plan are specified in detail in a separate policy on IA plans and reports (reference). At a minimum, the plan must specify:

- the objectives of the IA,
- an explanation of the proposed action,
- expected costs and schedule for implementation, and
- any pre- or post-monitoring or inspection and maintenance required in association with the IA.

4. DOE Concurrence?

DOE concurrence is required prior to implementation of the proposed action. Verbal approval is adequate.

5. Inform State, EPA, and public.

The ER Project informs the regulators and public of all actions being taken, even when there is no regulatory requirement to do so. These stakeholders will be informed of the intent to perform the action, and the letter plan will be placed in public reading rooms to describe the proposed action. Regulators will be supplied a courtesy copy of these plans.

6. Implement BMP.

Implementation of the BMP will be conducted in accordance with appropriate health and safety considerations and the Laboratory's ER Project Quality Assurance Project Plan. Any inspection and maintenance requirements specified in the plan will also be implemented as part of the BMP. Photographs of the effort will be taken to document the action.

7. Develop IA status report.

To complete a BMP IA, a status report will be generated. This will be a brief report submitted as a letter to DOE. The major results derived from monitoring data taken as part of the action will be included, as well as photographs documenting the action.

8. Working with DOE (and the DOE Oversight Bureau when possible), develop an IA plan including: IA objectives, summary of existing data and information that supports decision to perform an IA, sampling and analysis plans (SAPs) for any data collection required to guide, monitor or confirm effectiveness of the action, and detailed engineering description of action to be performed including waste volume and management considerations.

For IAs that are significant source removal efforts, engineering actions, or that otherwise go beyond a BMP, an IA plan will be developed. The detailed outline and requirements of IA plans can be found in a separate policy on IA plans and reports (reference). At a minimum these plans will include: the objective of the IA, a summary of existing data and information that supports the decision to perform the action, SAPs for any data collection required to guide, monitor or confirm the effectiveness of the action, and a detailed engineering description of the action to be performed including waste volume and management considerations.

9. DOE concurrence?

Formal written concurrence is required. This should be a simple signature to document agreement with the outcome of the planning effort. A standard signature sheet will be utilized.

10. Can comments/concerns be addressed?

If comments or concerns are articulated by the DOE review, a determination will be made as to whether they can be adequately addressed. If so, the IA plan will be revised to incorporate the comments and resubmitted for DOE concurrence. If significant comments are received which cannot be accommodated, then the IA will be abandoned, and the site will return to the Accelerated RFI Process Policy at Step 9 (see 96-PCT-006), where a determination is made concerning the need for additional data to determine the appropriate course of action for the site.

11. Inform state, EPA, and public.

The ER Project informs the regulators and public of all actions being taken, even when there is no regulatory requirement to do so. These stakeholders will be informed of the intent to perform the action, and the plan will be placed in public reading rooms to describe the proposed action. Regulators will be supplied a courtesy copy of these plans. If the State or EPA has any significant comments or concerns, an attempt will be made to address them.

12. Pre-IA data collection required?

Typically, sites selected for IA will be adequately characterized to design and implement the proposed IA. This level of characterization, however, is not a requirement for being considered appropriate for IA. In these cases, the IA plan will include the design for pre-action data collection. If for any reason the IA plan does not include pre-action data collection plans, and the answer to this question is "yes," a SAP should be developed prior to proceeding.

13. Collect and analyze data.

This data collection activity should be distinguished from data collected during the implementation of the IA. Data generated from this effort might be used to: provide information about the physical nature of the problem needed to execute an engineering solution, confirm the appropriateness of the site problem for IA, and/or confirm the current understanding of the nature and extent of contamination, or the magnitude of the source to be removed.

14. Do new data confirm IA appropriate?

Using the data generated from Step 13, confirm the appropriateness of the proposed IA. If data indicate that the IA is not going to work as expected (e.g., significant risk reduction is unlikely to occur as a result of this action), then this step provides an "out." It is also conceivable that further data collection could reveal that the problem is different than first expected, and either the site could be handled with an accelerated cleanup, NFA could be proposed, or further evaluation may be required.

15. After completing the action, the site should be reevaluated in the Accelerated RFI Process Policy (96-PCT-006), beginning with Step 7, and a status report documenting the IA should be prepared and submitted.

16. **Implement IA and any post IA data collection requirements.**

Prepare a status report. Implementation will be accomplished in accordance with all pertinent health and safety requirements and the Laboratory ER Project QAPP. The action should be closely monitored and documented. Any inspection and maintenance requirements specified in the plan that ensure the integrity of the IA, should also be implemented. Post IA data collection should be executed to demonstrate the success of the action.

This policy was developed and reviewed with exensive input from various field unit, project office, and DOE personnel.

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Date: April 12, 1996
Refer to: EM/ER:96-PCT-006

SUBJECT: ACCELERATED RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) FACILITY INVESTIGATION (RFI) PROCESS POLICY

STATEMENT OF ISSUE

The Los Alamos National Laboratory's (the Laboratory's) Environmental Restoration (ER) Project is implementing a streamlined, decision-focused approach to the implementation of RFIs. This approach focuses all major activities on a discrete set of well-defined decisions to determine whether a site is either appropriate for no further action (NFA), or one of several approaches to remediation including: voluntary corrective actions (VCAs), expedited cleanups (ECs), interim actions (IAs) and the traditional approach involving a corrective measures study (CMS) followed by corrective action implementation. Through the application of this process, the ER Project estimates that over 90% of the potential release sites (PRSs) that require some form of remediation will be appropriate for accelerated action. The remaining PRSs will likely require a full CMS, prior to the selection and implementation of corrective action.

The VCA, EC, and IA processes are presented in detail in two separate policy papers (Accelerated RCRA Facility Investigation Process Policy, 96-PCT-006), and Interim Action Process Policy, 96-PCT-005). In addition, the outline, format and content of plans and reports needed to carry out the accelerated cleanup process are documented in separate policies (Accelerated Cleanup Plans and Reports, 95-PCT-029-R1, and Interim Action Plans and Reports, 96-PCT-012).

SUMMARY OF POLICY

The ER Project will evaluate each non-active PRS through the application of an accelerated RFI decision logic. The logic is designed to accelerate the corrective action process in a well-documented, defensible manner that will lead to completing any required action at a given site in the most timely and cost effective manner possible. The decision logic is not intended to capture the actual implementation step-by-step process; rather, it is a tool for evaluating how far into the corrective action decision making process existing information about a site is able to take you, and to identify the next decision, which will be the focus of the RFI.

DISCUSSION

The accelerated RFI decision logic (Figure 1) is used to evaluate sites during the characterization phase of the remedial process. At several points in that process, questions are raised to determine whether a site is appropriate for accelerated cleanup, interim action, or no further action. Specific criteria are applied to support this determination. There are several points in the logic where a determination is made that additional data are required. At these points, the logic diagram suggests what the potential focus of these studies should be. A structured planning process such as the data quality objectives process should be used to develop a sampling and analysis plan consistent with the site objectives as required by the LANL ER Project Quality Assurance Project Plan Requirements for Sampling and Analysis (March 1996, LAUR-96-441).

The ER Project will use the following decision logic for PRSs undergoing an RFI. The details of each step are provided below.

ACCELERATED RFI DECISION LOGIC

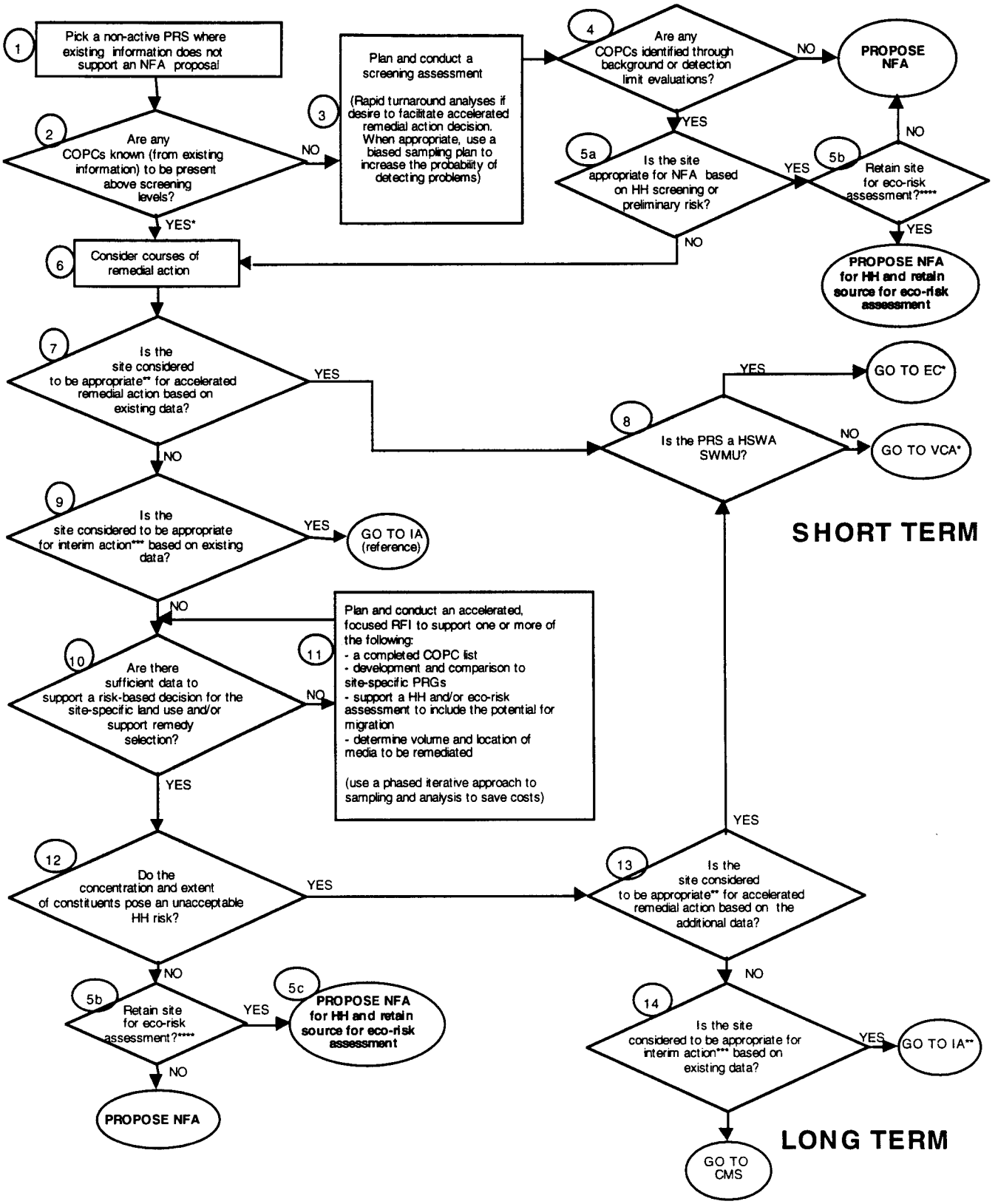
1. Pick a non-active PRS where existing information does not support an NFA proposal.

This accelerated RFI decision logic diagram is designed to deal with all non-active PRSs whether or not they have had a screening assessment already conducted with the following notable exceptions.

- PRSs where emergency response actions are warranted.
- PRSs where any interim action, including partial source removal, is being considered.
- PRSs proposed for NFA based on process knowledge, historical data, or current data.
- Non-RCRA sites.
- Acute risk sites, such as those where high explosives are at concentrations where there is a real possibility of a detonation. These are H&S problems and are not an ER decision logic issue.
- Sites that pose a regulatory or financial liability, but clearly pose no significant human health or ecological risk (typically they may not even fail a screening assessment, yet due to their history, may be a liability to the Laboratory).

2. Are any chemical of potential concerns (COPCs) known (from existing information) to be present above screening levels?

A "yes" decision would be made for any PRS where at least one COPC is known (or even strongly suspected) to be present at a level exceeding its screening action level (SAL). One could answer this "yes" without having conducted a full screening assessment, and, therefore, may not know the full COPC list, which is a requirement for a PRS to be considered appropriate for



*(Accelerated Cleanup Process, 95-PCT-016-R1)
**(Interim Action Process, 96-PCT-005)

Figure 1. Accelerated RFI Decision Logic

* If the COPC or unit is regulated under a different regulatory authority than RCRA (e.g., UST, TSCA, CWA or other regulatory authority) that requires special data collection, the required studies should be conducted prior to considering accelerated action

**Sites may be considered appropriate for accelerated action if all of the following are true:

1. remedy is obvious
2. remedy is the final solution
3. COPC list is known
4. adequate waste treatment, storage or disposal capacity is available (including mixed waste if applicable
5. remedy is not worse for ecosystem, worker or public safety than the problem
6. uncertainties (e.g., in 1-5 above) can be handled by contingencies in the remedial action plan and stopping criteria are defined.
7. estimated cost of remediation expected to be less than cost of moving forward with further data collection and/or data analysis and risk assessment

***Sites may be considered appropriate for interim action if all of the following are true:

1. sufficient information about contaminants and the environmental setting are known, but the site falls one or more specific accelerated action criteria
2. near-term opportunities exist for significant risk reduction, prevention of further contamination and/or long-term cost savings
3. appropriate technologies are available to deal with the known contaminants
4. proposed action will not impede or be inconsistent with expected approach for final remedy
5. interim action is not worse for ecosystem, worker or public health than the problem
6. if waste is generated, adequate waste treatment, storage or disposal capacity is available (including mixed waste, if applicable)

****Sites may be retained for ecological risk assessment if all of the following are true:

1. contaminant concentrations are above background
2. habitat exists on site, or there are potential offsite effects due to on site contamination
3. an ecological receptor of concern either has access to the site, or to areas potentially impacted by the site

Figure 1. Accelerated RFI Decision Logic (continued)

accelerated remedial action. Note that if you answer yes, the footnote indicates that if the COPC is regulated under a different regulatory authority than RCRA, and that authority spells out specific data collection requirements, then the required studies should be planned and conducted prior to evaluating the appropriateness of conducting an accelerated action on the site. For example, if the site is regulated under UST, specific characterization requirements and decision criteria will apply. New Mexico Environment Department water regulations may require quarterly monitoring of drainage channels for two years prior to determining that a site requires (or does not require) remediation.

3. Plan and Conduct a Screening Assessment

If the presence of COPCs above SALs is not known, then the logical next step is a human health (HH) screening assessment designed to determine if COPCs are present.

The Laboratory's screening assessment decision logic involves comparisons to background levels and SALs to identify COPCs, which require continued evaluation to determine if they require further site evaluation. Sites that have no analytes exceeding background or SALs, and which pass a multiple constituent evaluation, can then be proposed for NFA.

If the desire is to determine the appropriateness of a site for accelerated remedial action and have the opportunity to begin that action in a given field season, then the HH-screening assessments could be conducted using rapid turn-around analyses from the contract labs. The design for sampling a PRS would be biased to improve the probability of observing any COPCs that are present (using professional judgment, statistical design approaches or both).

4. Are there any COPCs identified through background or detection limit evaluations?

If no analytes greater than background are identified through a comparison with background (or greater than detection limits for organics), the site will be proposed for NFA. If any analytes of interest are identified, the site will move forward in the screening assessment.

5a. Is the site appropriate for NFA based on HH screening or preliminary risk?

Analytes that are found to exceed background (or detection limits for organics) are compared to screening action levels individually, and a multiple chemical evaluation is performed to determine if the site fails a human health screening assessment. For sites where at least one constituent greater than SALs, or where the multiple chemical evaluation reveals a possible problem, a preliminary risk assessment may be conducted to determine whether further consideration of the site is warranted.

5b. Retain the site for ecological risk assessment

Ecological risk assessments will likely be conducted on ecological exposure units (EEU) defined by the ecological risk team based on receptor species habitat distributions and other factors (dependent on regulator approval). Once an EEU

has been selected, all sources potentially impacting this zone will be considered in determining whether these sources collectively pose an unacceptable ecological risk that will require further remediation.

6. Consider courses of remedial action

Assuming one or more COPCs fail the screening assessment, this box requires immediate consideration of the remedial options to determine which options are feasible and practical. It is not intended for this box to invoke a mini-CMS. Rather, this box is intended to begin to get people thinking about the end goal of the ER Project by considering whether the remedy for this site is fairly straightforward, and doesn't warrant an exhaustive search for the appropriate remedy. If the remedy is obvious (e.g., presumptive or generic), then the site may be considered appropriate for accelerated action. Considering remediation early in the process is consistent with EPA's "Superfund Accelerated Cleanup Model" and DOE's "Streamlined Approach for Environmental Remediation" approaches.

7. Is the site considered to be appropriate for accelerated remedial action based on existing data?

This decision diamond invokes the footnote that defines the criteria to be used to determine if a site is appropriate for accelerated action. This decision is based on existing information and professional judgment. If existing data are insufficient to support this decision, then the site will move forward to evaluate whether the site is appropriate for an interim action.

Presumably, a site where at least one COPC is known to exceed SALs either from historical information or an actual screening assessment could end up in this diamond. If the first 5 of the accelerated action criteria are met, then the question of uncertainties comes to bear. If not enough is known to identify the site conceptual model and its reasonable problem deviations (including the list of COPCs); and/or if not enough is known to plan for contingencies, then further data should be collected prior to determining whether an accelerated action is appropriate. This is especially true if the list of COPCs is not known and the site history indicates that it is likely that mixed waste will be present. Finally, an informal "cost/benefit" analysis of a site may result in one of two possible outcomes. For sites that are relatively well contained, it may be more prudent to simply implement the remedy through a removal action, than to further characterize or assess the site. On the other hand, if the risk assessor on the team thinks that based on what is known, there is a good chance that a risk assessment would result in a proposal for NFA, despite one or more COPCs exceeding SALs, then it may be more cost effective to gather the required information (if any) and conduct the risk assessment, prior to evaluating the site for accelerated action. This is clearly a judgment call demanding not only technical, but also project management input and coordination as to site priority.

From an ecological perspective, this resolves itself into the question of whether the ecological impact resulting from remedial activity would be greater than the impact of leaving the contamination in place. The answer depends on the ecological conditions at the site. Considerations that must be taken into account are the following:

- Will remedial activities impact Threatened or Endangered or State-listed Species?
- Will remedial activities impact sensitive habitat (e.g., wetlands, floodplains)?
- Will remedial activities have a significant impact (e.g., > 20% reduction) on a habitat type or species population size?
- Will remedial activities result in impacts offsite (e.g., transport of silt into adjacent streams)?

If any of these impacts are likely to occur, further assessment should be undertaken before remedial activity is initiated.

8. Is the PRS a Hazardous and Solid Waste Amendments (HSWA) solid waste management unit (SWMU)?

After determining that a site is a good candidate for accelerated remedial action, a determination is made as to how to proceed. A VCA is designed for non-HSWA PRSs, and for a few HSWA SWMUs that are either small and can be cleaned up for less than 100K in one field season, or are regulated under a specific non-RCRA authority. The EC and VCA decision flows are presented on separate decision diagrams (see Accelerated Cleanup Process, 95-PCT-016-R1).

9. Is the site considered to be appropriate for IA based on existing data?

This decision diamond invokes the footnote that defines the criteria to be used to determine if a site is appropriate for IA. If existing data are insufficient to support this decision, then the site will move forward to evaluate whether data are sufficient to support a risk based decision, and probably on to further data collection.

A determination that the site is not appropriate for accelerated action will have already been made, presumably because the site failed one or more of the accelerated action criteria. If the primary reason that accelerated action is not being pursued is that the proposed remedy would not be the final solution, an interim action may be appropriate. For example, if either a best management practice, a source removal or other action is under consideration, and it is clear that the action would result in a significant risk reduction, or lower the cost of the final remedy, then an interim action plan should be developed. Additional criteria will need to be evaluated, as described in the footnote and the proposed interim action will need to be well defined prior to proposing the action for the site in question.

10. Are there sufficient data to support a risk-based decision for the site-specific land use and/or support remedy selection?

Assuming the site was either not ready to be assessed for appropriateness for accelerated action, or it appears to be a poor candidate for accelerated action it will end up here. An assessment of the existing data is performed to determine if it is adequate to support either a risk assessment based on the site-specific land use, or to support remedy selection. If the answer is yes, then a risk assessment

of some degree of sophistication is conducted (increasing sophistication and quantification is warranted for sites that appear likely to go to either NFA or CMS rather than accelerated cleanup). Assuming the answer is no, we move on to designing the required investigation(s) to support a risk-based decision.

11. Plan and conduct an accelerated, focused RFI to support one or more objectives.

This box initiates the planning process for conducting an accelerated RFI. The key to success is having the right technical expertise involved such as the site decision maker, risk assessor, data analyst, engineer and chemist during work, not after data collection completion. A phased, iterative approach to sampling and analysis is recommended. In general, this approach is an attempt to keep the remediation activities to a given field season, without overspending by analyzing too many or too few samples and/or having all samples analyzed using broad-scan analytical methods. A preliminary set of samples are generally taken and analyzed using a quick turn-around broad scan (if the COPC list is uncertain) to confirm or complete the COPC list and to determine how variable concentrations are at the site(s) of interest. This method requires a data analyst to be on board to immediately evaluate the quick turnaround results to complete the design (including the number and allocation of samples, the analytical methods and field quality assessment sample requirements) for the second phase of data collection in the same field season. In addition, internal and external reviews of the completed plans will need to be expedited for this approach to work. This approach will require regulator involvement as each phase cannot be completely detailed until the data from the previous phase are available. By involving regulators and other stakeholders in the planning process, and keeping them informed of what the results look like, this should be facilitated.

The box names a number of objectives which might be the focus of the studies. Not all may need to be satisfied for all sites. For example, if the site has moved forward due to HH concerns, but has passed the eco-screen, data to support an eco-risk assessment are not needed. If data reveal that the site is clearly below the site-specific preliminary remediation goals, and approval for these values has been obtained by involving the regulators in the planning, then a full blown baseline risk assessment may not be necessary to propose the site for NFA. In this case, the results of early phases of data collection may be adequate to stop the characterization process from going to subsequent phases of data collection. In other cases, data will need to be collected to support remedy selection (and implementation) either to expedite the CMS and/or to proceed with accelerated action. The volume and location of contaminated media will need to be estimated to support remedial actions. By understanding the most likely remedial alternatives the scale of this data collection can be appropriately selected to balance the cost of additional samples against the cost of remediation. In general, inexpensive remedies will not require the estimates on the same scale as expensive remedies where a more detailed cleanup may be appropriate (depending on the heterogeneity of the contaminants). The key to success here is good relationships with the regulators and other stakeholders to allow for rapid feedback and not delay the process beyond the current field season.

12. Do the concentration and extent of constituents pose an unacceptable HH or eco-risk?

Assuming data were sufficient to proceed immediately to a risk assessment, and/or data were generated to support a risk assessment, the next step is to determine whether a site poses an unacceptable risk. There are varying levels of specificity and detail to which a risk assessor may need to go to address this question. In some instances, a simple comparison to HH- risk-based concentrations may be sufficient to demonstrate that although a constituent may have exceeded HH-SALs, it is clearly not a significant risk and should be proposed for NFA, based on HH risk. Eco-risk evaluations, likewise, may be of varying degrees of complexity. In some cases, evaluations on the appropriate eco-exposure unit scale may be sufficient to determine that a site does not pose an unacceptable risk. In other cases, a qualitative evaluation of the results may reveal a clear problem that is appropriate for accelerated action. In these cases, the detailed risk analysis will be more appropriate to determine risk-based cleanup levels. Finally, cases that are borderline or complex will require a full baseline risk assessment.

13. Is the site considered to be appropriate for accelerated action based on additional data?

For sites that are found to pose an unacceptable risk which may not have been deemed appropriate for accelerated action prior to additional data collection and assessment, the question is posed again concerning the appropriateness for accelerated action.

14. Is the site considered to be appropriate for interim action based on existing data?

For sites that are found to pose an unacceptable risk and which are deemed inappropriate for accelerated action following additional data collection and assessment, the question is posed again concerning the appropriateness for interim action.

This policy was developed and reviewed with extensive input from various field unit, project office, and DOE personnel.

CONTACT PERSON: Dan Michael at (505) 667-0707.

Sincerely,

Tracy Glatzmaier
Environmental Restoration

Sincerely,

Bonnie Koch
Los Alamos Area Office

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Date: April 10, 1996
Refer to: EM/ER:96-PCT-007

SUBJECT: PREPARATION OF FINAL RESOURCE CONSERVATION AND RECOVERY ACT FACILITY INVESTIGATION (RFI) AND OTHER DELIVERABLE DOCUMENTS

STATEMENT OF ISSUE

A procedure is necessary to organize and finalize RFI work plans, RFI reports, voluntary corrective action (VCA) reports, and/or expedited cleanup (EC) plans and reports. The "Final Draft" of these documents is the deliverable submitted to the appropriate administrative authority which, depending on the circumstances, may be the New Mexico Environment Department (NMED), the Environmental Protection Agency (EPA), or the Department of Energy (DOE). The administrative authority reviews the "Final Draft" and may send a notice of deficiency (NOD) to the Environmental Restoration (ER) Project. The ER Project responds to the NOD within a specified time period. When the administrative authority and the ER Project have reached agreement on the document, the administrative authority sends a letter approving the document. The various correspondence such as NODs, ER Project responses, modifications to the document, and administrative agency approval letters are all part of the "Final" document.

SUMMARY OF POLICY

Each field unit will submit one copy of an appendix package containing the "Administrative Authority Review Correspondence" immediately to the RPF Document Custodian for all work plans and reports that have received approval letters to date. Include in the appendix package, along with the NOD(s), the response(s), and the approval letter, only the pages of the deliverable document that had substantive changes and were in response to the administrative authority's comments. The "Final Draft" document should not be reprinted or repaginated. For older RFI work plans that were redone to incorporate NOD responses, include in the appendix package only the pages with substantive changes. Do not include pages that had page numbering as the only change.

From this date forward, all modifications to documents resulting from NODs will be incorporated into the NOD response. An on-line database for NODs and NOD

responses will be used as an electronic repository. A separate PCT Policy will be written to provide specific instructions.

DISCUSSION

Once the administrative agency has given final approval of a "Final Draft" document, an appendix called "Administrative Authority Review Correspondence" (tabs can be obtained through the ER Project) will be compiled and inserted at the end of, or attached to, the document. The appendix will contain (in chronological order) copies of all associated NODs and the respective response(s) to the NOD comments, the administrative agency approval letter, and any updated pages of the document, which incorporate changes specified in the responses. The "Final" document will consist of the "Final Draft," along with the "Administrative Authority Review Correspondence" appendix, and new cover sheets and spines (generated by field unit personnel) which state that the document is final. The "Final Draft" document should not be reprinted or repaginated to create the "Final" document. In addition, a note will be added as the first page of the document on bright pink paper explaining the revised version (see Attachment 1 and use these same words for all documents).

The appendix package will be submitted by the field project leader (FPL) (or designee) to the Document Custodian at the Records Processing Facility (RPF) for standard distribution as controlled information to the regulatory agencies, DOE, and the public repositories only. If the FPL wants other copies, he/she must request this from the RPF. The appendix will be distributed to the same distribution that received copies of the "Final Draft." The "Final Draft" will become the "Final" document when the appendices and the new cover pages and spines are distributed.

ER Project personnel and/or reviewers that are using a document that is not marked as final, or is marked "Draft" or "Final Draft", should contact the ER Project Office to determine whether the document has been finalized. This will ensure that the most up-to-date information is being used. All deviations from approved sampling plans must be included in the RFI report. Significant deviations must be resolved with the ER Project Office and/or the administrative authority before carrying out RFI activities.

CONTACT PERSON: Tracy Glatzmaier at (505) 665-2613 of the ER Project Office.

Sincerely,

Tracy Glatzmaier
Environmental Restoration

Sincerely,

Bonnie Koch
Los Alamos Area Office

TG/BK/bp

EM/ER 96-PCT-007

Attachment: (1) Final Document Notification

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Attachment 1

Final Document Notification
(Provide on hot pink paper)

This document has been modified to incorporate and address comments from the administrative authority. Refer to the appendix labeled "Administrative Authority Review Correspondence" for administrative comments, responses to those comments, and modifications of this document.

Los Alamos National Laboratory

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Date: March 29, 1996
Refer to: EM/ER:96-PCT-008

SUBJECT: POLICY FOR THE EVALUATION AND CLEANUP OF TOTAL PETROLEUM HYDROCARBONS (TPHs) IN SOIL

STATEMENT OF ISSUE

The Los Alamos National Laboratory's (the Laboratory's) Environmental Restoration (ER) Project has developed a policy for the evaluation and cleanup of TPHs in soil to aid in ER Project decision making. The intent of this policy is to ensure technical consistency in the evaluation of petroleum contamination in soil and water and to provide a procedure for developing site-specific cleanup standards for petroleum in soil based on the protection of human health.

SUMMARY OF POLICY

The policy provides a description of the types of TPHs likely to be found at Laboratory sites, the state and federal regulations that govern management and cleanup of TPHs, and guidance for developing site-specific cleanup levels.

DISCUSSION

A detailed discussion follows in the attached paper.

This policy was developed and reviewed with extensive input from various field unit, project office, and DOE personnel.

CONTACT PERSON: John McCann (505) 662-0707, extension 15.

Sincerely,

Tracy Glatzmaier
Environmental Restoration

Sincerely,

Bonnie Koch
Los Alamos Area Office

TG/BK/rfr

Attachment: TPH Policy Paper

EM/ER:96-PCT-008

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EVALUATION AND CLEANUP OF TPH IN SOIL

Prepared by
Julie Wilson for the
Los Alamos National Laboratory
Environmental Restoration Decision Support Council

March 29, 1996

LA-UR-96-

INTRODUCTION

The purpose of this policy is to provide guidance for evaluation of petroleum contamination in soil and water and a procedure for development of cleanup standards for petroleum in soil based on protection of human health on a site-specific basis. The objectives of this policy are to

- present the regulatory basis for characterizing sites and developing alternatives to address total petroleum hydrocarbons (TPHs) contamination in soils and water;
- provide a screening action level (SAL) for TPHs in soil based on protection of human health; and
- provide field project leaders (FPLs) and other task managers with guidance for the investigation and remedy selection process of TPH-contaminated sites. This document does not provide cleanup levels for petroleum and petroleum constituents; rather it provides guidance for determining site-specific cleanup levels based on protection of human health.

This document does not provide guidance for determining site-specific cleanup levels for TPH based on ecological protection. Cleanup levels for TPH based on ecological protection will be in accordance with the ecological risk assessment approach that is being developed by Los Alamos National Laboratory (the Laboratory) in conjunction with NMED and EPA.

The following sections provide a description of the types of TPHs likely to be found at Laboratory sites, the state and federal regulations that govern management and cleanup of TPHs, and guidance for developing site-specific cleanup levels.

BACKGROUND

The information provided in this section is summarized from the *Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites* (ASTM 1995, 1312).

Petroleum fuels are complex, man-made mixtures that do not exist naturally in the environment. They are produced from crude oil by distillation in the refining process and consist of mixtures of hundreds to thousands of compounds, primarily hydrocarbons. The refined products vary greatly in numbers and types of compounds (for example, from gasoline to motor oil), and there can be significant variations within different samples of the same product type. These variations are the result of different sources of crude oil, refining processes and conditions, and kinds and amounts of additives used.

Chemical components of petroleum fuels can be generally divided into two categories: hydrocarbons (organic compounds composed of hydrogen and carbon only) and non-hydrocarbons (compounds containing other elements). Hydrocarbons make up the majority of the composition of petroleum fuels. Most trace metals found in crude oil are removed through the refining process.

Petroleum products are often described and compared according to boiling point ranges and carbon number (number of carbon atoms per molecule). Table 1 summarizes these characteristics for a range of petroleum products. As one moves down the table, the number of carbon atoms in each molecule of the petroleum product increases while volatility decreases (denoted by increasing flash point), indicating a transition to "heavier" products. This information is useful in determining environmental mobility and potential for degradation of petroleum product. In general, the heavier the product, the less mobile it is in the environment and the slower the degradation.

TABLE 1
CHEMICAL AND PHYSICAL CHARACTERIZATION OF PETROLEUM FUELS[a]

Petroleum Product	Predominant Carbon Number	Boiling Point (°C)	Flash Point[b] (°C)
Gasoline	C4 to C12	25 to 215	-40
Kerosene	C11 to C13	150 to 250	21 to 55
Diesel Fuel and Light Fuel Oils	C10 to C20	160 to 400	>35
Heavy Fuel Oils	C19 to C25	315 to 540	>50

[a] From *Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites* (ASTM 1995, 1312).
[b] Typical values

The following text provides brief descriptions of the petroleum products most likely to be found at Laboratory sites.

Gasoline - Gasoline is composed of hydrocarbons, primarily in the C4 to C12 range, which evaporate very rapidly, and "additives" that are blended with the fuel to improve its performance and to decrease wear on vehicle engines. The aromatic hydrocarbons in gasoline are primarily benzene, toluene, ethylbenzene, and xylenes; these are collectively referred to as "BTEX." Heavier aromatics are also present, including small amounts of polynuclear aromatic hydrocarbons (PAHs). Gasoline is composed of approximately 10 to 40% aromatics. Oxygenated compounds such as alcohols (methanol or ethanol) and ethers (methyl tertiarybutyl ether) are sometimes added to gasoline to boost octane and to reduce the amount of carbon monoxide produced during combustion. Leaded gasoline, more common in the past, contained lead compounds such as tetraethyl lead, which were added to boost octane. To reduce atmospheric emissions of lead, lead "scavengers," such as dibromoethane and dichloroethane, were sometimes added to leaded gasoline.

Kerosene - The hydrocarbons in kerosene commonly fall in the C11 to C13 range. Special kerosenes with a broader boiling range and low-flash kerosenes are also marketed. Both aliphatic and aromatic hydrocarbons (20% of kerosene is aromatic hydrocarbons) are present, including a greater percentage of multi-ring compounds than found in gasoline.

Diesel Fuel and Light Fuel Oils - Light fuel oils include No. 1 and No. 2 fuel oils. Hydrocarbons in diesel fuel and light fuel oils typically fall in the C10 to C20 range. Because of their higher molecular weights, compounds in these fuels are less volatile, less water soluble, and therefore, less mobile in the environment than hydrocarbons found in gasoline or kerosene. About 25 to 35% of these products are aromatic hydrocarbons, primarily alkylated benzenes and naphthalenes. BTEX concentrations are generally low.

Heavy Fuel Oils - The heavy fuel oils include Nos. 4, 5, and 6 fuel oils. These fuel oils are composed of hydrocarbons ranging from C19 to C25. They are dark in color and much more viscous than water. They typically contain 15 to 40% aromatic hydrocarbons, predominantly alkylated phenanthrenes and naphthalenes. No. 6 fuel oil, also referred to as "Bunker Fuel" or "Bunker C," is a highly viscous black product used in heavy industrial applications where high temperatures fluidize the oil. Its density is greater than water. Nos. 4 and 5 fuel oils are commonly produced by blending No. 6 with lighter distillates.

SUMMARY OF REGULATIONS AND GUIDANCE DOCUMENTS GOVERNING THE MANAGEMENT AND CLEANUP OF TPH IN THE ENVIRONMENT

Several federal and state regulations stipulate how petroleum contamination in the environment must be handled. These regulations can be separated into two categories: those that deal specifically with petroleum associated with underground storage tanks (USTs) and those dealing with petroleum as a general contaminant. Clear regulations pertaining to standards and requirements for owners and operators of USTs apply to products released from USTs. However, regulations applying to petroleum not associated with USTs are typically not as straight forward. In these circumstances, the petroleum release is first considered under regulations pertaining to more general contamination in the environment. However, the UST regulations must be acknowledged as an applicable, relevant and appropriate requirement (ARAR) whose requirements may also need to be met, as determined by the regulatory agency. It should be noted that the Laboratory Emergency Management Office should be contacted (667-6211) for petroleum releases not associated with a UST.

Federal Regulations

Regulations Governing USTs

Federal regulations which pertain to the management of USTs and petroleum products are contained in two separate parts of 40 CFR. Part 279 (EPA 1990, 0432) sets regulations for the management of used oil. Part 280 sets regulations for management and storage of all petroleum products and specifies procedures to be followed for investigating and reporting a release from a UST. Neither of these parts addresses cleanup levels for petroleum contamination or how such cleanup levels are to be derived.

Regulations Governing Petroleum Contamination In General

Petroleum-contaminated media not associated with a UST and that have become a waste because they were "generated" (such as excavating and stockpiling petroleum-contaminated soil with intent of disposing the soil) is addressed in 40 CFR Parts 260 to 272, Resource Conservation and Recovery Act (RCRA) Hazardous Waste Regulations (EPA 1990, 0432). RCRA hazardous waste regulations specify that a contaminated environmental medium is considered a hazardous waste if it is a "listed waste" (included in 40 CFR Part 261, Subpart D) or a "characteristic waste" (it demonstrates characteristics of corrosivity, ignitability, reactivity, or toxicity at levels specified in 40 CFR Part 261, Subpart C). An environmental medium, such as soil, contaminated with petroleum is considered a listed waste only if it is associated with certain processes (K-listed waste associated with the petroleum industry), none of which has occurred at the Laboratory. The environmental medium might be considered a listed waste if solvents that are not associated with petroleum products are also present in the medium. However, if petroleum is present at high enough concentrations, it may be considered a characteristic waste on the basis of toxicity. In this case, toxicity is measured by the toxicity characteristic leaching procedure (TCLP).

It should be noted that some environmental media and debris generated as a result of UST remediation are exempt from coverage under the RCRA hazardous waste regulations, even if they fail tests for toxicity (40 CFR 261.4(b)(10)). However, this exemption is limited to the Environmental Protection Agency (EPA) hazardous waste codes D018 through D043, which are a limited suite of organic constituents. Additionally, the technical standards and corrective action requirements for USTs specified in 40 CFR Part 280 must still be met.

Cleanup of petroleum-contaminated material is also addressed under RCRA in 40 CFR Parts 264 (guidelines dated July 27, 1990, and referred to as RCRA Subpart S), 265, 270, and 271. Subpart S outlines procedures to follow when conducting a RCRA corrective action at a hazardous waste management facility. Subpart S also provides guidance on how to derive risk-based action levels and media cleanup for individual constituents at contaminated sites, including

those contaminated with petroleum. Subpart S defines action levels as conservative risk-based screening criteria used to determine whether contamination exceeds levels that would be considered safe at any site. Cleanup levels are developed on a site-specific basis, and, if necessary, account for exposure to multiple constituents through multiple pathways. Using methodology specified in the proposed rule, media action levels can be calculated for petroleum products and the individual constituents that make up a petroleum product, if toxicity criteria are available for use in the calculations. Although the proposed rule has not been formally adopted, the methodology presented in Subpart S has been adopted by the Laboratory Environmental Restoration (ER) Project.

State Regulations

Regulations Governing USTs

State standards that specifically address petroleum contamination from USTs are set forth in the New Mexico UST regulations, Section 1209.D, Part 3[a] (New Mexico Environmental Improvement Board 1990, 0644). These regulations specify cleanup levels for contaminated soils associated with USTs. Cleanup levels are specified for benzene (10 mg/kg), total aromatic compounds (50 mg/kg if analyzed by a fixed laboratory or 100 mg/kg if analyzed by an approved field instrument), and 100 mg/kg for TPHs. All standards must be met to be in compliance with these regulations. It should be noted that, though the regulations are applicable to USTs only, cleanup standards cited within the regulation have been applied by the State at sites with petroleum contamination in soil not associated with USTs.

It should also be noted that the New Mexico UST regulation requirements for petroleum cleanup are limited to petroleum releases resulting in a contaminant plume with a vertical extent within 50 feet of "usable" groundwater and to "highly contaminated" soils, which are saturated with petroleum. The regulations do not specify the quantity of groundwater that must be present for the water to be considered "usable," but they do specify that if the water contains more than 10,000 mg/L total dissolved solids, the water is not considered to be usable.

New Mexico also has specific requirements for disposal of TPH-contaminated soil that may be generated as a result of remediation activities. The requirements are specified in the New Mexico Solid Waste Management Regulations (State of New Mexico 1994, 1309), Part VII (Special Waste Requirements), Section 708 (Contaminated Soils). These requirements include specifications for testing and storage of the soil and methods for remediating soil by aeration. These regulations state that the soil will not be accepted at a solid waste landfill if it contains free liquid or if it has TPH concentrations exceeding 1000 mg/kg, benzene concentrations exceeding 100 mg/kg, or total BTEX concentrations exceeding 500 mg/kg.

In addition to UST and solid waste regulations, New Mexico has adopted RCRA action levels specified in the proposed 40 CFR Subpart S (EPA 1990, 0432) and benchmark criteria specified in the Superfund Chemical Data Matrix (EPA 1993, 1311), which are conservative risk-based screening levels similar to the RCRA Subpart S action levels, for application as possible cleanup levels at UST sites. This adopted guidance would be considered ARARs by the State in determining cleanup levels for a site.

Regulations Governing Water

Regulations established by the New Mexico Water Quality Control Commission (NMWQCC) in the *State of New Mexico Standards for Interstate and Intrastate Streams* (State of New Mexico 1995, 1267) govern situations in which petroleum-contaminated environmental media could potentially impact surface water. These regulations specify that streams shall be free of water contaminants, from other than natural causes, that could adversely affect stream organisms (or other receptors, including man, because of bioaccumulation or biomagnification) or alter the physical or chemical properties of the stream bottom (*State of New Mexico Standards for Interstate and Intrastate*

Streams, Section 1102.A and F). A separate rule (Section 3101.C) specifies acute and chronic water quality criteria for inorganic chemicals in streams that would be classified as high quality coldwater fisheries; this rule is less likely to apply to streams in the vicinity of the Laboratory.

The NMWQCC has also issued a rule setting surface water quality (*State of New Mexico Standards for Interstate and Intrastate Streams*, Section 3101). Separate subparts within Section 3101 establish water quality standards for different uses of the water. Of primary interest with respect to petroleum contamination is Subpart B, which sets standards for use of the water as a domestic water supply. Subpart D sets standards for water used as a source of irrigation. All concentrations set are above those established in Subpart B. Subparts A, C, and E through J set standards for surface water at fisheries and for recreational use; the standards discussed are not related to petroleum contamination.

Standards set in *New Mexico Water Quality Control Commission Regulations* (State of New Mexico 1995, 1318), Section 3101 for groundwater also contain sub-parts. Subpart A sets groundwater standards for protection of human health. The remaining subparts contain regulations unrelated to petroleum contamination. Subpart A standards are identical to those set for surface water, with some additional criteria not included in the surface water standards for organic constituents, including criteria for benzene, toluene, ethylbenzene, and xylenes. As these standards are generally equivalent to the National Primary and Secondary Drinking Water Standards (EPA 1991, 0887;EPA 1995, 1314). When they differ, the more stringent of the two is applicable to Laboratory sites. Federal and state water quality standards that may be identified for petroleum are summarized in Table 2.

RECOMMENDATIONS

Screening Action Levels (SALs)

SALs are environmental medium concentrations used as indicators of potential contamination problems at a site. If chemical concentrations detected in a site environmental medium are below SALs, and if additive effects of multiple constituents are of no concern, chemical concentrations are considered to be below a level of concern. However, if chemical concentrations in the environmental medium are above SALs, further risk evaluation of the site is required. SALs are NOT cleanup levels, and exceedance of a SAL does not necessarily mean that cleanup is required.

In most cases, a SAL is a risk-based concentration that has been calculated using conservative exposure assumptions, such as those assumptions used in a residential exposure scenario. However, in some cases, the risk-based concentration must be modified to account for other factors, such as natural background. In other cases, the SAL is a concentration cited in a regulation, such as the water SALs which are equivalent to maximum contaminant levels (MCLs) promulgated under the Safe Drinking Water Act.

Soil and water SALs for the petroleum constituents and additives for which toxicity criteria are available are contained in the Facility for Information Management, Analysis, and Display. These SALs should be applied in lieu of a TPH SAL for sites where the TPH is not UST-related. These SALs for petroleum constituents and additives are summarized in Table 3. For sites where the source of TPH is a UST, SALs of 100 mg/kg TPHs and 50 mg/kg total aromatic hydrocarbons are recommended for use in a screening assessment to determine whether risk assessment or further investigation is necessary. These values are consistent with cleanup standards set by NMED UST regulations which are applicable to UST sites. If the petroleum contamination present is less than these values, the PRS may be recommended for no further action, as shown in the flow chart in Figure 1. For soils where petroleum contamination exceeds these SALs, the process for determining whether cleanup levels should be based on existing regulations or on site-

specific risk considerations is outlined in Figure 1. The options listed in the flowchart are discussed in more detail below.

TABLE 2
FEDERAL AND STATE DRINKING WATER QUALITY STANDARDS FOR PETROLEUM CONSTITUENTS AND PETROLEUM ADDITIVES

	National Primary Drinking Water Standards (MCLs) (mg/L)	NMWQCC Human Health Standards (mg/L)
Petroleum Constituents		
Total Aromatic	NA	NA
Benzene	0.005[a]	0.01
Toluene	1.0	0.75[b]
Ethyl Benzene	0.7[a]	0.75
Xylene	0.62[a]	0.62
Pyrene	NA	NA
Benzo(a)pyrene	0.0002[a]	0.0007
Anthracene	NA	NA
Phenanthrene	NA	NA
Naphthalene	NA	0.03[b]
Chrysene	NA	NA
Benzo(k)fluoranthene	NA	NA
Fluorene	NA	NA
Fluoranthene	NA	NA
Benzo(g,h,i)perylene	NA	NA
Benzo(b)fluoranthene	NA	NA
Benzo(a)anthracene	NA	NA
Total PAHs	NA	0.03[b]
Petroleum Additives		
Methyl t-butyl ether (MTBE)	NA	NA
t-butyl alcohol (TBA)	NA	NA
Methanol	NA	NA
Ethanol	NA	NA
Tetraethyl lead	NA	NA
Ethylene dichloride (EDC)	NA	NA
Ehtylene dibromide (EDB)	NA	NA

MCL = Maximum
NA = Not available
[a] Federal standards
[b] State standards apply

Developing Site-Specific Cleanup Levels

Selection of appropriate site-specific cleanup levels for petroleum and petroleum constituents can be difficult, even for a seemingly simple site. Using cleanup levels specified in the NMED UST regulations may be the simplest approach; however, these criteria are conservative and can result in excessively costly cleanup if applied under certain circumstances. Additionally, the cleanup levels specified in the NMED UST regulations are not applicable to TPH cleanups that are not UST-related.

Because of the large number of possible combinations of types of petroleum products, site-specific conditions and potential exposure scenarios, it is not possible to establish one global cleanup level for TPHs in soil or water that can be applied in all cases. The cleanup level identified for a site will vary with the type of petroleum product causing the contamination, the age of the release (older spills will have less of a component of aromatic hydrocarbons because of volatilization and degradation), and site-specific factors. Site-specific factors that must be considered in selecting the appropriate cleanup level include

- source of the TPH;

- proximity of the contaminants to ground and/or surface water;
- characteristics of and depth to the uppermost aquifer;
- soil types and geology;
- potential receptor populations, including sensitive subpopulations;
- aesthetic (taste and odor) and chemical/physical properties of the contaminants present;
- potential for direct contact with contaminants; and
- chemical additives to the petroleum product that may facilitate transport or increase toxicity.

TABLE 3
SCREENING LEVELS FOR PETROLEUM CONSTITUENTS IN SOIL AND WATER

	Oral Toxicity Criteria		EPA Carcinogenicity Classification[a]	Los Alamos National Laboratory Screening Action Levels (SALs)	
	Reference Dose (mg/kg/day)	Slope Factor or Cancer Potency Factor (kg-day/mg)		Soil (mg/kg)	Water (mg/L)
Petroleum Constituents					
Benzene	NA	2.90E-02	A	6.70E-01	5.00E-03
Toluene	2.00E-01	NA	D	910	1
Ethyl Benzene	1.00E-01	NA	D	3,100	7.00E-01
Xylene	2.00E+00	NA	D	160,000	10
Pyrene	3.00E-02	NA	D	2,400	1
Benzo(a)pyrene	NA	7.30E+00	B2	1.00E-01	2.00E-04
Anthracene	3.00E-01	NA	D	24,000	10
Phenanthrene	NA	NA	D	NA	NA
Naphthalene	4.00E-02	NA	D	3,200	1.4
Chrysene	NA	7.30E-03	B2	96	2.00E-04
Benzo(k)fluoranthene	NA	7.30E-02	B2	1.00	2.00E-04
Fluorene	4.00E-02	NA	D	3,200	1.40
Fluoranthene	4.00E-02	NA	D	3,200	1.40
Benzo(g,h,i)perylene	NA	NA	D	NA	NA
Benzo(b)fluoranthene	NA	7.30E-01	B2	1.00	2.00E-04
Benzo(a)anthracene	NA	7.30E-01	B2	1.00	1.00E-04
Petroleum Additives					
Methyl t-butyl ether (MTBE)	5.00E-03	NA	NA	NA	NA
t-butyl alcohol (TBA)	NA	NA	NA	NA	NA
Methanol	5.00E-01	NA	NA	40,000	18
Ethanol	NA	NA	NA	NA	NA
Tetraethyl lead	1.00E-07	NA	NA	NA	NA
Ethylene dichloride (EDC)	NA	9.10E-02	B2	2.00E-01	5.00E-03
Ehtylene dibromide (EDB)	NA	8.50E+01	B2	8.20E-03	4.00E-07

NA = Not available

[a] EPA carcinogenicity classification as follows:
A = Known human carcinogen, with sufficient evidence from epidemiological studies.
B1 = Probable human carcinogen, with limited evidence from epidemiological (none on this table).
B2 = Probable human carcinogen, with sufficient evidence from animal studies and inadequate or no data from epidemiological studies.
C = Possible human carcinogen, with limited evidence from animal studies.
D = Not classifiable as to human carcinogenicity, owing to inadequate human and animal evidence.
E = Evidence of noncarcinogenicity for humans.

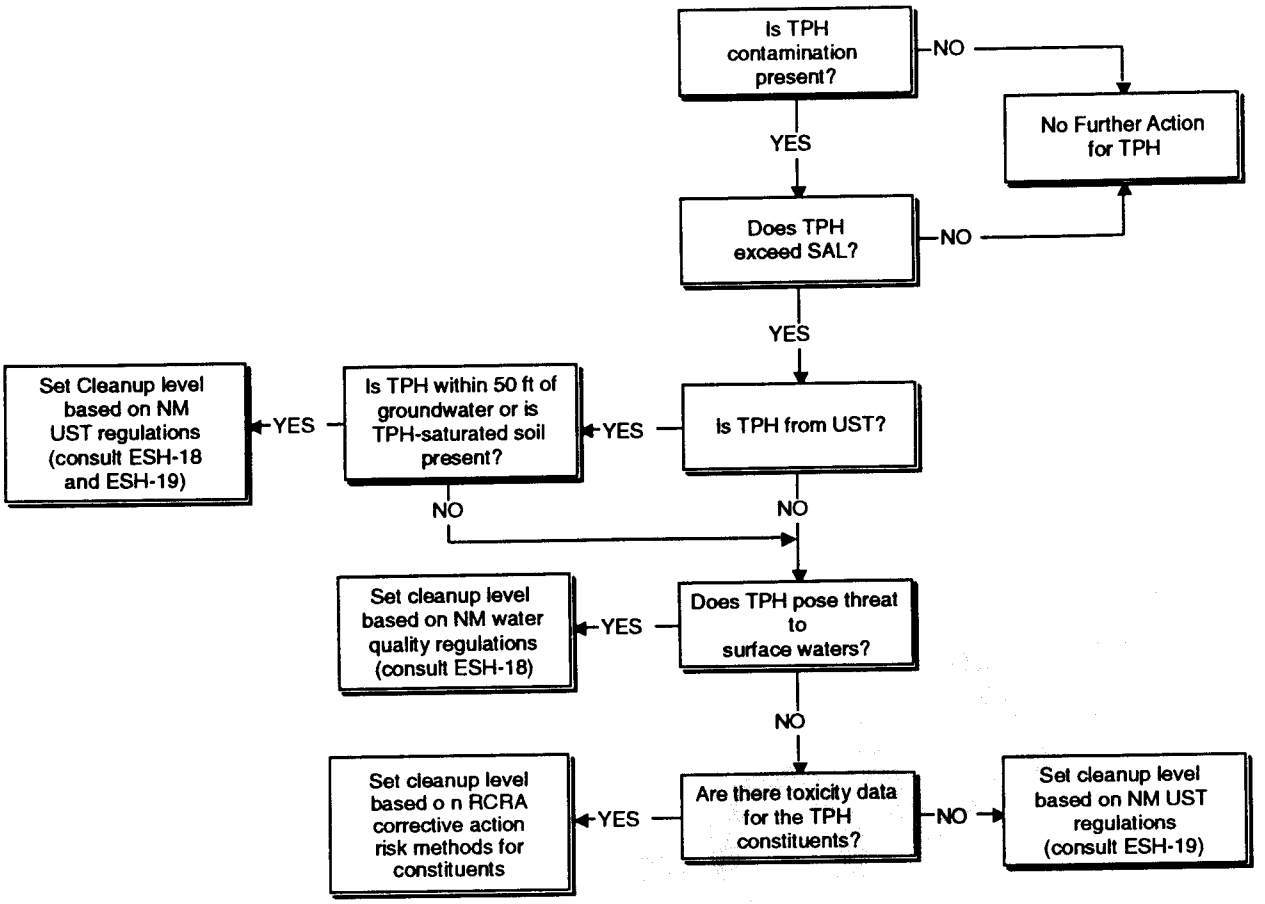

Figure 1. Flowchart for identifying cleanup levels for petroleum-contaminated soils.

Site-specific cleanup levels can be identified based on concentrations cited in existing regulations, by calculation of risk-based cleanup levels dependent on a land use scenario appropriate to the site, or by a combination of these. The basis used for selection of cleanup levels is dependent on site-specific factors. The site-specific factors form the basis of the questions posed in the flowchart in Figure 1.

It is recommended that the Field Unit risk assessor be involved in both the investigation and data evaluation stages to provide additional assistance in identifying a petroleum cleanup level that is appropriate for each site.

Use of Existing Regulations to Identify Cleanup Levels

The only cleanup levels for petroleum specifically set forth in state and federal regulations are soil cleanup levels set by the NMED UST regulations and water criteria set by primary and secondary drinking water standards and the NMWQCC. The soil cleanup levels specified by the NMED UST Regulations should be applied if petroleum contamination is within 50 feet of usable groundwater. Although specifically written for UST sites, the NMED has consistently applied these regulations to sites for which petroleum contamination is not related to USTs. However, it is unlikely that NMED will require application of cleanup levels specified in the UST regulations if there is no "usable" groundwater within 50 feet of the vertical extent of the petroleum contamination, as discussed previously. However, there is one key exception to this statement. If the site contains soil that is "highly contaminated" (i.e., saturated soil), the NMED is likely to require site remediation, regardless of the distance of the contaminant plume to usable groundwater.

If proximity to groundwater is likely to result in the NMED requiring soil cleanup levels to meet those stipulated in the UST regulations, both TPH concentrations and total aromatic hydrocarbon concentrations in soil must be determined. If the petroleum product has degraded, or if it is a heavier petroleum product with a lower percentage of aromatic organic compounds, then it may be possible to negotiate for a less conservative cleanup level for TPH. This is due to the fact that the contaminant present is less mobile in the environment and less likely to present a threat to groundwater. Site-specific factors would need to be considered in this scenario and presented to the NMED.

Primary and secondary drinking water standards apply if petroleum contamination has impacted or potentially could impact ground or surface water that could be used as a drinking source. Additionally, the surface water regulations for protection of the aquatic environment and non-human receptors and discussed previously will also apply, if petroleum contamination presents a potential threat to surface water. However, numerical values for petroleum and petroleum constituents in water are not specified in the surface water regulations except for some constituents in the case where surface water is used as a drinking water source (see Table 2). Rather, it must be demonstrated that an impact does not exist as a result of the contamination.

Use of Risk Assessment to Identify Cleanup Levels

If the cleanup levels specified by the regulations are not applicable because the TPH is not associated with a UST or because of other site-specific factors, risk-based cleanup levels for the site can be developed using site-specific information and the toxicity criteria provided in Table 3. Because no single risk-based cleanup level can apply to all PRSs, cleanup levels are not provided in this document. By developing an exposure scenario that is appropriate for the site being evaluated, site-specific risk-based cleanup levels can be developed for many petroleum constituents and additives.

Additionally, methodology and guidance for identifying cleanup levels for petroleum products has also been developed by both the Massachusetts Department of Environmental Protection and the National TPH Criteria Working Group These methods and guidance are currently under review by the ER Assessments Council for potential application in the identification of cleanup levels for petroleum products at Laboratory sites.

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Date: August 19, 1996
Refer to: EM/ER:96-PCT-014

SUBJECT: RESOURCE CONSERVATION AND RECOVERY ACT FACILITY INVESTIGATION (RFI) REPORT FRAMEWORK POLICY

STATEMENT OF ISSUE

In order to ensure that all personnel generating Los Alamos National Laboratory (the Laboratory) RFI reports produce consistent documents, the Laboratory's Environmental Restoration (ER) Project, with input from Environmental Protection Agency Region 6 and the New Mexico Environment Department, has developed a policy on the format to be used in writing RFI reports.

SUMMARY

This RFI report framework must be followed in generating all RFI reports unless special permission to deviate is obtained from the ER Project Office, or until this document is replaced by an updated format and the revised policy is distributed, or until the policy is superseded.

Follow this format unless special permission to deviate is obtained from the Project Office. It is not the intent of the Project Office to compromise the technical quality of an RFI report by blind adherence to the format specified in the attached document. Rather, it is realized that, in certain unforeseen-to-date or site-specific circumstances, variation from this format will be required. All requests for deviation should be addressed to Linda Nonno (665-0725, lnonno@lanl.gov).

DISCUSSION

The RFI Report Framework document, including example tables, example figures, and a SAP outline, is attached.

The RFI report is the appropriate place to discuss corrections to the RFI work plan or sampling and analysis plan (SAP). Be clear in specifying what the corrections are.

The Executive Summary provides a condensed description of the site(s) being reported. Chapter 1.0 presents a brief overview of the site(s) covered in the report and a brief description of the field work. Chapter 2.0 is a concise description of the environmental setting of the area under discussion. Chapter 3.0 provides a description of the methods and decision approach used to assess and analyze the data reported. Be sure to note any deviations from the methods or processes cited in

this chapter and state why the deviation occurred. Chapter 4.0 gives the reviewer a preview of the validity of the data presented in Chapter 5.0. Chapter 5.0 summarizes the data collected and discusses the results obtained along with conclusions and recommendations. An adequate SAP for significant (e.g., Phase II investigation) additional sampling (outline provided) must be included in Chapter 5. Include appendices as applicable. Appendix A lists the target analytes in each analytical suite for which samples were taken; Appendix B contains any supporting Quality Assurance tables; and Appendix C includes any supporting risk assessment calculations. Use additional attachments as necessary.

The contact person for information is Tracy Glatzmaier. She can be reached at 665-2613.

Sincerely,

Tracy Glatzmaier
Environmental Restoration

Sincerely,

Robert Simeone
Los Alamos Area Office

TG/RS/rfr

Attachment: RFI Report Framework Policy

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RFI Report for Potential Release Sites

XX-001
XX-002(a-c)
XX-003(b, e, g)
XX-008

(located in former Operable Unit XXXX)

Field Unit X

Environmental Restoration Project

Month Year

A Department of Energy Environmental Cleanup Program

Los Alamos
NATIONAL LABORATORY

LA-UR-YEAR-NUMBER

NOTE: List PRSs on the title page only if there are approximately 8 or fewer (use judgment). To conserve space, list similar numbers together (e.g., XX-003 (b, e, g) or, if applicable, XX-002 (a-c)). If there are too many PRSs to list, title the report as follows: RFI Report X (indicate number of report for this TA) for TA-XX, for example RFI Report 2 for TA-XX.

LANL ER PROJECT

RFI REPORT FRAMEWORK

Revision 1
August 12, 1996

GENERAL GUIDELINES

1. Follow this format unless special permission to deviate is obtained from the Project Office. It is not the intent of the Project Office to compromise the technical quality of an RFI report by blind adherence to the format specified in the attached document. Rather, it is realized that, in certain unforeseen-to-date or site-specific circumstances, variation from this format will be required. All requests for deviation should be addressed to Linda Nonno (665-0725, lnonno@lanl.gov).

2. The key to the various type faces used in the document is as follows:

   Bold = Required, must follow. However, if a section does not apply to a report, include the section with the words: Section not applicable to this report.

   Italics = Interpretation and guidance. Read, and follow where applicable.

   Underlined = Fill in the underscored portion as applicable to the site(s) being reported.

   Normal = Boilerplate. Use as much as possible, but make changes where necessary, as applied to a report.

   Bold Italics = Required, must follow if it applies to the site(s) being reported (e.g., Section 5.1.9.1).

3. Acronyms have not always been defined in boilerplate sections because it cannot be foreseen if the use in the boilerplate is the first occurrence of the acronym in the document. It is expected that editors will define the acronym when it first occurs. If first occurrence is in a boilerplate section, it is permissible to alter the boilerplate to accommodate defining the acronym.

4. Follow the ER Project Guidelines document for all formatting issues such as headers, footers, references, etc. Ask field unit editors or Marge Boettner for a copy of the document.

5. If a section of this document does not apply, the boilerplate "Section not applicable to this report." should occur at the highest appropriate level. For example,

   correct method: 5.1.12 Sampling and Analysis Plan (SAP) for PRS "X"
   Section not applicable to this report.

   incorrect method: 5.1.12 Sampling and Analysis Plan (SAP) for PRS "X"
   Section not applicable to this report.
   5.1.12.1 Problem Definition
   Section not applicable to this report.
   5.1.12.2 SAP Design
   Section not applicable to this report.
   etc.

6. Follow figure and table numbers as indicated. If additional figures/tables are needed, limit the numbering scheme to three levels. (For example Table 5.1.5-1 is acceptable, but Table 5.1.5.1-1 has four levels and would not be acceptable.)

7. The terms Phase I and Phase II are used throughout this document. Generally, Phase I refers to the initial investigation conducted (typically as a result of the original RFI work plan.) Phase II refers to any detailed further investigation that was/will be performed, for example, to define nature and extent. The Project is moving toward the Accelerated RFI process (see RFI Process Policy, EM/ER:96-PCT-006, April 12, 1996 [Project Consistency Team, 1210]); therefore, a distinction between Phase I and Phase II may not be applicable to the site being reported.

EXECUTIVE SUMMARY

Provide a brief description of the PRS(s) or PRS aggregate(s) that is (are) being reported. Include

- **facility operation processes,**
- **facility location, and**
- **operational time frame.**

Briefly describe the sampling event(s) and summarize the data analysis and any significant concerns with the quality of the data.

Explain the objectives of the investigation being reported, including whether this is a first (i.e., Phase I) or continued (i.e., further or Phase II) investigation. If applicable, include a brief summary covering findings of past data (e.g., contaminants previously identified), SALs exceeded, and the main implications of these findings.

Summarize the results of the investigation for each PRS or PRS aggregate.

If this report includes PRSs that have radionuclides as chemicals of potential concern, use the statement: Although radionuclides are regulated by the DOE and are not regulated under RCRA, it is more efficient and cost effective to investigate all types of potential contamination during a single site characterization. Therefore, radiochemical concerns are addressed in this report.

Include Table ES-1 (see example) which lists each PRS and the proposed action resulting from the investigation. This table is critical, even if there is only one PRS, because it provides the reviewer with a quick synopsis of the proposed action (NFA, VCA, EC, further investigation, or CMS). Reference the section in which PRSs are summarized.

TABLE ES-1
SUMMARY OF PROPOSED ACTIONS

			PROPOSED ACTION				
PRS No.	**HSWA[a]**	**Radionuclide Component[b]**	**NFA Criterion***	**Further Action[c]**	**Add to HSWA Module[d]**	**Rationale*** **	**Section No.**
0-001	X	X	5			RCRA and radionuclide contamination are below SALs.	5.x.11
0-002	X		5			RCRA contamination is below SALs.	5.x.11
0-003	X			VCA (date**)		RCRA contamination is above SALs; remedy obvious.	5.x.11
0-004				Further Investigation (date**)	X	Nature and extent of contamination is unknown.	5.x.11
0-005		X		VCA (date**)		Radionuclide contamination is above SALs; remedy obvious.	5.x.11
0-006	X	X		VCA (date**)		RCRA contamination is below SALs; radionuclide contamination is above SALs; remedy obvious.	5.x.11
0-007	X	X		Further Investigation (date**)		RCRA contamination is below SALs. Radionuclide contamination will be addressed in the future.	5.x.11

a. An X in this column indicates that the site is listed on the Hazardous and Solid Waste Amendments (HSWA) Module (Module VIII) of the Laboratory's RCRA operating permit.
b. An X in this column indicates that the site has a radionuclide component.
c. VCA, EC, further investigation, or CMS.
d. An X in this column indicates that hazardous constituents were confirmed at a site not already listed on the HSWA Module. The site requires further action; therefore, the site needs to be added to the Module.
* *Reference the appropriate NFA criterion (see No Further Action Criteria Policy, EM/ER:95-PCT-015, R1, August 30, 1996 [Project Consistency Team, 1210]).*
** *Indicate a best estimate for the start date of a further investigation and for the submittal date of a cleanup plan. For example, September 1997 or first quarter of 1998.*
*** *Clearly indicate if the rationale is for RCRA contamination, radionuclide contamination, or both.*

All information included in this table is example data only. Table footnotes designated by asterisks are guidance only.

RESOURCE CONSERVATION AND RECOVERY ACT
FACILITY INVESTIGATION REPORT

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1.0 INTRODUCTION

This section is intended to be a brief overview of the report. Details will follow in Chapter 5.

1.1 General Site History

Discuss the operational history of the facility or technical area in which the PRS or PRS aggregate is located. Include

- **length of period of operation and associated start/end dates;**
- **types of facility process(es) that could have potentially contaminated the site; and**
- **historical use of chemicals at the site(s)**

NOTE: To avoid confusion, DO NOT use the phrase potential chemicals/constituents of concern or the acronym PCOC. For general discussions of contamination that is believed to be potentially present at the site(s) being reported, use the phrases "potential contamination" or "chemicals potentially present." Technical terms to be used are defined as follows:

- *Chemical. Any naturally occurring or man-made chemical, including radionuclides.*
- *COPC (chemical of potential concern). A chemical identified as a potential human health risk at any point in the screening assessment. The chemical remains a potential concern until it is eliminated in the screening assessment process or in the site-specific human health risk assessment.*
- *COC (chemical of concern). A chemical that is identified as a potential risk as the result of performing a site-specific human health or ecological risk assessment.*

If reporting on an aggregate, present the logic for grouping the PRSs (for example, geographic location, similar contaminants, similar unit types, etc.).

If this report includes PRSs that have radionuclides as chemicals of potential concern, use the statement: Although radionuclides are regulated by the DOE and are not regulated under RCRA, it is more efficient and cost effective to investigate all types of potential contamination during a single site characterization. Therefore, radiochemical concerns are addressed in this report.

Include Figure 1.1-1 (see example). This map shows the location of the TA (highlighted) in which the PRS or PRS aggregate being reported is located with respect to the Laboratory, to New Mexico, and to the United States.

Include Figure 1.1-2 (see example). This map shows the location of the TA (highlighted) in which the PRS or PRS aggregate being reported is located with respect to other Laboratory TAs and surrounding land holdings.

If applicable, include Figure 1.1-3. This map shows the location of the PRSs being reported with respect to the TA and to each other.

1.2 RFI Overview

In most cases this will reference the RFI work plan for Phase I characterization. If this is a Phase II or further investigation report, reference the appropriate sampling and analysis plan for the PRS or aggregate. Include

- **a brief description of the conceptual model and**
- **the objectives of the sampling event(s).**

1.3 Field Activities

Describe the field work, including that information that is common to all field investigations in this report. Limit description to approximately one or two pages unless something extraordinary occurred. Include

- **start and finish dates of field work (some sampling may include one or more seasons);**
- **types of field surveys;**
- **types of field screening, including**
  - **screening conducted to support sampling location bias and**
  - **any screening used to support screening assessment decisions; and**
- **types of sampling performed (e.g., surface sampling, subsurface sampling, auguring, drilling, trenching, monitor well completion, etc.).**

Include boilerplate: All applicable LANL ER SOPs (LANL, 0875) were followed, unless otherwise noted in Chapter 5.

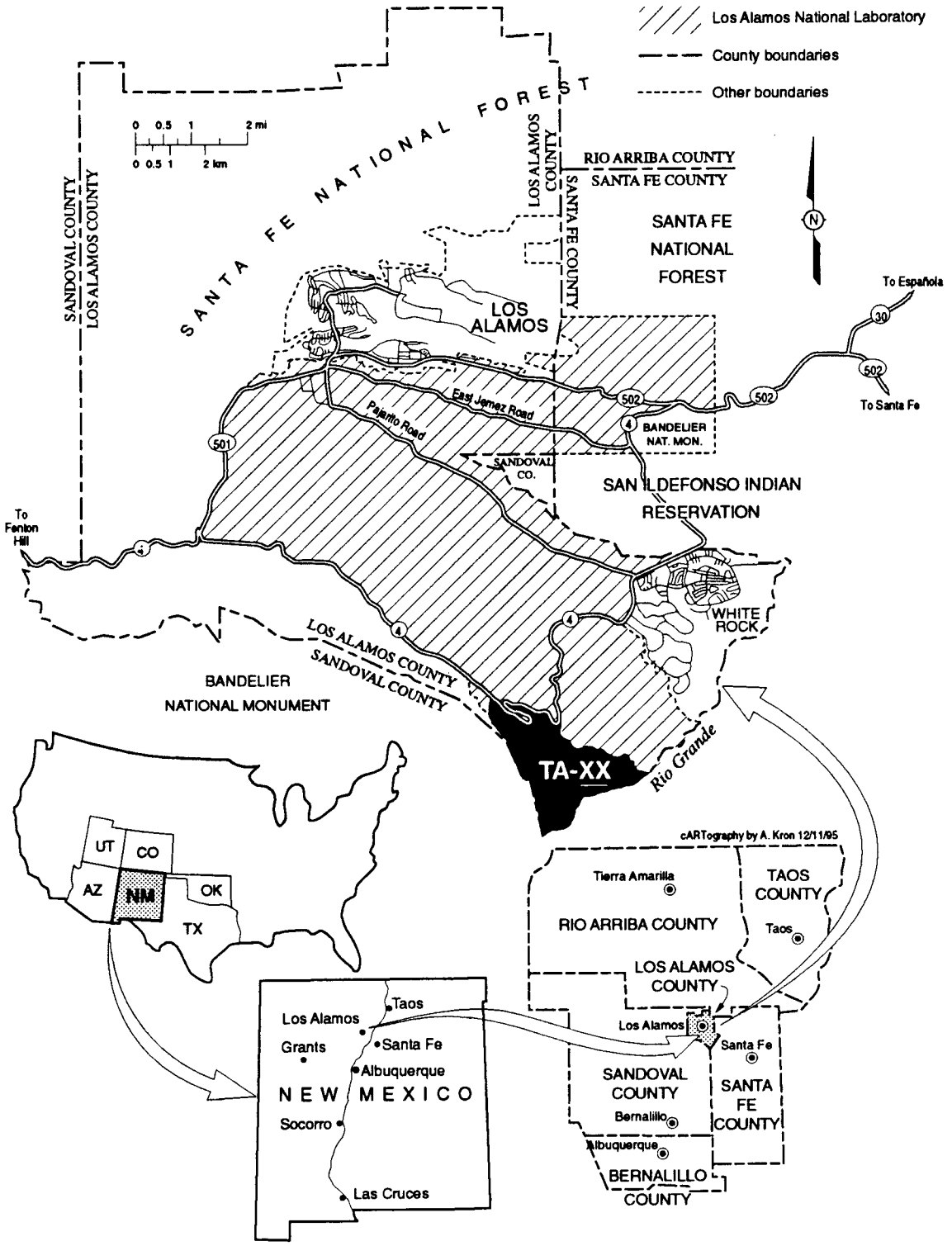


Figure 1.1-1. Location of TA-XX within Los Alamos National Laboratory, Los Alamos County, New Mexico.

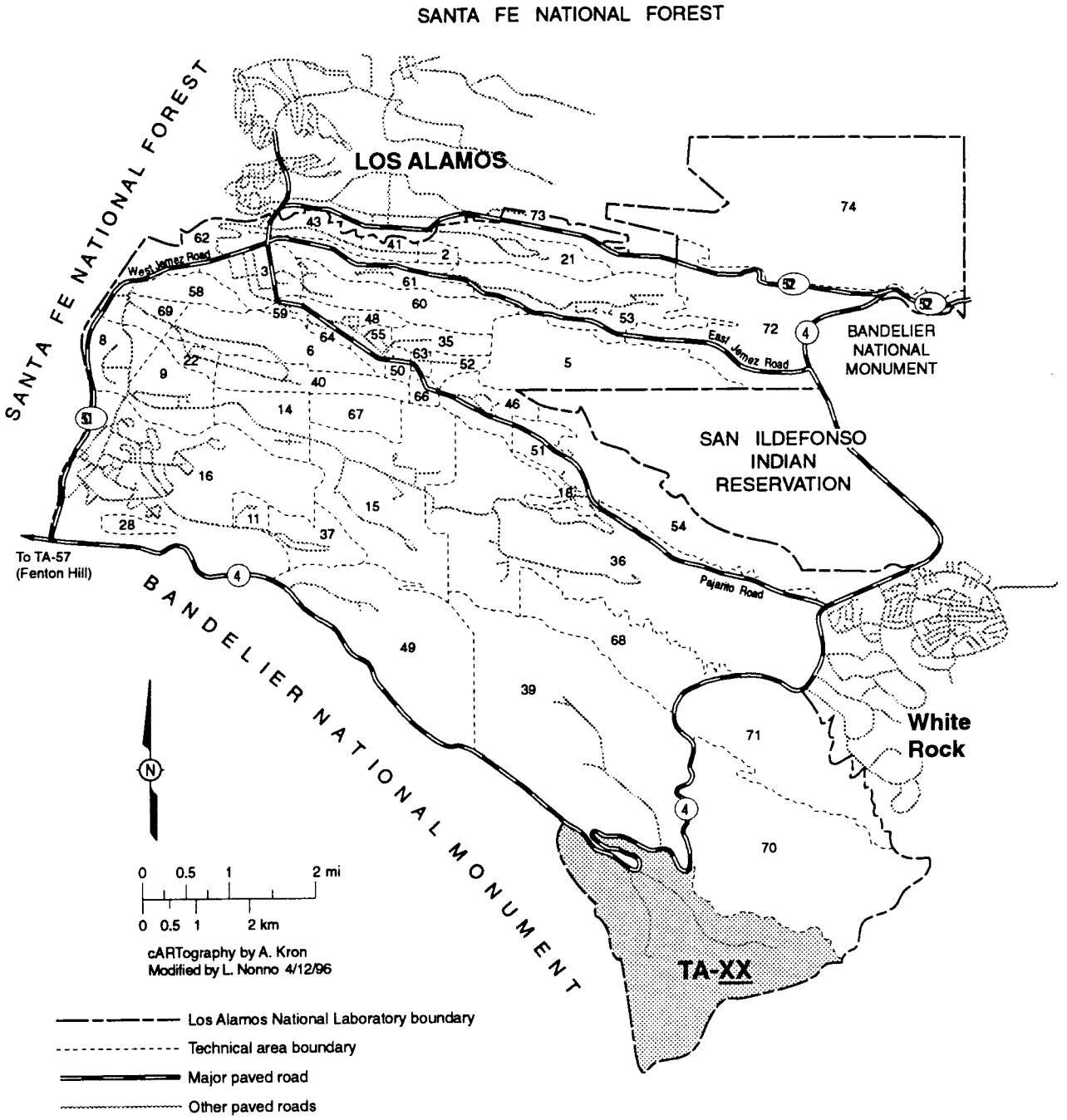


Figure 1.1-2. Location of TA-XX with respect to Laboratory TAs and surrounding land holdings.

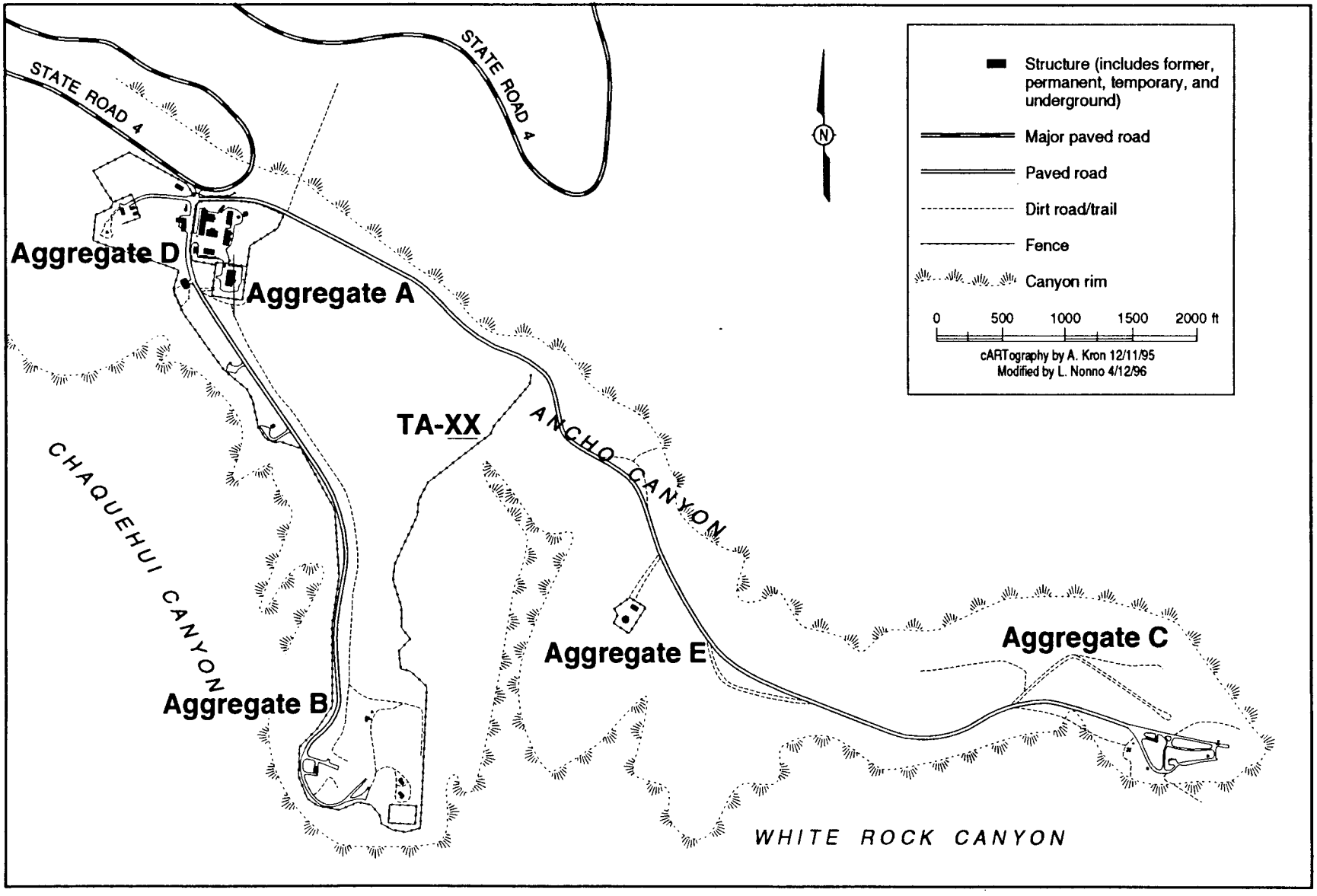


Figure 1.1-3. Location of PRSs/aggregates at TA-XX.

2.0 ENVIRONMENTAL SETTING

In each section below, briefly describe the environmental setting of the area under discussion (in most cases, summarize the applicable areas of the work plan for the PRSs being reported here). If a section of this chapter does not apply to a specific report, include the section number and title with the following words: Section not applicable to this report.

Modify the following boilerplate, as appropriate, for the area being described.

The environmental setting of the Laboratory is described in Section 2.4 of the Installation Work Plan (IWP) for Environmental Restoration (LANL 1995, 1275). A detailed discussion of the environmental setting for the area described in this report, including climate, geology, hydrology, and a conceptual hydrogeologic model for the area and its surroundings, is presented in the RFI Work Plan for OU ____ (LANL 199_, XXXX). A summary is presented in the following sections.

2.1 Climate

Los Alamos County has a semiarid, temperate, mountain climate. Summers are generally sunny with moderate, warm days and cool nights. High altitude, light winds, clear skies, and dry atmosphere allow summer temperatures to range from __°F to __°F at the area described in this report. During the winter, temperatures typically range from __°F to __°F. The average annual rainfall in the area of the PRSs described in this report is estimated to range from __ to __ in. Of this total, approximately 40% occurs as brief intense thunderstorms during July and August. Stream flow in canyons can occur as a result of these storms. Spring snowmelt runoff may also induce streamflow in the area canyons.

2.2 Geology

2.2.1 Geologic Setting

A detailed discussion of the geology of the entire Los Alamos area can be found in Section 2.5.1 of the IWP (LANL 1995, 1275). A summary of that material, emphasizing conditions expected near the area described in this report, is presented below.

Describe

- **the stratigraphy of the area (including how that information was obtained, i.e., logs of nearby wells) and**
- **depth to the main aquifer.**

If applicable, include Figure 2.2.1-1 (see example) showing the generalized stratigraphy in the area being described.

2.2.2 Soils

A detailed discussion of the soils in the Los Alamos area can be found in Section 2.5.1.3 of the IWP (LANL 1995, 1275). A summary of that material specific to the PRSs described in this report is presented below.

Describe soil type and mode of soil accumulation (this may affect which types of background values are used for comparison in the screening assessment). Include

- **a description of the soils mapped by Nyhan et. al. (1978, 0161) over the aggregate or site area;**
- **the general thickness and variability of soils, including any information regarding the depth to the soil/tuff interface, if applicable;**
- **any documentation of A, B and C horizons;**
- **whether a geomorphological survey was performed to investigate the rate of soil accumulation; and**
- **any features, such as sediment traps or erosion deposits, in which samples were taken.**

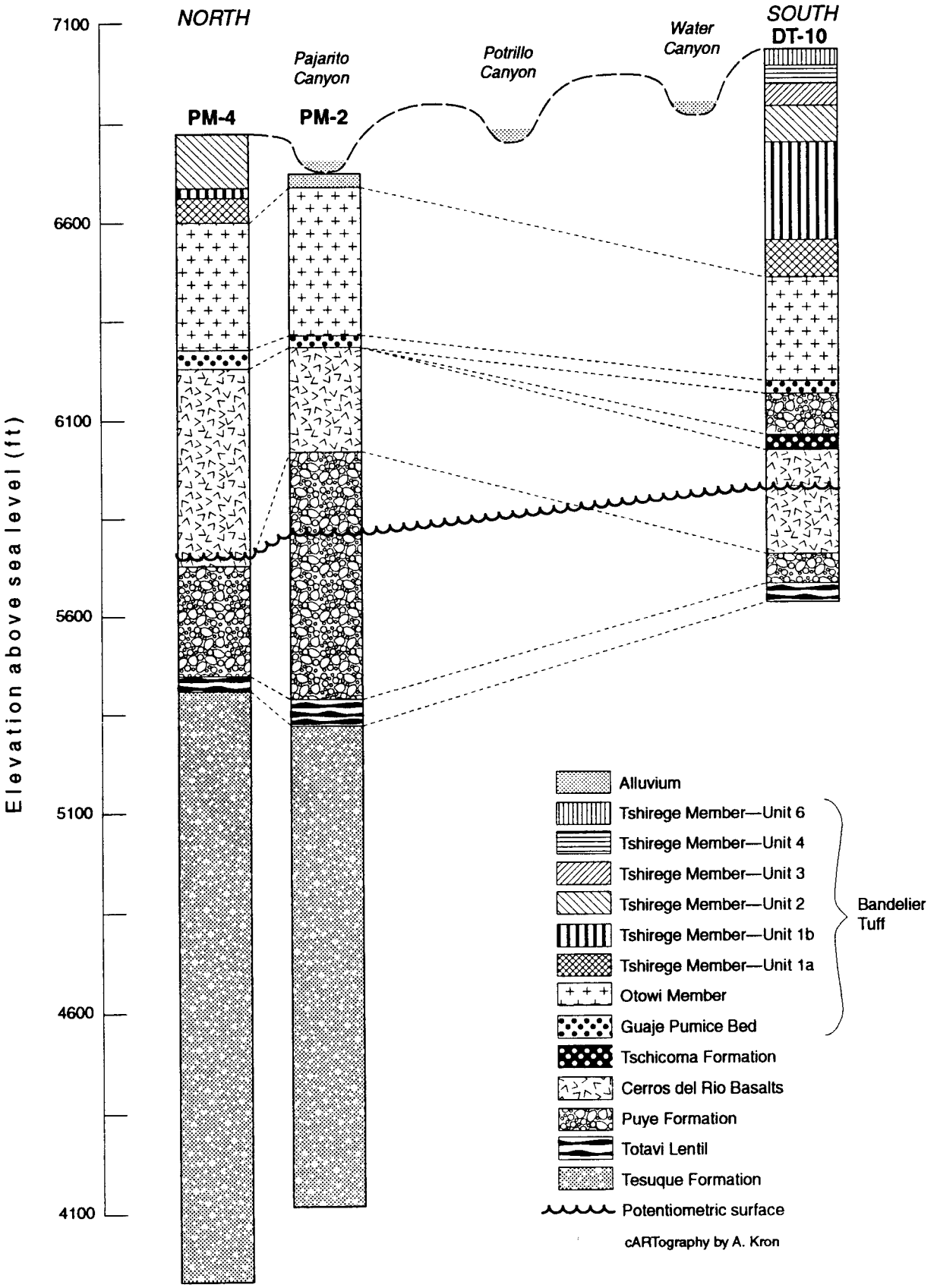


Figure 2.2.1-1. Generalized stratigraphy of TA-XX.

2.3 Hydrology

The hydrology of the Pajarito Plateau is summarized in Section 2.5.2 of the IWP (LANL 1995, 1275). Site-specific conditions are summarized below.

When available, and if applicable, provide a figure of the geologic formations penetrated, and indicate where the water level was encountered based on a well that was drilled as part of the investigation or a well that is close by. Reference Figure 2.2.1-1 if applicable.

Avoid definitive statements about potential for ground water contamination in the absence of relevant data. For example, "The aquifer is located at a depth of 1000-1200 ft, so there is no need to worry about ground water."

2.3.1 Surface Water

Include a discussion of any drainages, streams, wetlands, etc., in the area. Include Figure 2.3.1-1 (see example) showing the topography of the area described in this report.

2.3.2 Ground Water

Include

- **A discussion of any spring(s) and perched aquifer(s) in the area and**
- **a description of the well inventory in the area and a discussion of how deep the main aquifer is in the area, using the nearest well as a guide.**

2.4 Biological Surveys

Biological resource field surveys have been conducted in the area of the PRSs described in this report for compliance with the Federal Endangered Species Act of 1973; the New Mexico Wildlife Conservation Act; the New Mexico Endangered Species Act; Executive Order 11990, "Protection of Wetlands"; Executive Order 11988, "Floodplain Management"; 10 CFR 1022; Compliance With Floodplain/Wetlands Environmental Review Requirements (DOE 1979, 0633); and DOE Order 5400.1, General Environmental Protection Program (DOE 1988, 0075).

The results of these surveys and the habitat description for the PRS(s) and/or the PRS aggregate(s) described in this report will be included in the ecological RFI report prepared by the Decision Support Council Ecological Risk Assessment Team for the ecological exposure unit(s) in which this (these) PRS(s) and/or the PRS aggregate(s) is (are) located.

2.5 Cultural Surveys

A cultural resource survey has also been conducted in the area of the PRSs described in this report, as required by the National Historic Preservation Act (amended).

Discuss the results of the cultural/archaeological surveys conducted prior to the sampling event. When available, and the level of detail exists, take this information from the work plan. If surveys and reports came after the work plan, use the reports.

Include

- **a discussion of the disturbed and undisturbed environments and**
- **whether any cultural/archaeological sites are in the area.**

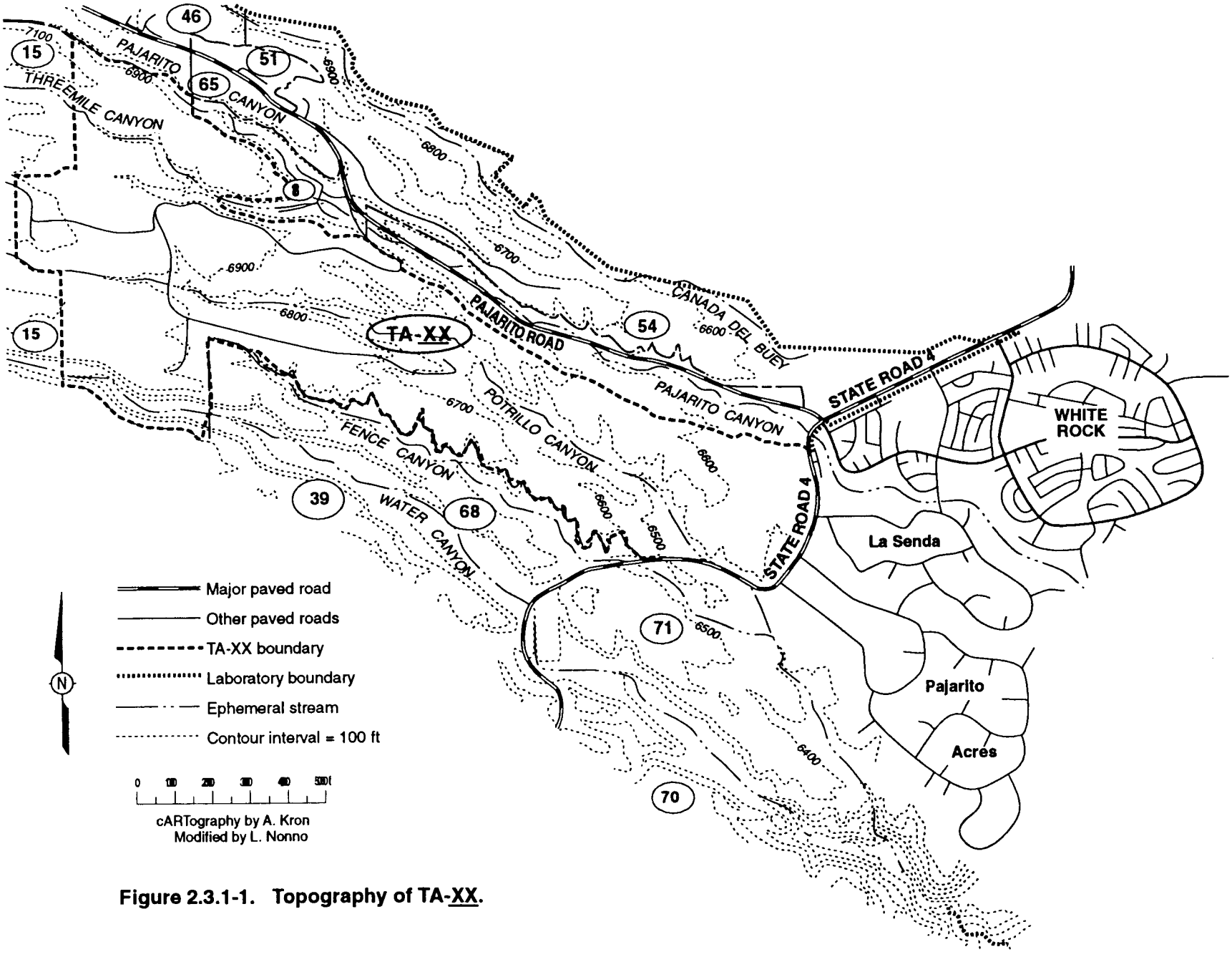


Figure 2.3.1-1. Topography of TA-XX.

3.0 APPROACH TO SAMPLE ANALYSES AND DATA ASSESSMENT

The approach to data assessment used by the ER Project is described in the policy document Risk-Based Corrective Action Process (Dorries 1996, 1297). The approach includes

- sampling and analysis design,
- field investigation and collection of field and QA samples,
- chemical and radiochemical analyses of samples and reporting of analytical data,
- baseline verification and validation of analytical data,
- organization of field and analytical data into PRS-specific data set(s),
- exploratory data analysis,
- focused validation when necessary to further assess questionable data,
- comparison of validated analytical results with LANL background data,
- comparison of validated analytical results with SALs,
- evaluation of sufficiency of data set(s) to support site decisions, and
- assessment of human health risk.

The following subsections provide overviews of the methods used to complete the steps listed above for the PRSs discussed in this RFI report.

Note any additions and/or deviations from the basic approach.

3.1 Sample Analyses

Samples were collected in accordance with the sampling design specified in the RFI Work Plan for OU XXXX (LANL 199X, XXXX); or the Sampling and Analysis Plan for PRS(s) (LANL 199X, XXXX); or the RFI Report for PRS(s) (LANL 199X, XXXX). All samples requiring chemical and radiochemical analyses and chain-of-custody documentation were submitted to the sample management office (SMO) and/or to the mobile radiological analysis laboratory (MRAL) and/or to an on-site mobile chemical van for analyses.

Note which analytical facilities (fixed lab, rad van, MRAL) were used for the PRSs in this report. Specify any on-site measurements (portable XRF, immunoassay kit, etc.) used in the decision process.

3.1.1 Analytical Methods

The following analytical suites were used for the sample analyses in this RFI report: inorganic chemicals, VOCs, SVOCs, (*etc., as needed*). A list of the target analytes for which analyses were performed for the purpose of this report can be found in Appendix A.

If other than the routine analytical services and methods are used, describe them here, including a description of the performance criteria. Indicate if the performance criteria were met in the appropriate section of Chapter 4. (If a nonroutine analytical method is used only for a particular PRS(s), include a brief description here and refer to the applicable section of Chapter 5, for example, 5.x.5, 5.x.6, or 5.x.7).

All samples were analyzed by contract analytical laboratories using methods specified in ER SMO analytical subcontracts (LANL 1995, 1278). The allowed methods are current EPA SW-846 and Contract Laboratory Program (CLP) methods or equivalent for inorganic chemicals, VOCs, SVOCs, (*etc., as needed*). Prior to analysis for inorganic chemicals, solid samples were digested according to EPA SW-846 method 3050 or equivalent (EPA 1992, 1207). The subcontracts specify LANL-approved methods for radiochemical analyses according to the technologies identified in the subcontract (e.g., americium-241 by alpha spectroscopy, tritium by liquid scintillation, or multiple isotopes by gamma spectroscopy). Analytical method selection is described in Appendix IV of the ER Project Quality Assurance Project Plan Requirements for Sampling and Analysis (QAPP) (LANL 1996, 1292). For each analyte, quantitation or detection limits are specified as contract-required estimated quantitation limits (EQLs) for organic chemicals and radionuclides and estimated detection limits (EDLs) for inorganic chemicals. These limits are included in Appendix III of the ER Project QAPP along with the target analytes for each analytical suite.

3.1.2 Data Validation

Data verification and baseline validation procedures were used to determine whether data packages received from the analytical laboratory were generated according to specifications and

contain the information necessary to determine data sufficiency for decision-making. For analytical data used for decisions discussed in this RFI report, baseline data validation under the ER protocol was performed as described in the QAPP (LANL 1996, 1292).

This process produced validation reports, with data qualifiers designating potential deficiencies for affected results. Each data qualifier is accompanied by a reason code that provides information about the deficiency which led to qualification of the data. The validation reports were used in the decision-making process and to direct the focused validations required to evaluate the usability of the data for this report.

Data were qualified (i.e., a marker was attached to the data results) for a variety of reasons during the baseline validation process. The baseline validation procedure used for routine analytical services provides information about the reason the qualifier was applied and its potential impact on the affected data. The purpose is not to reject data but rather to ensure that the relative quality of the data is understood so that the data may be used appropriately.

Note if other than the routine process was used. Include a description of what was done and why there was a deviation. This is most likely to occur when nonroutine analyses and services were used or for data produced prior to the implementation of the baseline validation process.

Data qualifiers used in the LANL ER Project baseline validation process are

- A The data required for data review and evaluation are not available.
- U The analyte was not positively identified in the sample, and the associated value is the sample-specific EQL/EDL.
- J The analyte was positively identified, and the associated numerical value is estimated to be more uncertain than would normally be expected for that analysis.
- J+ The analyte was positively identified, and the result is likely to be biased high.
- J- The analyte was positively identified, and the result is likely to be biased low.
- UJ The analyte was not positively identified in the sample, and the associated value is an estimate of the sample-specific EQL/EDL.
- RPM Without further review of the raw data, the sample results are unusable due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. Presence or absence cannot be verified. NOTE: Any results qualified as RPM must be evaluated for relevance to data use.
- P Professional judgment should be applied to using the data in decision-making.
- PM Professional judgment should be applied to using the data in decision-making. A manual review of raw data is recommended to determine if the defect impacts data use for decision-making.

An example of the implications of the J+ qualifier: data used to determine if a SAL has been exceeded are not impacted from the high recovery when the results are less than the SAL. However, when the results are greater than the SAL, there is the possibility that the high bias indicates a false positive in relation to exceeding the SAL. A false positive could drive an action/decision (e.g., retain as a COPC). To possibly prevent this, a focused validation could evaluate other indicators of bias to support the high bias or to dispel it. If the bias can be quantitated with assurance, it may be possible to justify a determination of "less than the SAL."

An example of the implications of the J-qualifier: if a result is greater than the SAL, the negative bias has no impact on the decision to designate the chemical as a risk-based COPC. If the result is less than the SAL, a false negative may occur that must be evaluated when making a decision whether or not to retain the chemical as a COPC.

A focused data validation may be required as a follow-up to the baseline validation. The purpose of a focused validation is to determine the technical adequacy of measurement data when

- the data are qualified as deficient or as requiring professional judgment during the verification/baseline validation process. For example, when holding times are

exceeded or interferences are present, a focused validation may be required to assist in determining data adequacy for the intended use.

- the data quality assessment process requires additional information about the
  - variability or uncertainty of the reported data or
  - data quality prior to making a data use decision because of anomalies detected in a data set.

Details of quality assurance/quality control activities are presented in Chapter 4 of this RFI report. Qualifiers resulting from baseline and focused validation are shown in the analytical results tables included in Chapter 5 of this report. Summaries of data quality evaluations and focused validation of analytical data relevant to this report are given in Appendix B. The RPM, P, and PM qualifiers do not appear in Chapter 5 data tables, nor in Appendix B, because they are replaced during focused validation according to the data use.

3.2 Process for the Identification of COPCs

3.2.1 Inorganic Chemicals

Detected inorganic chemicals are compared with natural background distributions to determine if they should be retained as COPCs or eliminated from further consideration. The inorganic background data used in this RFI report are from the following source(s): *(Follow the guidance for background data selection provided in Application of LANL Background Data to ER Project Decision-Making, Part I: Inorganics (Project Consistency Team, 1210 [EM/ER:96-PCT-010]; Ryti et al. 1996, 1298).*

- soil, sediment, and/or tuff samples collected throughout Los Alamos County for which chemical analyses were performed for certain inorganic (metal) chemicals (Longmire et al. 1995, 1142; 1995, 1266). **Briefly state the rationale for selecting the appropriate background data subset. For example, PRS samples were collected from fill material; the all-soil-horizons background data set was used because the soil master horizon cannot be identified in disturbed material.**
- ***background concentrations of data collected at or near the PRS(s) being reported. Briefly state the rationale for collecting local background data.*** *(If you have site-specific background data, use this bullet and include a table of site-specific background screening values.)*

Comparisons between site data and background data are initially performed by comparing each observed concentration datum with a chemical-specific background screening value that is the upper tolerance limit (UTL), or the maximum reported concentration, or the detection limit of a nondetected chemical. These background screening values are derived from LANL-wide soil, sediment, and/or tuff background data, and details on the calculation of these values are presented in Longmire et al. (1995, 1266). Certain inorganic chemicals in certain media have no LANL-wide background data. For these exceptions, PRS sample-specific detection limits are used as nominal background screening values. In this report, chemicals that lack background data include list chemicals.

If other statistical tests are used for background comparisons, specify the test(s) and provide a rationale for using them. Refer to sections of this RFI report in which the comparisons are used. Indicate if background screening or hot measurement comparison and statistical tests are used jointly to produce one list of inorganic chemicals/radionuclides greater than background. Detailed information on selecting statistical tests is presented in the guidance document Application of LANL Background Data to ER Project Decision-Making, Part I: Inorganics (Project Consistency Team, 1210 [EM/ER:96-PCT-010]; Ryti et al. 1996, 1298).

Note any deviation to this process for decisions in this report.

3.2.2 Radionuclides

Comparing reported radiochemical results with minimum detectable activities and background data is necessary to determine the presence of radionuclides and to distinguish concentrations of radionuclides associated with Laboratory operations from those attributable to global fallout and/or to naturally occurring radionuclides.

The LANL ER Project requires that radiochemical data be reported by a laboratory on the basis of a detection test. Therefore, as part of the data validation/data assessment, reported results must be evaluated to ensure that only those results that represent detections be used to classify a radionuclide as a COPC. This is typically done by comparing the reported value with the associated minimum detectable activity if one is reported. When the minimum detectable activity is not available or does not meet the data quality needs of the ER Project, the reported value will be tested against an estimated minimum detectable activity. This estimated value is based on instrument counting error. The counting error is typically reported as the analytical uncertainty at a value of 1-sigma (i.e., one standard deviation), and the estimated minimum detectable activity is computed as 3-sigma.

Data analysts should be aware that radiological uncertainty in FIMAD is sometimes reported as 1-, 2-, or 3-sigma and that the reported uncertainty may be the total propagated uncertainty, which includes other sources of error in addition to the counting error. Where appropriate to specific radionuclides, other means of evaluating reported results may include half-life, isotopic ratios, and/or parent-daughter relationships. You can also exclude radionuclides, based on process knowledge, e.g., potassium-40.

Detected radionuclides are retained as COPCs or eliminated from further consideration based on a comparison with natural or anthropogenic background distributions. The radionuclide background data used in this RFI report are from the following source(s):

- soil, sediment, and/or tuff samples collected throughout Los Alamos County for which chemical analyses were performed for certain naturally occurring radioactive chemicals (Longmire et al. 1995, 1142; 1995, 1266). **Briefly state the rationale for selecting the appropriate background data subset. For example, PRS samples were collected from Qbt3 and Qbt4; the Qbt3 and Qbt4 background data sets were used because they were identified in borehole logs at depths of 10 to 30 ft and 30 to 50 ft, respectively.**
- ***background concentrations of radioactive chemicals associated with global fallout from atmospheric nuclear testing (e.g., plutonium, cesium, strontium, and tritium) reported in LANL Environmental Surveillance reports (Purtymun et al. 1987, 0211; ESG 1988, 0408; ESG 1989, 0308; Environmental Protection Group 1990, 0497; Environmental Protection Group 1992, 0740).*** *(This bullet applies primarily to surface samples collected from relatively undisturbed sites. The impact of mixing should be considered and the use of fallout-related background justified. If you have no surface samples or if site soils have been disturbed, eliminate this bullet.)*
- ***background concentrations of data collected at or near the PRS(s) being reported. Briefly state the rationale for collecting local background data.*** *(If you have site-specific background data, use this bullet and include a table of site-specific background screening values.)*

Comparisons between site data and background data are initially performed by comparing each observed concentration datum with a radionuclide-specific background screening value that is either the UTL or the maximum reported activity. These background screening values are derived from LANL-wide soil, sediment, and/or tuff background data, and details on the calculation of these values are presented in Longmire et al. (1995, 1266). Certain radionuclides in certain media have no LANL-wide background data. For these exceptions, PRS sample-specific minimum detectable activities are used as nominal background screening values. In this report, radionuclides that lack background data include list radionuclides that were detected but do not have a background screening value.

If other statistical tests are used for background comparisons, specify and provide a rationale for them. Refer to sections of this RFI report in which the comparisons are used. Indicate if background screening or hot measurement comparison and statistical tests are used jointly to produce one list of inorganic chemicals/radionuclides greater than background. Detailed information on selecting statistical tests is presented in the guidance document Application of LANL Background Data to ER Project Decision-Making, Part I: Inorganics (Project Consistency Team, 1210 [EM/ER:96-PCT-010]; Ryti et al. 1996, 1298).

MDA, the acronym for minimum detectable activity, is already used throughout the project as the acronym for material disposal area. To avoid confusion, always write out the term minimum detectable activity and do not use MDA as an acronym for that term.

Note any deviation to this process for decisions in this report.

3.2.3 Organic Chemicals

Background data are not available for organic chemicals. Organic chemicals positively identified in one or more samples have been carried forward in the screening assessment process for the PRS(s) in this RFI report. Chemicals not detected in any sample have been removed from further consideration.

The elimination as COPCs of nondetected organic chemicals for which the detection limit is greater than the SAL should be addressed in Section 4.3 (Organic Analyses). Organic chemicals that were not detected in any sample are addressed in Chapter 5 only if one or more sample EQLs were significantly elevated due to matrix problems, etc.

Note any deviation to this process for decisions in this report.

3.2.4 Risk-Based Screening Assessment

Inorganic chemicals and radionuclides that exceed background and organic chemicals positively identified in one or more samples require further evaluation if they also exceed SALs. SALs for nonradioactive chemicals are based on EPA Region 9 preliminary remediation goals (PRGs) for residential soil and tap water. Where appropriate, certain EPA Region 9 water PRGs are replaced by Native American Pueblo, state, or federal water quality standards. Soil and water media have separate SALs for each chemical. The decision to identify a chemical as a COPC when a SAL is not available is made on a case-by-case basis, taking into account the availability of process knowledge and toxicological information.

If more than one COPC is present at the site, a multiple chemical evaluation (MCE) is performed to determine if the potentially additive effect of chemicals detected below SALs warrants additional investigation. The method for performing an MCE is summarized in the policy document Risk-Based Corrective Action Process (Dorries 1996, 1297). These comparisons are the last quantitative steps in the screening assessment process for human health concerns. If COPCs remain after this step, then further evaluation is required. If no COPCs remain after this step and the data set is sufficient to support the decision, an NFA recommendation may be proposed based on human health concerns.

If COPCs remain after the screening assessment, several options exist for the PRS. A further site-specific evaluation may lead to eliminating a COPC without going into a formal risk assessment. The site may be proposed for further sampling to more completely characterize the site or for remediation if it is cost effective to proceed without a risk assessment. A risk assessment may be conducted to determine if the remaining COPCs present an unacceptable human health risk.

Note any deviation to this process for decisions in this report.

3.3 Human Health Assessment

3.3.1 Risk Due to Naturally Occurring Inorganic Chemicals in Soils (Background)

Risk is associated with exposure to inorganic chemicals naturally occurring in soil. Calculation of background risks using the same methodology as site risk estimates provides a frame of reference for risk levels calculated at a site. This information provides a basis for determining risk-based remediation goals, which in some circumstances may be set at target risks comparable to background rather than default values, i.e., a cancer risk of 10^{-6} or a hazard index of 1. Background risks can also affect decisions at sites that have chemicals for which there is a toxicity threshold. For some inorganic chemicals, background intakes may be near a toxicity threshold such that incremental intakes associated with contamination may be unacceptable.

Background risk estimates provided in Table 3.3.1-1 were calculated using the same exposure assumptions by which SALs are calculated. SALs are based on health-protective assumptions for a residential scenario (EPA 1995, 1307). For soil exposure, the pathways include incidental soil ingestion, inhalation of resuspended dust, and dermal contact with soil. The background soil data used for these calculations were collected from several soil horizons at geographically diverse locations. Background risks are estimated for two statistics. One statistic is the median, which represents the midpoint in the concentration range (technically, the median is the concentration value that divides the results into two equal groups or where half of the data are above and half are

below this value). The second statistic represents the upper range on background concentration values, and is either a calculated UTL or a maximum concentration value.[1]

The background risks based on the LANL SAL residential exposure model are provided in Table 3.3.1-1. Risks due to background concentration are presented for both noncarcinogenic and carcinogenic outcomes. The potential for adverse noncarcinogenic health effects is estimated by a hazard quotient. A chemical intake leading to a hazard quotient of up to 1 is not associated with adverse health effects. None of the median background concentrations result in hazard quotients greater than 1. The hazard quotient of the UTL concentration for manganese exceeds 1 (1.9). However, exposure to naturally occurring manganese is not expected to have significant health consequences because of the unlikely occurrence of the UTL concentration over an entire exposure area, the conservative assumptions used in the exposure assessment, and the margin of safety incorporated into the reference dose.

Three of the background inorganic chemicals provided in Table 3.3.1-1 are also carcinogens. Applying the default exposure assumptions used for SALs, the lifetime cancer risks due to residential soil exposure to background concentrations (UTL column) are estimated at approximately 1 excess case of cancer in 100,000 people for beryllium, 2 in 100,000 for arsenic, and 2 in 1,000,000,000 for cadmium (carcinogenic only by inhalation). EPA uses a range of 1 excess case of cancer in 10,000 people to 1 in 1,000,000 as a guidance for an acceptable range of cancer risk (EPA 1990, 0559).

These background risk estimates provide a frame of reference for a risk-based screening assessment and site decisions. If a site-specific risk assessment is necessary to further evaluate risks, background risks can also be calculated using site/scenario-specific assumptions to assist in any remedial action decisions for the site.

Note any deviation to this process for decisions in this report.

TABLE 3.3.1-1
RISK DUE TO BACKGROUND CONCENTRATIONS OF INORGANIC CHEMICALS IN SOIL ASSUMING A RESIDENTIAL SCENARIO[a]

Inorganic Chemical	Background Soil Concentration[b] mg/kg		Hazard Quotient		Lifetime Cancer Risk	
	Median	UTL	Median	UTL	Median	UTL
Aluminum	10 000	38 700	0.1	0.5	NC[c]	NC
Antimony	0.6	1[d]	0.02	0.03	NC	NC
Arsenic	4	7.82	0.2	0.4	1×10^{-5}	2×10^{-5}
Barium	130	315	0.03	0.06	NC	NC
Beryllium	0.895	1.95	0.003	0.006	6×10^{-6}	1×10^{-5}
Cadmium[e]	0.2	2.6[d]	0.005	0.07	1×10^{-10}	2×10^{-9}
Chromium[f]	8.6	19.3	0.00009	0.0002	NC	NC
Cobalt	6	19.2	0.001	0.004	NC	NC
Copper	5.75	15.5	0.002	0.01	NC	NC
Lead[g]	12	23.3	0.03	0.06	NC	NC
Manganese	320	714	0.8	1.9	NC	NC
Mercury	0.05	0.1[d]	0.002	0.004	NC	NC
Nickel	7	15.2	0.005	0.01	NC	NC
Selenium	0.3	1.7[d]	0.0008	0.005	NC	NC
Thallium	0.2	1[d]	0.03	0.2	NC	NC
Uranium	0.9	1.87	0.004	0.008	NC	NC
Vanadium	21	41.9	0.04	0.08	NC	NC
Zinc	30.7	50.8	0.001	0.002	NC	NC

a. Risk estimates are based on reference doses, slope factors, and EPA Region 9 default exposure assumptions effective April 1996.
b. Background concentrations taken from the Longmire et al. all soil horizons data set (1995, 1142).
c. NC = noncarcinogen
d. Maximum detected background value.
e. Cancer risks for cadmium are based solely on inhalation of resuspended dust.
f. Naturally occurring chromium is assumed to exist in a trivalent state.
g. Hazard quotient based on biokinetic uptake model.

[1] UTLs and maximum concentration values are identical to those described in Section 3.2.1 (Inorganic Chemicals).

3.3.2 Risk Assessment

If a human health risk assessment was performed, use the boilerplate: The human health risk assessment(s) presented in Section 5.x.9 follow(s) the process outlined in the policy document Risk-Based Corrective Action Process (Dorries 1996, 1297) and consists of the following steps:

- identification of COPC concentrations,
- exposure assessment,
- toxicity assessment, and
- risk characterization.

If no human health risk assessments were performed, use the following statement: No human health risk assessments were performed for this PRS or PRS aggregate).

If applicable, indicate if more sampling is proposed to collect more data for a human health risk assessment.

3.4 Ecological Assessment

In cooperation with the New Mexico Environment Department and EPA Region 6, the Laboratory ER Project is developing an approach for ecological risk assessment. Further discussion of ecological risk assessment methodology will be deferred until the ecological exposure unit methodology being developed has been approved.

4.0 RESULTS OF QUALITY ASSURANCE/QUALITY CONTROL ACTIVITIES

Chapter 4 is similar (although more report-specific) to Chapter 3 in that it provides background for the presentation of results in Chapter 5. Chapter 4 gives the reviewer a preview of the validity of the data presented in Chapter 5. The EPA guidance provided to LANL/DOE in 1994 shows a summary of QA/QC results preceding the analyses presented in Chapter 5.

Because many, if not all, RFI reports must cover volumes of data, the focus of the discussion in this section must be on potential problems associated with the usability of the data. These problems are summarized in the Data Validation table in Appendix B, which must be included for every report (see example in Appendix B). Include only data that have potential problems. If necessary, use more than one table per suite. The table and the text include explanations, where possible, of how qualified data can still be used in Chapter 5.

This section reviews the impact on data usability of QC results reported in Appendix B of this RFI report, as well as QA results associated with laboratory and field QC samples.

NOTE: When using qualified data, especially those impacted by QC deficiencies, a rationale for accepting the data for use must be included in Sections 4.1, 4.2, and/or 4.3, as appropriate.

Each subsection within this chapter must describe the usability of the data. For each subsection, describe any problem associated with

- **surrogates,**
- **matrices,**
- **blanks,**
- **lab and field replicates,**
- **holding times, and**
- **etc. as applicable**

State that the qualifications placed on sample results by data validation are summarized in Appendix B. Reference Table B-1 (B-2, B-3, etc., as needed) and include qualifications in Appendix B.

4.1 Inorganic Analyses

Include the number of field samples collected and the number and type of field QC samples analyzed for the suite of inorganic chemicals.

Describe inorganic QC information that may impact data use. For example, as indicated by matrices, blanks, lab and field replicates, etc. Include a description of the QC samples evaluated. Include any nonroutine services, such as a metal not on the target analyte list. Highlight specifics relative to any focused validation performed. State the reason focused validation was requested, summarize the conclusions, and list PRSs and sections in this report to which the qualified data apply.

Note any deviations from the general data verification/validation process, such as assuming the correctness of analyte identification, and note any deviation to this process for decisions in this report.

If inorganic analyses were not performed, use the following statement: No inorganic analyses were performed at this site.

4.2 Radiochemical Analyses

Include the number of field samples collected and the number and type of field QC samples analyzed for the suite of radionuclides.

Describe pertinent information relative to all the radiochemical data. Describe radiochemical QC information that may impact data use. For example, as indicated by tracers and carriers, matrices, lab and field replicates, etc. Include a description of the QC samples evaluated. Include any nonroutine services, such as a radionuclide not on the routine analytical services target analyte list. Highlight specifics relative to any focused validation performed. State the reason focused validation was requested, summarize the conclusions, and list PRSs and sections in this report to which the qualified data apply.

Note any deviations from the general data verification/validation process, such as assuming the correctness of analyte identification, and note any deviation to this process for decisions in this report.

If radiochemical analyses were not performed, use the following statement: No radiochemical analyses were performed at this site.

4.3 Organic Analyses

Include the number of field samples collected and the number and type of field QC samples analyzed for the suite of organic chemicals.

Describe organic QC information that may impact data use. For example, as indicated by surrogates, matrices, blanks, lab and field replicates, etc. Include a description of the QC samples evaluated. Include any nonroutine services, such as TPHs or BTEX. Unless one or more EQL values are elevated due to matrix problems, eliminate non-detected organic chemicals for which detection limits exceed SAL values from further evaluation. (See Section 3.2.3, Organic Chemicals). Highlight specifics relative to any focused validation performed. State the reason focused validation was requested, summarize the conclusions, and list PRSs and sections in this report to which the qualified data apply.

Note any deviations from the general data verification/validation process, such as assuming the correctness of analyte identification, and note any deviation to this process for decisions in this report.

If applicable, include HE in Section 4.3.

If organic analyses were not performed, use the following statement: No organic analyses were performed at this site.

5.0 SPECIFIC RESULTS, CONCLUSIONS, AND RECOMMENDATIONS

Create any necessary subsections if such splitting enhances the organization and clarity of the presentation.

5.1 PRS or Aggregate "X"

Briefly summarize the PRS or PRS aggregate. This should be no more than one or two sentences. Include

- **specific associated building(s) and structure(s);**
- **types of unit(s) (e.g., outfall, septic tank, etc.);**
- **nature of contamination observed; and**
- **recommendations.**

For example, "Septic Tank PRS XX-001 served buildings TA-XX-XX and TA-XX-XY. Organic solvents were detected at concentrations above human health risk-based standards and is, therefore, being recommended for cleanup under a voluntary corrective action. A VCA plan for this PRS is planned for submittal to DOE by date." (Provide the best estimate. For example, by January 1997 or by the second quarter of 1997.) "All specific results, conclusions, and recommendations are (will be) included in the VCA plan."

If applicable, include Figure 5.1-1 (see example) to indicate the PRS (PRS aggregate) location.

5.1.1 History

PRS or Aggregate "X" is discussed in detail in Section(s) XX of the RFI work plan (RFI Work Plan for OU XXXX LANL 199X, XXXX) or other document (e.g., an RFI Report or Sampling Plan). **Include**

- **a discussion of any archival data that became available after the RFI work plan (or other document) was submitted;**
- **the process(es) that might have created contamination; and**
- **a discussion of the chemicals used at the site that contributed to the list of COPCs.**

5.1.2 Description

Include specifics for the geology, hydrology, soils, wildlife habitats, etc., that were not detailed in Chapter 2.

5.1.3 Previous Investigation(s)

Include

- **any pre-RFI studies** *(if this information is available in the RFI work plan, summarize the previous investigations and refer the reader to the work plan for more detail)* **and**
- **a summary of any Phase I information if the current report is a Phase II (or further investigation) report** *(if this information is available in an RFI report, summarize the previous investigations and refer the reader to the report for more detail).*

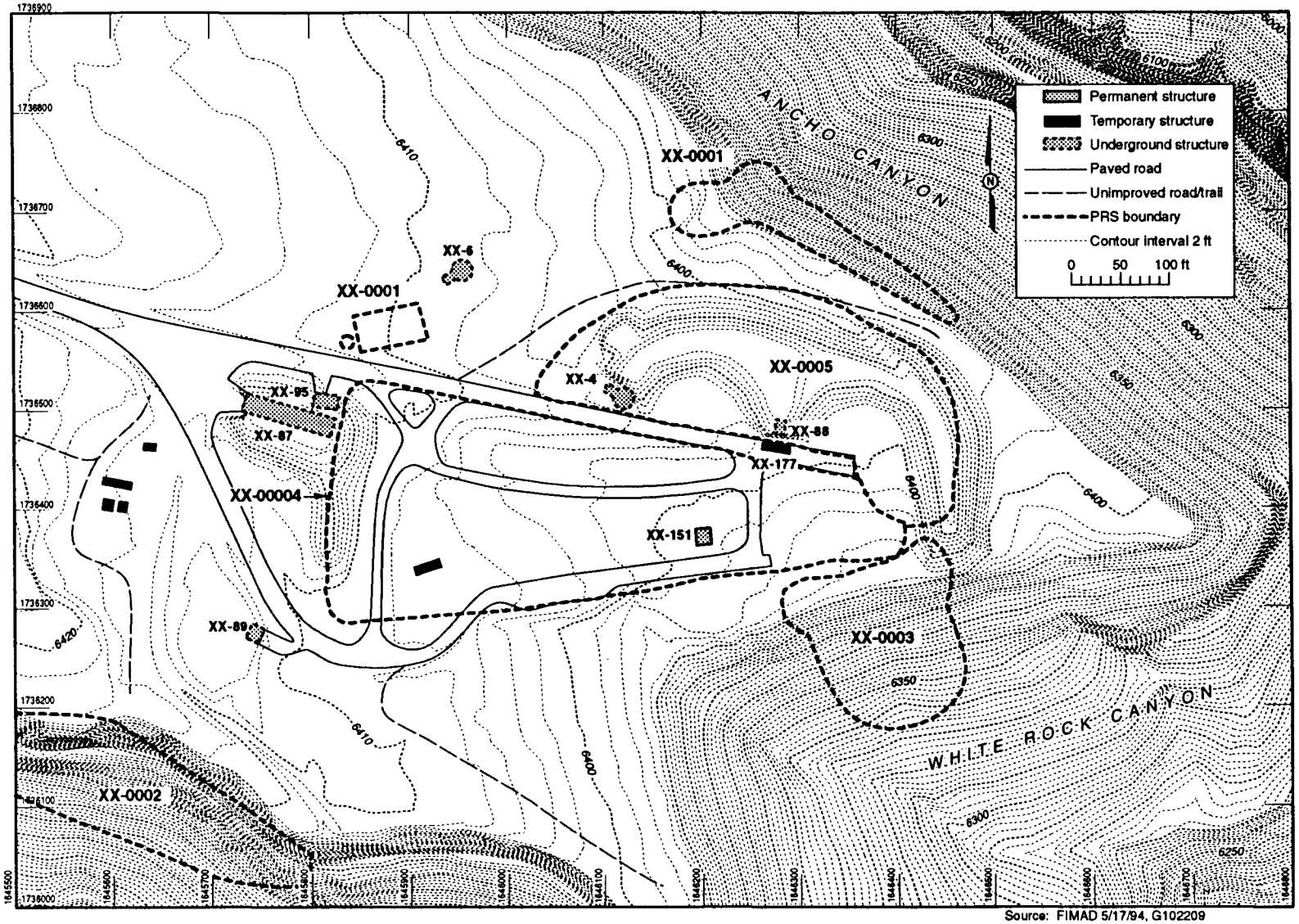
If no previous investigations have been performed, use the following statement: No previous investigations have been performed at this site.

If data from a previous investigation are used to support the risk-based screening assessment (see Section 5.1.8), prepare a table with standard format (see example Tables 5.1.5-1, 5.1.6-1, 5.1.7-1, and 5.1.8-3) to support the discussion. The quality of the data should also be discussed if those data are used in the screening assessment.

5.1.4 Field Investigation

Summarize the specific objectives of the investigation and the supporting conceptual model specific to the PRS (PRS aggregate).

Describe when the investigation took place, and outline what specifically was performed to investigate the PRS (or aggregate); report on the outcome of the activities, including any problems associated with the operation. Include



Source: FIMAD 5/17/94, G102209
Modified by cARTography by A. Kron 12/11/95
Modified by: L. Nonno 04/12/96

Figure 5.1-1. Aggregate X PRSs in this RFI report.

- all field-screening results except screening for health and safety (table format optional), including results from more than one season, if applicable; type of field-screening instrument(s) used; general frequency and range of levels detected for the chemicals investigated with each type of instrument;
- all information relevant to borehole sampling, such as depths; and
- all information relevant to the actual sampling event(s) (e.g., types of samples collected, etc.).

Report any deviations from an approved sampling plan. Include

- what was supposed to have been done (based on approved sampling and analysis plan);
- a clear description of the deviation;
- why the deviation was necessary; and
- any impact to the success of the field activities experienced because of the deviation.

Include Table 5.1.4-1 (see example) to summarize all sampling. Format as shown in the example. If samples for a particular suite were not collected, do not include that column. Add any nonstandard suite(s) as applicable. If necessary, provide more than one table, breaking out by suite where applicable. Reference Figure 5.1.4-1 (see example) showing all sample locations (use example format provided unless dividing the figure would allow for more detail or would be less confusing). In Figure 5.1.4-1, it is recommended that all surface samples (i.e., 0-5 ft) be indicated using sample ID numbers; all deeper borehole samples be indicated using location ID numbers; and if the sample location has both surface and subsurface samples, the location ID number only should be used. However, if mixing sample and location IDs on a single figure makes that figure confusing, do what makes sense for the PRS being considered.

TABLE 5.1.4-1
SUMMARY OF SAMPLES TAKEN

Location ID	Sample ID	Depth (ft)	Media*	VOCs	SVOCs	PCBs	Inorganic Chemicals	Radionuclides
ta-0001	futa-yr**-1285	0 - 0.5	soil	xxxxx***				
ta-0002	futa-yr-1286	0.5 - 1	soil					
ta-0003	futa-yr-4691	0 - 0.5	soil					
ta-0004	futa-yr-4692	0.5 - 1	soil					
ta-0005	futa-yr-4700	0 - 0.5	soil					
ta-0006	futa-yr-4701	0.5 - 1	soil					
ta-0007	futa-yr-4702	6	Qbt3					
ta-0008	AAA1000	0.5 - 1	fill					

* *Indicate specific soil master horizon or geologic subunit, if appropriate. (Ryti et al. 1996, 1298)*
** *fu = field unit number; ta = technical area number; yr = last 2 digits of the year in which the sample was taken.*
*** *xxxxx = request number*

NOTE: All information included in this table is example data only. Table footnotes designated by asterisks are guidance only.

5.1.5 Evaluation of Inorganic Chemicals

Summarize the COPCs determined as a result of the screening. Follow the example table provided (see Table 5.1.5-1). When the results being reported are for two or more analytes and/or for two or more sample IDs, always use the table format. Otherwise, results may be summarized using text only.

The regulators originally asked for the table format provided in Table 5.1.5-1. To accommodate multiple matrix-based UTLs for data obtained from several soil layers and/or geologic subunits (Ryti et al. 1996, 1298), two format options to this table (see examples) have been provided. Option 1 provides a column for designating soil master horizon and/or geologic subunit. Option 2 is organized by soil master horizon and/or geologic subunit. Use which ever option best suits specific needs. Use of landscape mode and reduced type size to include more analytes is acceptable for all versions of this table. In those instances for which the number of analytes makes using the original table options extremely unwieldy, you may use the alternate format [see Table

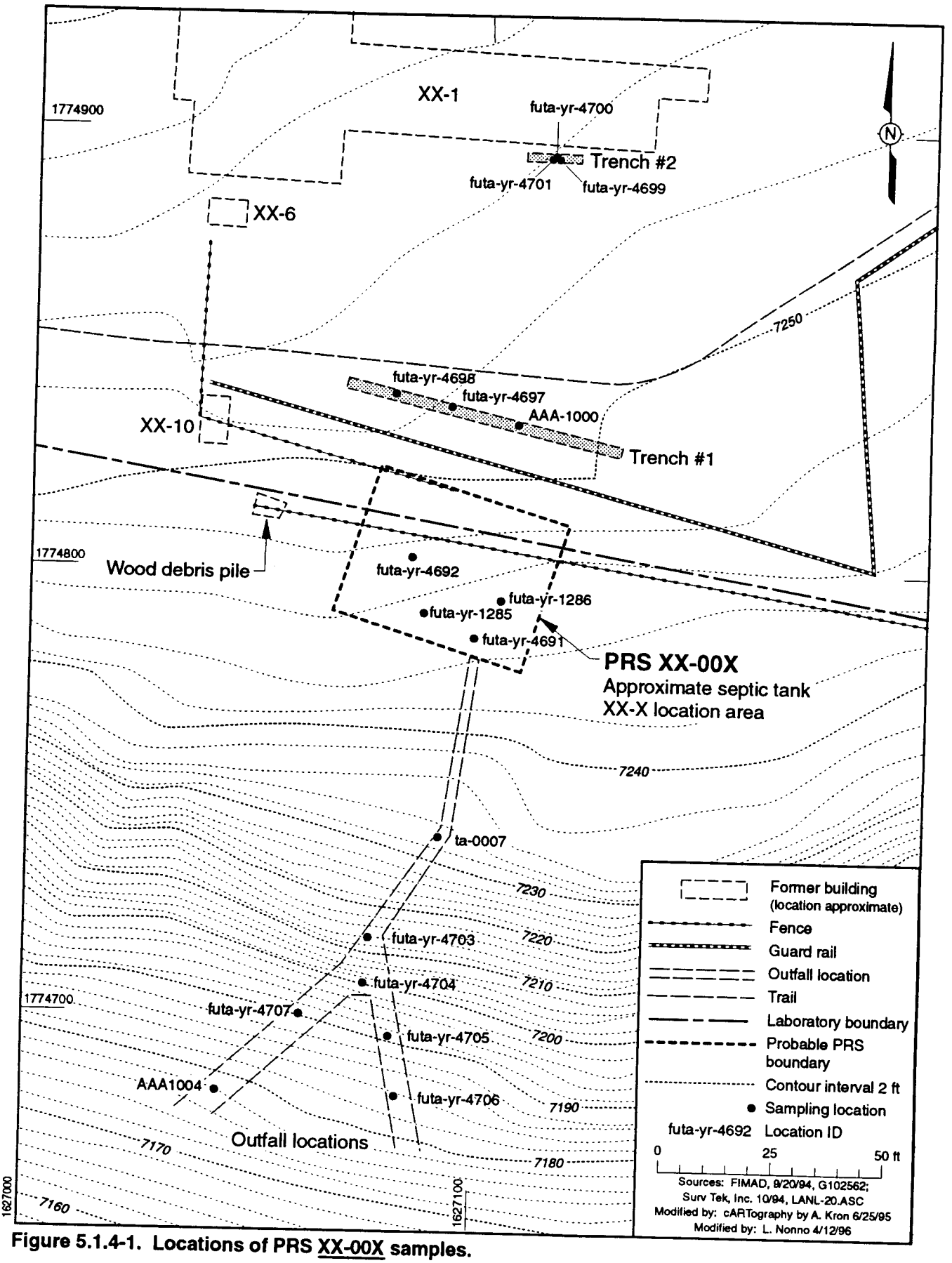


Figure 5.1.4-1. Locations of PRS XX-00X samples.

5.1.5-1 (alternate format)].

NOTE 1: It is the data user's responsibility to capture or convert data from FIMAD in the appropriate format, including conveying the proper number of significant figures. Improper use of significant figures could indicate to the reader a lack of professionalism and inattention to the data sets being presented thus presenting a poor image of the Laboratory. It is important to document any impact to a decision due to rounding data values. Make sure the data presentation is logical and defensible.

NOTE 2: Table includes the background UTL as well as the SAL. The SAL is included to assist the reviewer in thinking ahead about whether a COPC above its UTL value is also above SAL. In order to better visualize the data, show hits above UTL by outlining the table cell that contains the result and by reversing the text for those hits above SAL (see Table 5.1.5-1 for example). When selecting the outline for a cell, use 1 1/2 pt. double outlining, bold outlining, or an equivalent, dependent upon the software used in creating the table.

NOTE 3: Use U qualifiers rather than a "<" symbol. Do not include chemicals for which all data are U-qualified unless one or more U-qualified values exceed the UTL.

In the table, include qualifiers assigned during the data validation process (not analytical laboratory qualifiers) where applicable. Do not leave any table cell blank, even if a value falls below background UTL. Use this table to provide analysis results even for those analytes for which no UTL is available (see silver for example). Do not include a column for chemicals with no UTL (e.g., mercury) unless there are observations above detection limits.

^*^*^*^*^*^*^*^*^*^*^*^* *(option 1)*^*^*^*^*^*^*^*^*^*^*^* *(option 1)*^*^*^*^*^*^*^*^*^*^*^* *(option 1)* *^*^*^*^*^*^*^*^*^*^*^*

^*

TABLE 5.1.5-1
INORGANIC CHEMICALS WITH CONCENTRATIONS AT OR ABOVE BACKGROUND SCREENING VALUES FOR PRS/AGGREGATE "X"

Sample ID	Depth (ft)	Media**	Mercury (mg/kg)	Silver (mg/kg)	Nickel (mg/kg)	Lead (mg/kg)	Zinc (mg/kg)
SAL	N/A[b]	N/A[b]	23	383	1 500	400	23 000
soil UTL[a]	N/A[b]	N/A[b]	0.1[c]	DL[d]	15.2	23.3	50.8
Qbt3 UTL	N/A[b]	N/A[b]	DL[d]	1.9	2.6	16.2	55.5
futa-yr*-1285	0 - 0.5	soil	10.2	2.4 (U)	19	350	23
futa-yr-1286	0.5 - 1	soil	12.6	26	9.5	11 (J)	276
futa-yr-4691	0 - 0.5	soil	13 (J)	23 (J)	0.8 (U)	15	964
futa-yr-4700	0.5 - 1	soil	10	200	15 (J-)	143	350
futa-yr-4701	0 - 0.5	soil	14 (J)	1 600	26.7	17 (J)	1 208
AAA1004	0.5 - 1	soil	0.08 (U)	400	7 (J-)	45	985
futa-yr-4702	6-7	Qbt3	14	450	1.2	18	125

a. Upper tolerance limit of LANL-wide soil background date from A, B, and C horizons.
b. NA = not analyzed. N/A = not applicable. *(Use as applicable.)*
c. Maximum detected background value.
d. Background data not available; sample-specific detection limits (DLs) used as screening criteria.
* *fu = field unit number; ta = technical area number; yr = last 2 digits of the year in which the was taken.*
** *Indicate specific soil master horizon or geologic subunit if appropriate.*

Qualifiers used in table are defined in Section 3.1.2.

^*

^*^*^*^*^*^*^*^*^*^*^*^* *(option 1)*^*^*^*^*^*^*^*^*^*^*^* *(option 1)*^*^*^*^*^*^*^*^*^*^*^* *(option 1)* *^*^*^*^*^*^*^*^*^*^*^*

NOTE: All information included in this table is example data only. Table footnotes designated by asterisks are guidance only.

^^*^*^*^*^*^*^*^*^*^*(option 2)*^*^*^*^*^*^*^*^*^*^*^*(option 2)*^*^*^*^*^*^*^*^*^*^*^*(option 2)*^*^*^*^*^*^*^*^*^*^*^*^

TABLE 5.1.5-1
INORGANIC CHEMICALS WITH CONCENTRATIONS AT OR ABOVE BACKGROUND SCREENING VALUES FOR PRS/AGGREGATE "X"

Sample ID	Depth (ft)	Mercury (mg/kg)	Silver (mg/kg)	Nickel (mg/kg)	Lead (mg/kg)	Zinc (mg/kg)
SAL	N/A[b]	23	383	1 500	400	23 000
soil UTL[a,**]	N/A[b]	0.1[c]	DL[d]	15.2	23.3	50.8
futa-yr*-1285	0 - 0.5	10.2	2.4 (U)	19	350	23
futa-yr-1286	0.5 - 1	12.6	26	9.5	11 (J)	276
futa-yr-4691	0 - 0.5	13 (J)	23 (J)	0.8 (U)	15	964
futa-yr-4700	0.5 - 1	10	200	15 (J-)	143	350
futa-yr-4701	0 - 0.5	14 (J)	1 600	26.7	17 (J)	1 208
AAA1004	0.5 - 1	0.08 (U)	400	7 (J-)	45	985
Qbt3 UTL**	N/A[b]	DL[d]	1.9	2.6	16.2	55.5
futa-yr-4702	6-7	14	450	1.2	18	125

a. Upper tolerance limit of LANL-wide soil background date from A, B, and C horizons.
b. NA = not analyzed. N/A = not applicable. *(Use as applicable.)*
c. Maximum detected background value.
d. Background data not available; sample-specific detection limits (DLs) used as screening criteria.
* *fu = field unit number; ta = technical area number; yr = last 2 digits of the year in which the was taken.*
** *Indicate specific soil master horizon or geologic subunit if appropriate.*

Qualifiers used in table are defined in Section 3.1.2.

^^*^*^*^*^*^*^*^*^*^*(option 2)*^*^*^*^*^*^*^*^*^*^*^*(option 2)*^*^*^*^*^*^*^*^*^*^*^*(option 2)*^*^*^*^*^*^*^*^*^*^*^*^

NOTE: All information included in this table is example data only. Table footnotes designated by asterisks are guidance only.

If, regardless of qualifiers assigned during baseline data validation (i.e., during data validation using generic, not problem-specific, criteria), the data are determined usable for decisions specific to this site, use the following words: The qualifiers shown in the table have been assigned during baseline data validation. However, the data are usable for site-specific decisions, as stated in the rationale below.

Explain why it was determined that the data are usable (e.g., "As discussed in Section 4.1 (Inorganic Analyses), nickel data were qualified because of low surrogate recovery. However, because nickel was identified above its UTL value in two of the samples without qualifiers, nickel is carried forward to SAL comparisons regardless that the qualified values might be above UTL"). NOTE: If the data usability concerns were determined to be independent of PRS-specific decisions, then the rationale should have appeared in Section 4.1.

If data have been rejected by focused validation using decision-specific criteria, then the data should not be used for decision-making purposes.

If other statistical tests are used for background comparisons, specify the test(s). Provide a rationale for using the tests and discuss the decisions you made based upon these tests.

In discussing inorganic chemicals at or above background, reference a detailed figure (see example Figure 5.1.5-1) that shows spatially where chemicals above background are found at the site. If necessary for showing detail, use more than one figure. If numerous chemicals are identified, thus cluttering the figure, chemicals above UTLs not affecting site decisions may be omitted. At the discretion of the authors, depth and concentration may be included in the

figure to indicate spatial relations if this is important to the conclusions of this report. As appropriate, either location or sample ID number must be specified for each data point included in the figure. If appropriate, the same information should appear or be clearly noted in the corresponding table. If applicable, risk-based COPCs should be identified in this figure or in a separate figure (see Section 5.1.8, Risk-Based Screening Assessment).

NOTE: Chemicals identified above background as a result of screening are now COPCs.

^*^*^*^*^*^* *(alternate format)*^*^*^*^*^*^*^*^*^(alternate format)*^*^*^*^*^*^*^*^*^* (alternate format)*^*^*^*^*^*^*^

TABLE 5.1.5-1

INORGANIC CHEMICALS WITH CONCENTRATIONS AT OR ABOVE BACKGROUND SCREENING VALUES FOR PRS/AGGREGATE "X"

Analyte (mg/kg)	Sample ID	Sample Value (mg/kg)	SAL (mg/kg)	UTL[a] (mg/kg)	Media**	Depth (ft)
Mercury	futa-yr*-1285	10.2	23	0.1[c]	soil	0 - 0.5
	futa-yr-4700	46			soil	0.5 - 1
	futa-yr-4704	54			soil	0 - 0.5
	futa-yr-4705	24.5			soil	0.5 - 1
Silver	futa-yr-4709	12.6	383	DL[d]	soil	0.5 - 1
Nickel	futa-yr-4691	16	1 534	15.2	soil	0 - 0.5
Lead	futa-yr-4700	725	400	23.3	soil	0.5 - 1
	futa-yr-4701	25			soil	0 - 0.5
	futa-yr-4705	460		16.2	Qbt3	6-7
Uranium	futa-yr-4701	14 (U)	230	5.45	soil	0 - 0.5

a. Upper tolerance limit of LANL-wide soil background date from A, B, and C horizons.
b. NA = not analyzed. N/A = not applicable. *(Use as applicable.)*
c. Maximum detected background value.
d. Background data not available; sample-specific detection limits (DLs) used as screening criteria.
* *fu = field unit number; ta = technical area number; yr = last 2 digits of the year in which the was taken.*
** *Indicate specific soil master horizon or geologic subunit if appropriate.*

Qualifiers used in table are defined in Section 3.1.2.

^*^*^*^*^*^* *(alternate format)*^*^*^*^*^*^*^*^*^(alternate format)*^*^*^*^*^*^*^*^*^* (alternate format)*^*^*^*^*^*^*^

NOTE: All information included in this table is example data only. Table footnotes designated by asterisks are guidance only.

5.1.6 Evaluation of Radionuclides

Summarize the COPCs determined as a result of the screening. Follow the example table provided (see Table 5.1.6-1). When the results being reported are for two or more analytes and/or for two or more sample IDs, always use the table format. Otherwise, results may be summarized using text only.

Follow the same guidance for table formatting as stated in Section 5.1.5 (Evaluation of Inorganic Chemicals). The guidance in Notes 1, 2 and 3 of Section 5.1.5 also apply to Section 5.1.6.

In the table, include qualifiers assigned during the data validation process (not analytical laboratory qualifiers) where applicable in each table. Do not leave any table cell blank, even if a value falls below background UTL. Use this table to provide analysis results even for those analytes for which no UTL is available

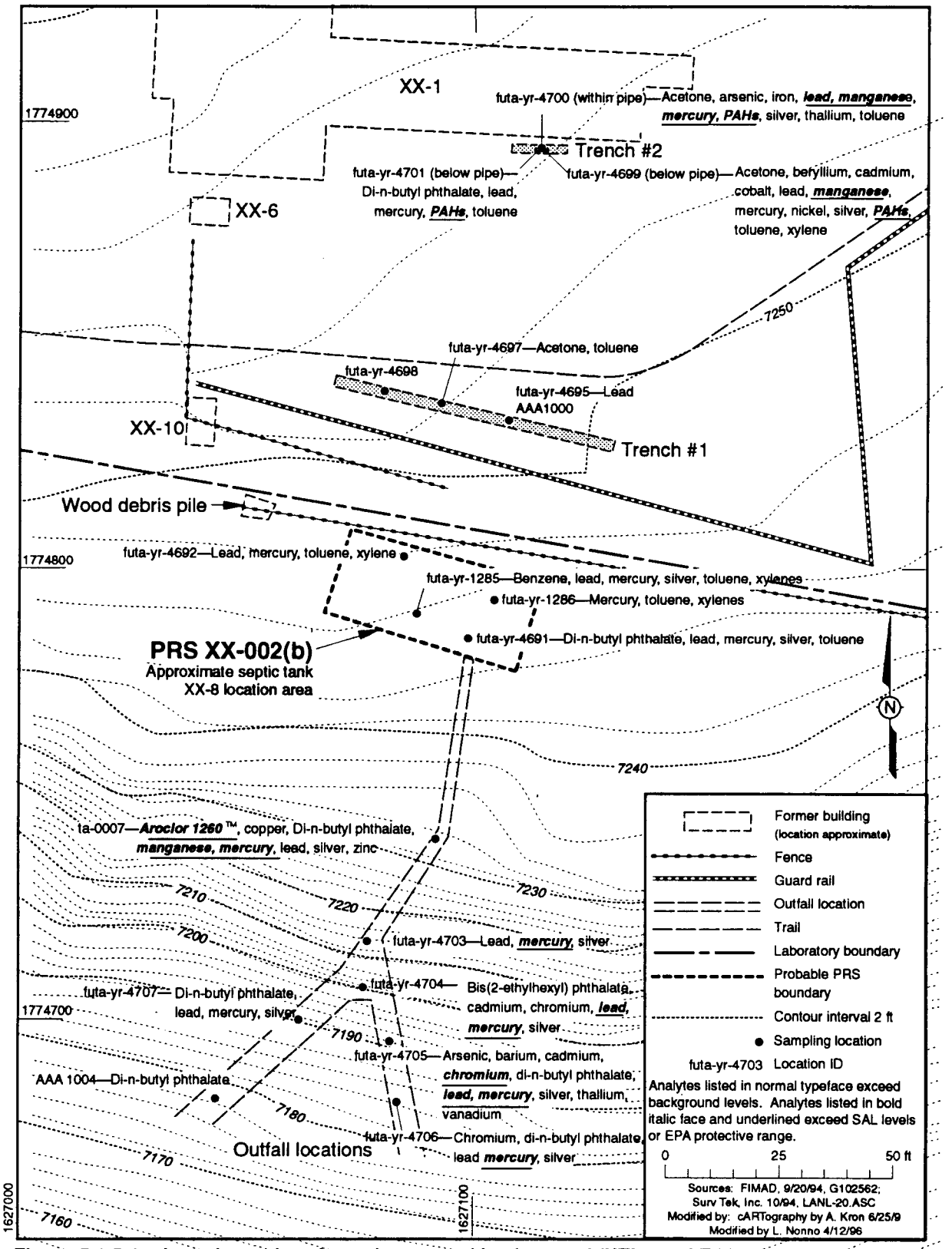


Figure 5.1.5-1. Locations of analytes that exceed background (UTLs and EQLs) and that exceed SALs at PRS/Aggregate X.

TABLE 5.1.6-1
RADIONUCLIDES WITH CONCENTRATIONS AT OR ABOVE BACKGROUND SCREENING VALUES FOR PRS/AGGREGATE "X"

Sample ID	Depth (ft)	Plutonium-239/240 (pCi/g)	Strontium-90 (pCi/g)	Cesium-134 (pCi/g)	Tritium (pCi/g)	Uranium-234 (pCi/g)
UTL[a]	N/A[b]	0.05[c]	1[c]	not available[d]	2.6[e]	1.94[c]
SAL	N/A[b]	24	4.4	1.9	260	13
futa-yr*-1285	0 - 0.5	2 500 (J+)	1.92	0.35	350	74
futa-yr-1286	0.5 - 1	2 400 (J+)	0.303 (UJ-)	0.11	430	27
futa-yr-4691	0 - 0.5	1 200 (J+)	0.704	0.244	290	64
futa-yr-4700	0.5 - 1	980 (J+)	0.252	0.144	1 436	35
futa-yr-4701	0 - 0.5	670 (J+)	0.276	0.177	377	12
AAA1004	0.5 - 1	725 (J+)	0.239	0.459	459	59

a. Upper tolerance limit of LANL-wide soil background date from A, B, and C horizons.
b. NA = not analyzed. N/A = not applicable. *(Use as applicable.)*
c. Maximum detected value from Environmental Surveillance data.
d. Background data not available; sample-specific minimum detectable activities are used as screening criteria.
e. Maximum detected value from Environmental Surveillance data (13 pCi/ml) and maximum soil moisture (25%).
* *fu = field unit number; ta = technical area number; yr = last 2 digits of the year in which the sample was taken.*

Qualifiers used in table are defined in Section 3.1.2.

NOTE: All information included in this table is example data only. Table footnotes designated by asterisks are guidance only.

(see cesium-134, for example). Do not include a column for radionuclides with no UTL unless there are observations above detection limits.

If, regardless of qualifiers assigned during baseline data validation (i.e., during data validation using generic, not problem-specific, criteria), the data are determined usable for decisions specific to this site, use the following words: The qualifiers shown in the table have been assigned during baseline data validation. However, the data are usable for site-specific decisions, as stated in the rationale below.

Explain why it was determined that the data are usable (e.g., "During the data validation process, data were rejected because of the high recovery rate for the plutonium-242 tracer. How-ever, in this case, the plutonium-239/240 sample values are so high that the potential positive bias is insignificant relative to the degree to which the UTL value was exceeded. The data are, therefore, considered usable for the purpose of UTL comparison"). NOTE: This example of data usability differs from the examples provided for inorganic and organic chemicals. In this case, the data usability concerns are related to a PRS-specific decision. If the data usability concerns were determined to be independent of PRS-specific decisions, then the rationale should have appeared in Section 4.2.

If data have been rejected by focused validation using decision-specific criteria, then the data should not be used for decision-making purposes.

If other statistical tests are used for background comparisons, specify the test(s). Provide a rationale for using the tests and discuss the decisions you made based upon these tests.

In discussing radionuclides at or above background, reference back to Figure 5.1.5-1 or generate a new map using the same format as Figure 5.1.5-1.

NOTE: Chemicals identified above background as a result of screening are now COPCs.

5.1.7 Evaluation of Organic Chemicals

EQLs are analyte specific and sample dependent. Organic chemicals that have been positively identified at a site may have been measured at concentrations either above or below their EQLs. All positively identified COPCs must be shown in Table 5.1.7-1 (see example table). It is important to evaluate any positively identified results that are less than the EQL. Estimated values (J-qualified) below the EQL may be important to the risk assessor for multiple chemical evaluation

(MCE), the statistician, or the project leader who may need to address the presence of the positively detected analyte(s) as an indicator of potential contamination that may need further investigation. If any organic chemical is in this category, the rationale for eliminating it from further consideration as a COPC must be described.

Judgment should be used whether to also reference a map showing where organic chemicals above their EQLs are found at the site. If an organic chemical appears to be a COPC (e.g., not due to blank contamination, etc.), then referring to a map may be appropriate; however, many organic chemicals detected are so far below SAL that reference to a map may be unnecessary. If a map is used, reference back to Fig. 5.1.5-1 or generate a new map using the same format as Fig. 5.1.5-1.

Follow the example table for comparison with estimated quantitation limits (see Table 5.1.7-1).

NOTE 1: In Table 5.1.7-1, use significant figures as per the guidance of Section 5.1.5 Note 1.

NOTE 2: Table includes the EQL as well as the SAL. The SAL is included to assist the reviewer in thinking ahead about whether an identified COPC above its EQL value is also above SAL. In order to better visualize the data, show hits above EQL by outlining the table cell that contains the result and by reversing the text for those hits above SAL (see Tables 5.1.7-1 for example). When selecting the outline for a cell, use 1 1/2 pt. double outlining, bold outlining, or an equivalent, dependent upon the software used in creating the table.

NOTE 3: Use U qualifiers rather than a "<" symbol. Do not include chemicals for which all data are U-qualified.

TABLE 5.1.7-1
DETECTED ORGANIC CHEMICALS FOR PRS/AGGREGATE "X"

Sample ID	Depth (ft)	Aroclor-1254 (mg/kg)	Dibutyl phthalate (mg/kg)	Tetrachloroethylene (mg/kg)
SAL	N/A[a]	1.4	6,500	7.0
EQL	N/A[a]	1.0	0.33	0.013
futa-yr*-1000	0 - 0.5	3.0	0.11 (J)	0.01
futa-yr -1001	0.5 - 1	5.0	0.46	0.008 (J+)
futa-yr -1002	0 - 0.5	2.44	0.73	0.01
futa-yr -1003	0.5 - 1	2.24	0.41	0.013
AAA1004	0 - 0.5	0.7 (U)	0.88	0.010 (J+)
AAA1005	0.5 - 1	0.8 (U)	0.29 (J)	0.01
futa-yr -1006	0 - 0.5	1.66	0.92	0.01

a. NA = not analyzed. N/A = not applicable. *(Use as applicable.)*
* *fu = field unit number; ta = technical area number; yr = last 2 digits of the year in which the sample was taken.*

Qualifiers used in table are defined in Section 3.1.2.

NOTE: All information included in this table is example data only. Table footnotes designated by asterisks are guidance only.

Include qualifiers assigned during the data validation process (not analytical laboratory qualifiers) where applicable in table. Do not leave any table cell blank, even if a value falls below EQL.

If, regardless of qualifiers assigned during baseline data validation (i.e., during data validation using generic, not problem-specific, criteria), the data are determined usable for decisions specific to this site, use the following words: The qualifiers shown in the table have been assigned during baseline data validation. However, the data are usable for site-specific decisions, as stated in the rationale below.

Explain why it was determined that the data are usable (e.g., "As discussed in Section 4.3 (Organic Analyses), tetrachloroethylene data were qualified because of high surrogate recovery. However, because no sample values exceeded the sample EQL, tetrachloroethylene is not

identified as a COPC regardless of the potential positive bias of the sample data"). NOTE: If the data usability concerns were determined to be independent of PRS-specific decisions, then the rationale should have appeared in Section 4.3.

If data have been rejected by focused validation using decision-specific criteria, then the data should not be used for decision-making purposes.

5.1.8 Risk-Based Screening Assessment

This section includes a comparison with SALs and, if applicable, a multiple chemical evaluation (MCE).

Present the results relative to the guidance and standards referenced in Section 3.2.4 (Risk-Based Screening Assessment).

Perform the risk-based screening assessment separately for noncarcinogens, chemical carcinogens, and radionuclides; present three separate tables. Follow the example shown in Table 5.1.8-3. Label the tables 5.1.8-1, 5.1.8-2, 5.1.8-3 for noncarcinogens, carcinogens, and radionuclides, respectively, as applicable to the site being reported.

TABLE 5.1.8-3
PRS/AGGREGATE "X" RADIONUCLIDES
WITH CONCENTRATIONS IN SOIL THAT EXCEED SALs

Sample ID	Location ID	Depth (ft)	Plutonium-238 (pCi/g)	Plutonium-239/240 (pCi/g)	Strontium-90 (pCi/g)	Uranium-234 (pCi/g)
SAL	N/A*	N/A*	27	24	4.4	13
futa-yr**-1000	ta-0001	0 - 0.5	36	2 500	3	18 (J)
AAA1001	ta-0002	0 - 0.5	54	2 400	19	86 (J)
AAA1002	ta-0003	0 - 0.5	498	1 200	113	74 (J)
futa-yr-1003	ta-0004	0 - 0.5	345	670	76	27 (J)
futa-yr-1004	ta-0005	0 - 0.5	112	140	23	64 (J)
futa-yr-1005	ta-0006	0 - 0.5	13	94	11	35 (J)
futa-yr-1006	ta-0007	0 - 0.5	58	23	34	11 (J)
futa-yr-1007	ta-0008	0 - 0.5	168	154	47	59 (J)

* NA = not analyzed. N/A = not applicable. *(Use as applicable.)*
** fu = field unit number; ta = technical area number; yr = last 2 digits of the year in which the sample was taken.

Qualifiers used in table are defined in Section 3.1.2.

NOTE: All information included in this table is example data only. Table footnotes designated by asterisks are guidance only.

Include qualifiers assigned during the data validation process (not analytical laboratory qualifiers) where applicable in table. Do not leave any table cell blank, even if a value falls below SAL. If no SAL is available, consult a member of the Decision Support Council Risk Assessment team.

If, regardless of qualifiers assigned during baseline data validation (i.e., during data validation using generic, not problem-specific, criteria), the data are determined usable for decisions specific to this site, use the following words: The qualifiers shown in the table have been assigned during baseline data validation. However, the data are usable for site-specific decisions, as stated in the rationale below.

In this case, explain why it was determined that the data are usable (e.g., "Uranium-234 analytical laboratory control sample results deviated from known values by 150%. The associated sample results were validated as estimates (J). Because several uranium 234 sample values exceeded the SAL by substantially more than 150%, the uncertainty in the sample values does not affect identification of uranium-234 as a COPC in the SAL comparison").

If data have been rejected by focused validation using decision-specific criteria, then the data should not be used for decision-making purposes.

If no chemicals were detected at or above SAL, make the statement that no chemicals were detected at or above SAL.

Provide a figure showing the location(s) of risk-based COPCs. (A previous figure such as Figure 5.1.5-1 may be used or a new figure may be generated.) As applicable, include Table 5.1.8-4 (see example) to show the results of MCE

calculations. Calculate MCE values to one decimal place only. The normalized values should contain the appropriate number of significant figures according to the guidance given in Section 5.1.5, NOTE 1. Note that most SAL values have only two significant figures. Show all COPCs (normalized values equal to or above 0.1) by reversing the text (see normalized values for antimony, lead, and pyrene in Table 5.1.8-4).

TABLE 5.1.8-4
MULTIPLE CHEMICAL EVALUATION FOR SOIL SAMPLES AT PRS/AGGREGATE "X"

Chemical	Location ID	Sample ID	Maximum Sample Value	Soil SAL[a]	Normalized Value
Noncarcinogenic Effects (mg/kg)					
Antimony	ta-0001	futa-yr*-1000	8.9	31	0.3
Cadmium	ta-0002	futa-yr-1001	3.4	38	0.09
Lead	ta-0003	futa-yr-1002	185	400	0.5
Pyrene	ta-0004	AAA1003	780	2 000	0.4
Silver	ta-0005	AAA1004	4.5	380	0.01
				Total[b]:	1
Carcinogenic Effects of Chemicals (mg/kg)					
Aroclor 1260	ta-0007	futa-yr-1005	0.55	1	0.6
Chromium	ta-0008	futa-yr-1006	62(J)	210	0.3
				Total[b]:	0.9
Carcinogenic Effects of Radionuclides (pCi/g)					
Plutonium -238	ta-0009	futa-yr-1007	1.27	27	0.05
Plutonium -239/240	ta-0010	futa-yr-1008	6.36(J)	24	0.3
				Total[b]:	0.4

a. SAL = screening action level.
b. Total may not equal sum of normalized values due to rounding.
* *fu = field unit number; ta = technical area number; yr = last 2 digits of the year in which the sample was taken.*

Qualifiers used in table are defined in Section 3.1.2.

NOTE: All information included in this table is example data only. Table footnotes designated by asterisks are guidance only.

5.1.9 Human Health Risk Assessment

Present the results of a preliminary risk assessment (if performed). Include

- **the land use scenario used to perform the assessment;**
- **a summary of the results in terms of whether an unacceptable risk does or does not exist at the site; and**
- **a discussion of the necessity of further investigation if an unacceptable risk was found.**

All calculations supporting the risk assessment (sufficient for the regulator to reproduce the risk assessment) must be provided in Appendix C.

If no risk assessment was necessary, use the following statement: No human health risk assessment was performed for this PRS (or PRS aggregate). **State the reason why no human health risk assessment was performed.**

A breakout of the following subsections may contribute to the organization and presentation of the material:

5.1.9.1 Review of COPCs and Extent of Contamination

Include a review of the COPCs identified in the previous subsections. In addition, define the nature and extent of contamination for the PRS or aggregate being reported. Also, the investigation, especially if designed to support a screening decision (or to identify COPCs), may not include sufficient data to assess the extent of contamination. In addition, some sites are, by type, exceptions; for instance, the linear and usually shallow nature of contamination typical of outfalls does not lend itself to topographic maps and subsurface cross sections; physical barriers, such as septic tank walls, may also limit need for such a discussion.

If an analysis is not appropriate, make the statement that extent of contamination is not known or appropriate for the level or type of investigation performed.

For sites where a spatial analysis of extent is appropriate and feasible, prepare a cross section showing vertical definition and a topographic map showing horizontal definition. The boundaries of where extent was defined are shown by a solid line; where it was not defined, a dashed line is used to support the discussion. The screening level to be used to select data for the presentation will vary on a case-by-case basis; in some instances all data above background may be relevant; but, in most cases, the data above SAL or some other level of risk will be considered to be the relevant data. As part of the analysis, discuss the necessity of further sampling if extent of contamination was not fully defined as a result of the investigation.

If a pathway analysis can be performed as a result of the spatial analysis of the data, include it in this section. The results of any modeling of the site that generate information on the spatial distribution of contaminants that have migrated from the site could also be presented in this section.

5.1.9.2 Exposure Assessment

Include, if applicable,

- ***description of exposure scenario, receptors, and pathways;***
- ***concentration and location of COPCs***
- ***environmental fate and transport modeling; and***
- ***estimation of COPC intake.***

5.1.9.3 Toxicity Assessment

Include an assessment of

- ***general toxicology of COPCs and***
- ***derivation of toxicity criteria for COPCs.***

If you have a long list of COPCs, include this information in Appendix C.

5.1.9.4 Risk and Dose Characterization

Risk and dose are characterized with respect to integration of the previous three sections. Risk due to naturally occurring inorganic chemicals in soils (background) may also be characterized with respect to the site-specific exposure assessment, if applicable, and presented here. Nonradionuclides and radionuclides, if both are addressed, may need to be covered in separate subsections.

Include an assessment of uncertainty with regard to

- ***land use assumptions,***
- ***exposure parameters and models,***
- ***environmental fate and transport models, and***
- ***toxicity criteria.***

5.1.10 Preliminary Ecological Assessment

In cooperation with the New Mexico Environment Department and EPA Region 6, the Laboratory ER Project is developing an approach for ecological risk assessment. Further ecological risk assessment at this (these) site(s) will be deferred until the site(s) can be assessed as part of the ecological exposure unit methodology currently being developed.

5.1.11 Conclusions and Recommendations

Use the results of Sections 5.1.3 through 5.1.10 to justify conclusions and recommendations. Develop conclusions to provide a comprehensive and logical rationale for the recommendations. If a risk assessment was not performed, the rationale supporting the decisions should put the quantitative screening results (UTL, EQL, and SAL comparisons) into a logical framework that interprets the results from the perspective of the conceptual model describing contaminant distribution and potential human exposure at the site.

Possible factors to be addressed in the rationale may include

- *Analytical Issues. Is the analyte list complete? If data are sufficient for evaluation, do bias and/or precision problems impact site recommendations?*
- *Spatial Characterization(s) Has (have) the location(s) of the PRS(s) being reported been positively identified? Are the number, location, and depth of soil samples sufficient? (Consider patterns observed in the data, possible contaminant redistribution since the time the site was active, release mechanisms, volume of release, etc.) Should additional media be sampled? Are the data biased?*
- *Environmental Fate and Transport. (Related to spatial characterization.) Could chemical or biological degradation and/or re-speciation impact decisions? Could chemical adsorption, precipitation, dissolution, etc., impact redistribution in the environment? How could site-specific hydrologic and geologic conditions impact contaminant transport and hence site decisions?*
- *Exposure and Toxicity(s) How do site location, accessibility, and potential use affect site decisions? How do assumptions concerning exposure mechanisms and model parameters impact site decisions? How does uncertainty in contaminant toxicity impact site decisions?*

If any of these factors were addressed in previous sections of this report (in particular if a risk assessment was performed), a brief summary of these evaluations and how they support the final recommendations is sufficient. Try to minimize the introduction of new information. This section should primarily interpret information from previous sections and connect it into a logical explanation to support the conclusions derived and the recommendations proposed.

In general, NFA recommendations based on Phase I data require the most substantial defense because a site decision is often made when sample data are limited. In this case, the rationale may involve a subjective cost/benefit evaluation based on the likelihood of new data affecting the site decision. If a Phase II investigation is proposed, the rationale for taking this action should support the problem definition and goals stated in Section 5.1.12.1 (SAP Problem Definition).

Clearly state the recommendation(s) for proposed actions.

If NFA is the proposed action, reference the appropriate NFA criterion *(See No Further Action Criteria Policy, EM/ER:95-PCT-015, R1, August 30, 1996 [Project Consistency Team, 1210])* **and include the following statement:** This (these) site(s) is (are) proposed for NFA, based on NFA Criterion provide number. A Class III permit modification will be requested to remove this site from the Hazardous and Solid Waste Amendments Module of the Laboratory's Resource Conservation and Recovery Act operating permit.

If the site is not on the HSWA Module, and no further action is necessary, include the following statement: Based on NFA Criterion provide number, this PRS will not be added to the HSWA Module of the Laboratory RCRA operating permit and is proposed for removal from the ER Project list of PRSs.

If Phase II (or any further investigation) is the proposed action, summarize when the additional sampling is necessary and include the sampling and analysis plan in Section 5.1.12.

If accelerated cleanup is proposed, state the reason for recommending the proposed cleanup and reference the accelerated cleanup plan to be submitted by a specified date.

If a corrective measures study is proposed, state the reason for recommending the study and reference the corrective measures study plan to be submitted by a specified date.

If the site is proposed to be deferred to the decommissioning program, state the reason and indicate a time (however tentative) by which the decommissioning will occur.

5.1.12 Sampling and Analysis Plan (SAP) for PRS or Aggregate "X."

DO NOT SUBMIT AN RFI REPORT WITHOUT AN ADEQUATE SAMPLING AND ANALYSIS PLAN (SAP). IF YOU ARE UNABLE TO DESIGN AN ADEQUATE SAP BY THE RFI DEADLINE, YOU SHOULD REQUEST AN EXTENSION OF THE DEADLINE AT LEAST ONE MONTH PRIOR TO THAT DEADLINE.

SAPs should be clear and specific enough that a second party given the plan could execute it with essentially the same results as those of the author of the plan. The plan should explicitly state the objectives and rationale for every set of samples (i.e., stream sediment samples, surface samples, subsurface samples, etc.). The following information is to be included.

5.1.12.1 Problem Definition

Question(s) to be answered by the data

- *Questions to be answered by the data collected must be concrete and specific, not open-ended.*

Purpose for which this information is needed

- *What decisions depend on the answers to these questions?*

Include only as much of the following types of information as is necessary to clarify the questions and purposes of the proposed investigation or help the reader to understand the site.

Site description

If this is part of a larger report in which the site has already been adequately described (e.g., an RFI report), reference the appropriate section(s).

- *Include a figure showing the salient site features and indicating the areas of interest.*
- *Summarize physical features and site history pertinent to this SAP.*

Historical data

Reference earlier sections of an RFI report, an attachment, or another report, for detailed information and lengthy data tables. Reference sources of historical data, directly or indirectly.

- *Summarize the most pertinent existing data; a short table may be appropriate.*

Regulatory drivers

- *Identify pertinent legislation, permits, guidance, etc.*

5.1.12.2 SAP Design

Present an overview of "what" and "why." The details of "how" belong in Section 5.1.12.3 (SAP Implementation).

Overview of information to be collected

- ***Identify locations and media to be sampled, and frequency if more than once.***
- ***Identify target analytes.***
- ***List all measurements (both field and analytical laboratory) to be reported.***
  - *Explain, if appropriate, how selection of samples for analytical laboratory analysis will be based on results of field tests, surveys, sampling grids, or statistics.*
  - *As appropriate, include figure(s) identifying sampling locations, and table(s) listing sample matrices, locations, depths, and proposed analyses.*
  - *Describe contingency plans, if any.*

How will these data be used to answer the questions?

- ***Specify the summary statistics to be calculated.***
- ***Specify target levels with which summary statistics will be compared.***
  - *Identify sources of other information for statistical or other comparisons, as appropriate, such as background data sets, previously collected baseline data, or data from an upgradient well.*

Assumptions underlying the design

- *For example,*
  - *expectations about the spatial distribution and levels of contamination,*
  - *assumptions about the availability of auxiliary information for biasing or stratifying samples,*
  - *expectations concerning the performance of field kits,*
  - *the anticipated bias and precision of individual measurements, and*
  - *physical and temporal constraints affecting the design.*

Requirements for data quality implied by intended data use

- *Specify the critical range of concentrations (e.g., within an order of magnitude of the preliminary remediation goal or waste acceptance criterion). Determine acceptable levels of precision and bias for summary statistics within this critical range.*
- *Consider foreseeable problems that could render the data unusable for its intended purpose.*

Measurements to verify assumptions and requirements

- ***Identify data quality assessment information to be collected to verify critical assumptions.***
  - *In particular, identify measurements or observations that will be used to trigger implementation of any contingency plan.*
- ***Describe data acceptance criteria that will be used for review, verification, and validation of the data.***

5.1.12.3 SAP Implementation

Provide a level of detail that makes the design outlined in Subsection 5.1.12.2 (SAP Design) "third-party implementable." Cite SOPs when available and appropriate. (Develop or modify SOPs if necessary.) Provide details not included in the SOPs.

Field methods

- ***Include all methods for surveying and sampling that will affect data to answer question.***
  - *Describe surveying and permanent marking of survey and sample locations.*
  - *Describe site preparation for surveys and sampling.*
  - *Describe sampling methods to be used. Include any special field sample preparation not covered in SOPs.*
  - *Specify when and how to collect QC samples, calibrate field instruments, etc.*
  - *Identify all sampling information that must be recorded on the sampling logs, in logbooks, and/or in the field database.*
  - *Describe any temporal information that may affect data collection.*

Measurement methods

- ***Include field, mobile laboratory, and off-site laboratory methods.***
  - *Cite SOPs wherever possible. Exclude measurements for H&S, DOT, etc.*
  - *Identify screening instruments to be used. Supplement SOPs with sufficient QC/calibration/testing to meet requirements.*
  - *Describe use of field test kits. Supplement SOPs or manufacturer's instructions with sufficient QC/calibration/testing to meet requirements.*
  - *Describe auxiliary field measurements to be made, e.g., dry sieving to determine particle size fractions, soil type characterization.*
  - *Describe mobile van analyses*
  - *Describe off-site analytical methods to be used. Specify any special requirements such as rapid turnaround, sample cleanup expectations.*

Field decisions

- *Provide clear instructions on the use of field measurements to select samples for further analysis. Specify what information is to be recorded both for these locations/samples and for other candidate locations/samples.*
- *Provide criteria (i.e., Reconsidering and/or Stopping Work on Accelerated Cleanups, EM/ER:96-PCT-004, April 12, 1996 [Project Consistency Team, 1210]) to be used by field team to determine when a contingency plan should be invoked.*

Sample handling

- *Describe how samples are to be preserved, packaged, shipped, and tracked. Cite SOPs where applicable.*
- *Describe any special arrangements such as archiving samples or their derivatives, if applicable.*

Data tracking

- *Specify which field measurements must be recorded in sampling logs, logbooks, and/or the field database.*
- *Describe how field information will be prepared for and transmitted to a central data management system.*

- *Describe how mobile laboratory data will be reported to field crews and how it will be uploaded to the central data management system.*
- *Describe forms of data (electronic, hard copy) expected from off-site laboratories, and how those data will be uploaded to the central data management system. Cite SOPs/SOWs where applicable.*

Schedule

- *Anticipate the length of time each activity will require. Include time for analysis of samples, data assessment, and preparation of reports.*
- *If contingency plans need to be invoked, how will that modify the schedule?*

5.1.12.4 Data Assessment

Describe the process by which the usability of all data for its intended purpose will be evaluated vis-a-vis the assumptions and requirements specified in Section 5.1.12.2 (SAP Design).

Verification and baseline data validation

- *Discuss data verification and baseline validation process. SOPs/SOWs/QAPP may be cited if available and appropriate.*
- *Describe how results will be communicated to data users; for example, by application of standard qualifiers to results. Standard procedures may be cited if available and appropriate.*
- *Describe how field data will be reviewed and verified.*

Data quality assessment

- *Describe activities planned to complete reconciliation of results with data quality objectives, such as*
  - *focused validation of analytical data packages,*
  - *comparison of achieved bias and precision with levels originally prescribed, and*
  - *evaluation of validity of the assumptions that were made for planning purposes.*

5.1.12.5 Administration

Summarize the nontechnical aspects of the SAP essential to maintain quality and to achieve third-party implementability. If more than one SAP is to be submitted in the same report and the information for this section is identical, you need to include this section only for the first SAP and then refer back to this section for subsequent SAPs.

Project task organization

- *Describe functional roles and responsibilities. Include those for which names, phone numbers, and addresses will need to be supplied before SAP is executed.*
- *Provide an organizational chart.*
- *Identify any special personnel needed to meet task objective.*

Training

- *Identify special training needed for this investigation, such as use of field kits, nonstandard field sample preparation, or special field documentation requirements, etc.*

Records

- *Include what they are [e.g., handwritten field records (sample logs, logbooks), electronic data files, and formal reports] and who is to receive them.*

Oversight

- *Indicate what is planned, e.g., readiness review, peer reviews, field audits. Mention special concerns, if any, such as completion of SOPs or SOWs.*

Inspection/acceptance policies

- *Cite SOPs if available and appropriate.*
- *Identify person(s) responsible and criteria for inspection/acceptance of supplies and consumables.*

Reports to management

- *Identify reports to be provided to management, including expected frequency and content.*

5.2 PRS or Aggregate "Y"

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APPENDIX A ANALYTICAL SUITES

Results of analyses can be found in FIMAD. Hard copies of supporting information will be provided upon request.

Chemicals that are reported by analytical laboratories as nondetects have not been included in the tables of this RFI report. Nonetheless, nondetected chemicals are often part of the decision-making process, and it is important to note that analyses for these chemicals were performed. This appendix provides a list of the target analytes in each analytical suite for which samples were taken (see Table 5.x.4.1, Summary of Samples Taken).

The lists provided below are standard analytical suites. The lists may need to be modified to suit the needs of specific RFI reports. Target analytes in several suites have changed with subsequent contract laboratory statements of work. For example, the inorganic suite changed from 11 to 21 analytes in mid-1994. When in doubt, check the target analyte list in one of the data packets.

As appropriate, include the following lists for all suites for which samples were taken. The lists should be consistent with Table 5.x.4.1. Delete any suite NOT used in a specific RFI report. Add any nonstandard suite (such as water quality analyses) as applicable. Modify target analytes in each suite, as applicable.

Inorganic Suite

Aluminum	Calcium	Lead	Selenium
Antimony	Chromium	Magnesium	Silver
Arsenic	Cobalt	Manganese	Sodium
Barium	Copper	Mercury	Thallium
Beryllium	Cyanide	Nickel	Vanadium
Cadmium	Iron	Potassium	Zinc

Volatile Organic Suite

Acetone	Chloroform	1,2-Dichloropropane	1,1,2-Trichloroethane
Benzene	Chloromethane	1,3-Dichloropropane	1,1,1,2-Tetrachloroethane
Bromobenzene	2-Chlorotoluene	2,2-Dichloropropane	1,1,2,2,-Tetrachloroethane
Bromochloromethane	4-Chlorotoluene	1,1-Dichloropropene	Tetrachloroethene
Bromodichloromethane	1,2-Dibromo-3-chloropropane	c-1,3-Dichloropropene	Toluene
Bromoform	1,2-Dibromoethane	t-1,3-Dichloropropene	Trichlorotrifluoroethane
Bromomethane	Dibromomethane	Ethylbenzene	Trichloroethene
2-Butanone	1,2-Dichlorobenzene	2-Hexanone	Trichlorofluoromethane
n-Butylbenzene	1,3-Dichlorobenzene	Iodomethane	1,2,3-Trichloropropane
sec-Butylbenzene	1,4-Dichlorobenzene	Isopropylbenzene	1,2,4-Trimethylbenzene
tert-Butylbenzene	Dichlorodifluoromethane	p-Isopropyltoluene	1,3,5-Trimethylbenzene
Carbon disulfide	1,1-Dichloroethane	4-Methyl-2-pentanone	Vinyl chloride
Carbon tetrachloride	1,2-Dichloroethane	Methylene chloride	o,m,p-Xylene (mixed)
Chlorobenzene	1,1-Dichloroethene	n-Propylbenzene	
Chlorodibromomethane	c-1,2-Dichloroethene	Styrene	
Chloroethane	t-1,2-Dichloroethene	1,1,1-Trichloroethane	

Semivolatile Organic Suite

Acenaphthene
Acenaphthylene
Aniline
Anthracene
Azobenzene
Benzo(a)anthracene
Benzoic acid
Benzo(b)fluoranthene
Benzo(k)fluoranthene
Benzo(g,h,i)perylene
Benzo(a)pyrene
Benzyl alcohol
Bis(2-chloroethoxy)methane
Bis(2-chloroethyl)ether
4-Bromophenylphenyl ether
Butylbenzylphthalate
4-Chloroaniline
4-Chloro-3-methylphenol
2-Chloronaphthalene
2-Chlorophenol
4-Chlorophenylphenyl ether
Chrysene
Dibenzo(a,h)anthracene
Dibenzofuran
1,2-Dichlorobenzene
1,3-Dichlorobenzene
1,4-Dichlorobenzene
3,3'-Dichlorobenzidine
2,4-Dichlorophenol
Diethylphthalate
Dimethyl phthalate
2,4-Dimethylphenol
2,4-Dinitrophenol
Di-n-butylphthalate
4,6-Dinitro-2-methylphenol
2,4-Dinitrotoluene
2,6-Dinitrotoluene
Di-n-octylphthalate
Bis(2-ethylhexyl)phthalate
Fluoranthene
Fluorene
Hexachlorobenzene
Hexachlorobutadiene
Hexachlorocyclopentadiene
Hexachloroethane
Indeno(1,2,3-cd)pyrene
Isophorone
2-Methylnaphthalene
2-Methylphenol
4-Methylphenol
Naphthalene
2-Nitroaniline
3-Nitroaniline
4-Nitroaniline
Nitrobenzene
2-Nitrophenol
4-Nitrophenol
N-Nitrosodimethylamine
N-Nitrosodiphenylamine
N-Nitroso-di-n-propylamine
2,2'-oxybis(1-Chloropropane)
Pentachlorophenol
Phenanthrene
Phenol
Pyrene
1,2,4-Trichlorobenzene
2,4,5-Trichlorophenol
2,4,6-Trichlorophenol

Pesticide and Polychlorinated Biphenyl Suite

Aldrin
alpha-BHC
beta-BHC
delta-BHC
gamma-BHC (Lindane)
alpha-Chlordane
gamma-Chlordane
4,4'-DDD
4,4'-DDE
4,4'-DDT
Dieldrin
Endosulfan I
Endosulfan II
Endosulfan sulfate
Endrin
Endrin aldehyde
Endrin keytone
Heptachlor
Heptachlor epoxide
Methoxychlor
Toxaphene
Aroclor-1016
Aroclor-1221
Aroclor-1232
Aroclor-1242
Aroclor-1248
Aroclor-1254
Aroclor-1260

High Explosive Suite

2-Amino-4,6-dinitrotoluene (2-AM-DNT)
4-Amino-2,6-dinitrotoluene (4-Am-DNT)
1,3-Dinitrobenzene (1,3-DNB)
2,4-Dinitrotoluene (2,4-DNT)
2,6-Dinitrotoluene (2,6-DNT)
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)
Methyl-2,4,6-trinitrophenylnitramine (Tetryl)
Nitrobenzene (NB)
Nitrocelluose
Nitroguanidine
Nitroglycerine (NG)
2-Nitrotoluene (2-NT)
3-Nitrotoluene (3-NT)
4-Nitrotoluene (4-NT)
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)
Pentaerythritol tetranitrate (PETN)
Tetrazene
1,3,5-Trinitrobenzene (1,3,5-TNB)
2,4,6-Trinitrotoluene (2,4,6-TNT)

Radiochemical Suite

Gross alpha/beta	Cesium-137	Plutonium-238	Sodium-22
Gross gamma	Cobalt-57	Plutonium-239/240	Strontium-85
Actinium-228	Cobalt-60	Potassium-40	Strontium-90
Americium-241	Europium-152	Protactinium-231	Thallium-208
Annihilation radiation	Iodine-129	Protactinium-233	Thorium-227
Barium-140	Lanthanum-140	Protactinium-214m	Thorium-228, 230, & 232
Bismuth-211	Lead-210	Radium-223	Thorium-234
Bismuth-212	Lead-211	Radium-224	Tin-113
Bismuth-214	Lead-212	Radium-226	Tritium
Cadmium-109	Lead-214	Radium-228	Uranium-234, 235, & 238
Cerium-139	Manganese-54	Radon-219	Yttrium-88
Cerium-144	Mercury-203	Ruthenium-106	Zinc-65
Cesium-134	Neptunium-237	Selenium-75	

APPENDIX B DATA VALIDATION

Appendix B summarizes any potential problems associated with the usability of the data. The qualifiers in Appendix B can be the product of a focused validation and often result in changes to the qualifier appropriate to data use. If a focused validation is not performed, the qualifiers in Appendix B are a product of the validation report. This appendix is reserved for any supporting data validation tables.

If no supporting data validation tables are necessary, provide boilerplate: No data validation tables are necessary for PRS(s) being reported because....

If necessary, provide more than one data validation table, breaking out by suite where applicable.

TABLE B-1
DATA VALIDATION TABLE FOR TA-XX SAMPLES

Request Number	Sample ID	Suite*	Comments
12345	futa-yr** -1000	SVOCs	Phthalate contamination of method blank caused by laboratory contamination. QC results within allowable limits; all data are valid
12346	futa-yr -1001	PCBs	Equipment rinsate missed holding time, but no PCBs were detected in samples. Therefore, this does not affect usability of data; all data are valid
12346	futa-yr -1002	Inorganic chemicals	Cadmium values low by 25% in QC samples. Sample values also low (0.4-0.6 mg/kg). Does not affect usability of data; all data are valid
12345	futa-yr -1003	SVOCs	Phthalate contamination of method blank caused by laboratory contamination. QC results within allowable limits; all data are valid
12347	futa-yr -1009	SVOCs	SVOCs expected, but not detected. % recovery of surrogates less than 10%, indicating strong potential for false negatives. Data were rejected by validator.

** NOTE: Suites may include VOCs, SVOCs, pesticides, herbicides, HE, inorganic chemicals, and radionuclides.*
*** fu = field unit number; ta = technical area number; yr = last 2 digits of the year in which the sample was taken.*

NOTE: All information included in this table is example data only. Table footnotes designated by asterisks are guidance only.

APPENDIX C RISK ASSESSMENT CALCULATIONS

This appendix is reserved for any supporting risk assessment calculations.

Include all supporting calculations (sufficient for the regulator to reproduce the risk assessment).

If no supporting calculations are necessary, provide boilerplate: No quantitative risk assessment was performed on PRS(s) being reported.

If more than one risk assessment calculation is necessary, break this appendix into several sections.

Los Alamos National Laboratory

ENVIRONMENTAL RESTORATION

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Date: March 29, 1996
Refer to: EM/ER:96-PCT-010

SUBJECT: USE OF BACKGROUND DATA FOR THE ENVIRONMENTAL RESTORATION (ER) PROJECT DECISION MAKING POLICY

STATEMENT OF ISSUE

The Los Alamos National Laboratory's (the Laboratory's) ER Project has developed a Project-wide set of background data that can be used for ER Project decision making. The current policy covers issues directly relating to inorganic contamination at ER Project potential release sites (PRSs). The intent of this policy is to ensure technical consistency in the selection of geologically defensible subsets of the Project-wide inorganic data and to ensure that consistent and appropriate statistical comparisons are made with these data.

SUMMARY OF POLICY

Background data are used to support ER Project decision-making during Resource Conservation and Recovery Act facility investigation (RFI) screening assessment, risk assessment, and development/application of PRS remedial objectives. Background data are available for several geological media, including soil, sediments, and bedrock. Comparisons to background should be considered during planning for data collection to determine if site-specific background data are needed. The set of background data used for decision making will be documented in each ER Project report where applicable. This policy assists the technical teams in documenting and performing statistical background comparisons.

DISCUSSION

The background comparison approach consists of two steps. The first step is the assembly of a defensible set of background data. This document summarizes the Laboratory-wide set of background analytical data from samples of soils, sediment, and tuff collected by Longmire and others (Longmire et al. 1995, 1266), and presents a simple decision logic to select geologically defensible subsets of these data. All ER Project reports that evaluate differences from background will justify the use of Laboratory-wide background concentration data or present the rationale for using site-specific background concentration

data. The second step is the selection of the statistical method(s) used to compare site data with background data. Two statistical methods are presented. The first compares the site concentration data with a statistic representing the upper percentile of background concentrations. The second is a group of methods designed to detect a distributional shift between site data and background data. Although guidelines for the application of these methods are presented in this document, each ER Project report that includes background comparisons should briefly describe the statistical analysis method chosen and justify its application to the data in question. Lastly, particular attention should be paid to background comparisons of arsenic, beryllium, and manganese, because background concentrations of these elements exceed Environmental Protection Agency risk-based screening values.

Selection of the appropriate Laboratory background data set(s) for making statistical background comparisons is essential for PRS decision making. PRS decisions are ultimately based on samples collected from a number of primary geomorphic units, including: mesa top, hill or canyon slope, and canyon bottoms. In addition there are subdivisions within the primary geomorphic units. For example, the geomorphic unit designated as canyon slopes is a mixture of mesa top soils and Bandelier Tuff. Although not inclusive of all Laboratory geomorphic units, existing Laboratory-wide background data do include samples of mesa top soils, Bandelier Tuff, and preliminary data on channel sediments.

If none of the existing subsets of Laboratory-wide background data (soil, Bandelier Tuff, and channel sediments) are obviously applicable, other background data options should be considered, including: evaluating background data needs relative to sampling objectives, evaluation of data through interelement correlations, or generating site-specific (local) background.

This policy was developed and reviewed with extensive input from various field unit, project office, and DOE personnel.

CONTACTS: Pat Longmire at 505-665-1264 and/or Randy Ryti at 505-662-0707, extension 12.

Sincerely,

Tracy Glatzmaier
Environmental Restoration

Sincerely,

Bonnie Koch
Los Alamos Area Office

TG/BK/rfr

EM/ER:96-PCT-010

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APPLICATION OF LANL BACKGROUND DATA TO ER PROJECT DECISION-MAKING PART I: INORGANICS

Prepared by
Randall Ryti, Patrick Longmire and Eric McDonald for the
Los Alamos National Laboratory
Environmental Restoration Decision Support Council

March 29, 1996

LA-UR-96-1534

INTRODUCTION

The purpose of this policy paper is to provide guidance to Los Alamos National Laboratory (LANL/the Laboratory) Environmental Restoration (ER) Project personnel on the ER Project's approach to conducting background comparisons for inorganics. Part II, presented as a separate document, will present the background comparison approach for radionuclides.

The background comparison approach consists of two steps. The first step is the assembly of a defensible set of background data. This document summarizes the Laboratory-wide set of background analytical data from samples of soils, sediment and tuff collected by Longmire and others (Longmire et al. 1995, 1266), and presents a simple decision logic to select geologically defensible subsets of these data. All ER Project reports that evaluate differences from background will justify the use of Laboratory-wide background concentration data or present the rationale for using site-specific background concentration data. The second step is the selection of the statistical method(s) used to compare site data with background data. Two statistical methods are presented. The first compares the site concentration data with a statistic representing the upper percentile of background concentrations. The second is a group of methods designed to detect a distributional shift between site data and background data. Although guidelines for the application of these methods are presented in this document, each ER Project report that includes background comparisons will briefly describe the statistical analysis method chosen and justify its application to the data in question. Particular attention should be paid to background comparisons of arsenic, beryllium and manganese, because natural background concentrations of these elements exceed Environmental Protection Agency (EPA) risk-based screening values.

SUMMARY OF REGULATIONS AND GUIDANCE GOVERNING STATISTICAL COMPARISONS TO BACKGROUND

The EPA guidance documents supporting the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) and Resource Conservation and Recovery Act (RCRA) programs provide specific information on how to design background studies and how to statistically compare site data with background data.

The CERCLA document, *Guidance on Data Useability in Risk Assessment (Part A)* (EPA 1992, 1166), recommends collecting background data prior to collecting site data. If the comparison of background data with site-derived data for a given chemical does not show a difference statistically, that chemical is eliminated from further evaluation. The CERCLA guidance also suggests that the number of background samples collected from a site be based on the "minimum detectable difference" procedure (EPA 1989, 0303). Data analysts unfamiliar with this approach should contact the statistical specialists within the ER Project's Decision Support Council.

Background comparisons for groundwater monitoring data are addressed in the RCRA document, *The RFI Guidance* (EPA 1989, 0088). Methods for comparing data derived from upgradient wells with data from downgradient wells are presented in the RCRA groundwater statistical analysis document (EPA 1989, 1141). These statistical methods are codified in 40 CFR Part 264, *Statistical Methods for Evaluating Ground-Water Monitoring from Hazardous Waste Facilities: Final Rule* Federal Register Tues. Oct. 11, 1988.

Statistical methods used for background comparisons of groundwater can be applied to background comparisons for data from other media as stated in the preface of the RCRA groundwater statistical analysis document (EPA 1989, 1141):

"This scenario can be applied to other non-RCRA situations involving the same spatial relationships and the same null hypothesis. The explicit null hypothesis for testing contrasts between means, or where appropriate between medians, is that the means between groups (here monitoring wells) are equal (i.e., no release has been detected), or that the group means are below a prespecified action level (e.g., the ground-water protection standard). Statistical methods that can be used to evaluate these conditions are described in Section 5.2 (Analysis of Variance), 5.3 (Tolerance Intervals), and 5.4 (Prediction Intervals)."

The RCRA groundwater monitoring guidance states that the specific approach proposed by the owner/operator should be submitted to EPA for approval, especially where methods other than those presented in the guidance are used. Statistical methods presented below are consistent with those found in the analysis of variance and tolerance interval sections of the RCRA groundwater statistical analysis document (EPA 1989, 1141).

LABORATORY BACKGROUND COMPARISON APPROACH

Figure 1 shows the overall background comparison strategy that supports ER Project decision-making. The decision objectives for the background comparison are an important factor in selecting both the appropriate subset of Laboratory background data and the statistical method used to make the comparison.

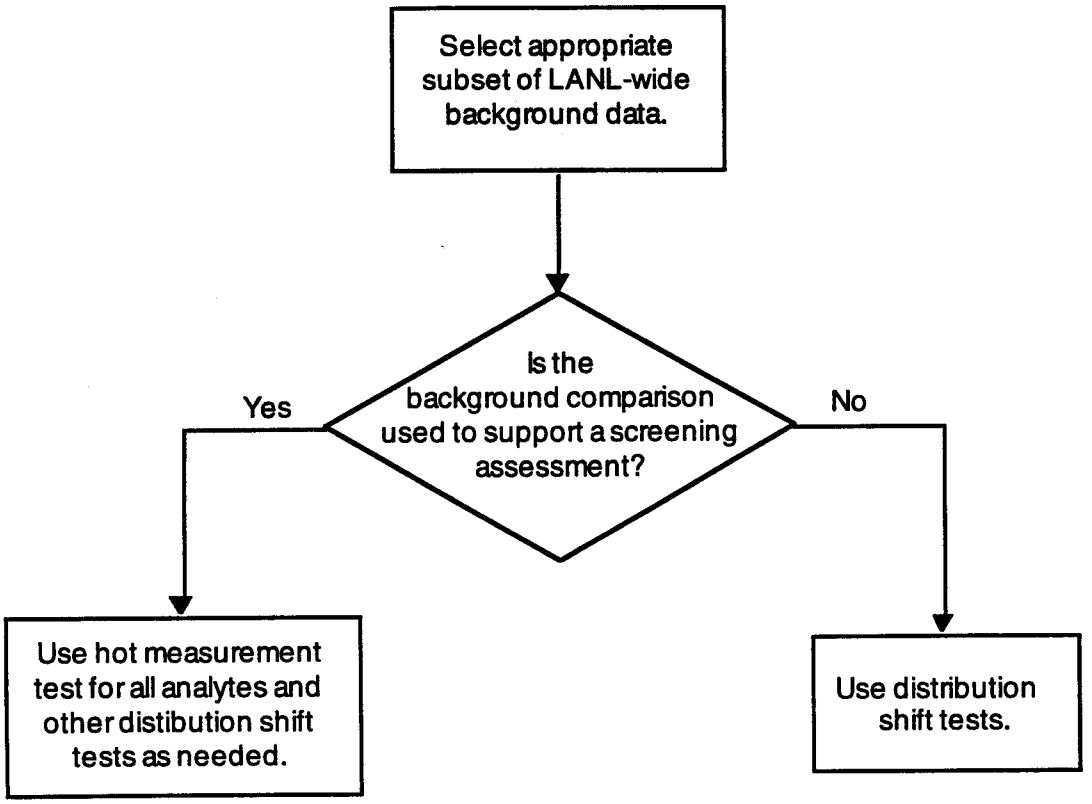

Figure 1. BACKGROUND COMPARISON STRATEGY.

Selecting Background Data

Selection of the appropriate Laboratory background data set(s) for making statistical background comparisons is essential for potential release site (PRS) decision-making. PRS decisions are ultimately based on samples collected from a number of primary geomorphic units, including: mesa top, hill or canyon slope, and canyon bottoms. In addition there are subdivisions within the

primary geomorphic units. For example, the geomorphic unit designated as canyon slopes is a mixture of mesa top soils and Bandelier Tuff. Although not inclusive of all Laboratory geomorphic units, existing Laboratory-wide background data include samples of mesa top soils, Bandelier Tuff, and preliminary data on channel sediments. The purpose of this section is to guide the selection of appropriate subsets of these background data.

To support RCRA facility investigation (RFI) screening assessments or other data analyses, background data are often selected after characterization samples have been collected. However, background data selection should also be considered in planning for sampling. The planning team should consider what quality of background data are needed to meet their specific sampling objectives. Whether considered before or after data collection, the basic considerations are similar and members of the Decision Support (chemistry, risk analysis, and statistics) and Earth Science (pedology, geology, geochemistry, geomorphology, stratigraphy) Councils should be consulted to provide guidance on the selection and uses of background data.

The process for selecting the most appropriate Laboratory background data set is summarized in Figure 2. In addition to the decision points shown in Figure 2 and discussed below, it is essential that comparable sample preparation and analytical methods be used for background and PRS samples. For example, XRF (X-Ray Fluorescence) may be comparable to whole sample analysis (e.g., hydrofluoric acid digestion) for some inorganic analytes such as iron, but not for other inorganic analytes such as barium.

Decision 1. Were Pajarito Plateau soils[1] and/or fill material sampled at the PRS?

"Yes" Decision. Soils across the Laboratory are highly variable spatially and in complexity due to the complicated history of landscape evolution and variation in ages of soil parent material. Most PRSs on mesa tops and within canyon bottoms consist of a mixture of native soils and fill material. The amount of fill material can vary (0 to 100%). Fill material typically consists of disturbed soils with crushed Bandelier Tuff, but other rock types also may be present. Soil consists of layers or horizons of mineral and/or organic matter of variable thickness that parallel the land surface and differ from their parent material in morphological, physical, chemical, and mineralogical properties and in biological characteristics. Soil horizons are identified by a master horizon designation (see Appendix for a detailed discussion). Most Laboratory soil consists of A, B or C master horizons.

"No" Decision. If Pajarito Plateau soils and/or fill material were not sampled, move on to decision 3, which pertains to Bandelier Tuff.

Decision 2. Can a soil master horizon be identified for each sample?

"Yes" Decision. When PRS samples are not representative of all three Laboratory soil master horizons, (A, B, and C), horizon-specific background data are the most applicable for statistical background comparisons. Horizon-specific information is useful where variability between horizons is significant relative to sampling objectives. For example, a sampling objective may be to determine the volume of soil above a risk-based threshold for beryllium. In this case, differences in beryllium concentrations between the A and B horizons may be greater than a risk-based cleanup threshold (residential scenario). Therefore, determining the volume elevated above background would determine the effect above background given specific soil horizons.

"No" Decision. When sites have no well-defined soil horizons (such as sites with fill material) or when Field Unit personnel have determined that variability between soil horizons was not relevant to the sampling objectives, the Laboratory-wide soils background data are the appropriate data set for statistical background comparisons. An example of soil horizon variability not relevant to sampling objectives would be a sampling plan designed to estimate the volume of barium above cleanup levels. Such a sampling plan would not require horizon specific background data because the cleanup level is at least ten times greater than soil background levels.

---

[1] Because most Laboratory PRSs are located on the Pajarito Plateau, Pajarito soil samples form the bulk of the soil samples included in the Laboratory-wide background soil database. One exception is Fenton Hill, which is located in the Jemez Mts.

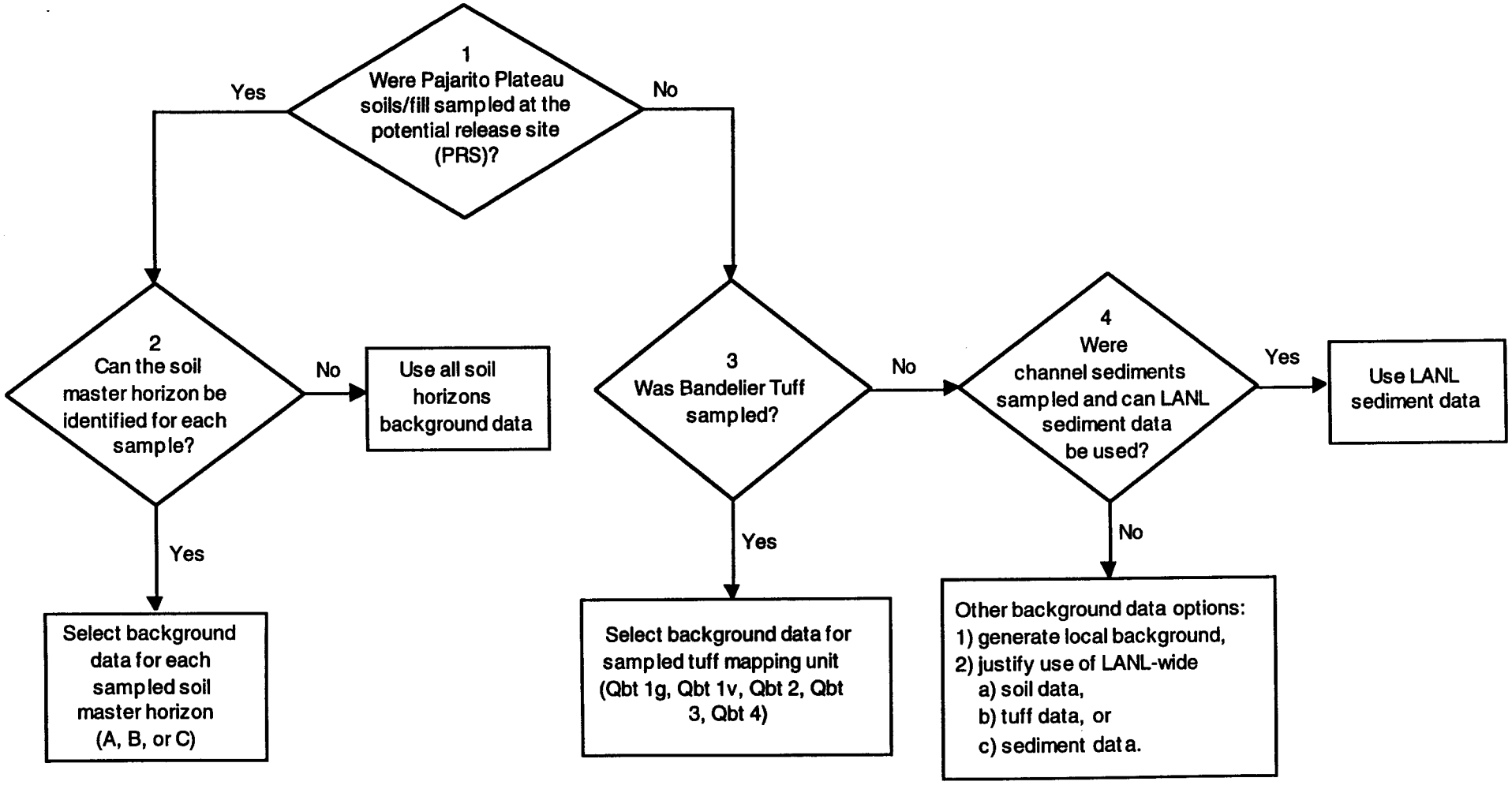

Figure 2. BACKGROUND DATA SELECTION PROCESS.

Decision 3. Was Bandelier Tuff sampled?

"Yes" Decision. Use the appropriate background data set for specific rock units of Bandelier Tuff (Longmire et al. 1995, 1266). Bandelier Tuff (Tshirege Member) consists of four rock units (Longmire et al. 1995, 1266) that can be identified in the field by mapping and/or by evaluating core samples. These include in ascending order: Units 1 (Qbt 1g and Qbt 1v), 2 (Qbt 2), 3 (Qbt 3), and 4 (Qbt 4). Inorganic background data are available for Qbt 1g, Qbt 1v, Qbt 2, Qbt 3, and Qbt 4 (Longmire et al. 1995, 1266; Broxton et al. 1996, 1305). Readers should note that limited background data are available for other stratigraphic units (Cerro Toledo, Otowi member, and Tschicoma). These data are summarized in the ER Project background report *Natural Background Geochemistry and Statistical Analysis of Selected Soil Profiles, Sediments, and Bandelier Tuff, Los Alamos, New Mexico* (Longmire et al. 1995, 1266).

"No" Decision. If the Bandelier Tuff was not sampled, move on to decision 4 that addresses Laboratory background channel sediment data.

Decision 4. Were channel sediments sampled and can Laboratory sediment data be used?

"Yes" Decision. If channel sediments were sampled and the Laboratory sediment data can be used, the Laboratory sediment background data are the appropriate data set for statistical comparisons. An initial background data set for channel sediments has been provided by Longmire and others (Longmire et al. 1995, 1266) for Ancho Canyon and Indio Canyon. Channel sediments within the two canyons are derived entirely from Bandelier Tuff. Currently, there are no channel sediment data for canyons with sediments derived from the Tschicoma Formation (e.g., Los Alamos and Guaje Canyons). These preliminary data will be supplemented by additional samples collected by the ER Project on an as needed basis.

"No" Decision. A "no" decision indicates that none of the existing subsets of Laboratory-wide background data (soil, Bandelier Tuff, and channel sediments) are obviously applicable. Other background data options should be considered, including: evaluating background data needs relative to sampling objectives, evaluation of data through interelement correlations, or generating site-specific (local) background.

The risk management and decision objectives for the background comparison are equally important during planning for background data needs and during the post sampling background comparison. The data analyst or planning team must determine if the variation between subsets of the Laboratory-wide background is significant relative to the decision to be made with the data. For example, Laboratory-wide soil background data may be adequate to support a screening assessment at a site having no history of inorganics release. Whereas, a screening assessment for a firing site, where significant quantities of inorganics would have been released, would require use of the appropriate subset of Laboratory-wide data.

One way to justify the use of Laboratory-wide background data is to evaluate the data through interelement correlations. Typically, there are significant correlations between major (aluminum, iron, and potassium) and trace elements (arsenic, beryllium, copper, nickel, vanadium, and zinc). The correlations are presented and the geochemical basis is detailed in *Natural Background Geochemistry and Statistical Analysis of Selected Soil Profiles, Sediments, and Bandelier Tuff, Los Alamos, New Mexico* (Longmire et al 1995, 1266). For most inorganic chemicals, these strong correlations result in a consistent ratio of trace to major elements. A significantly elevated ratio of a given trace to a major element can be used to document a release of that trace element. Bivariate plots of trace elements to major elements are one way to visually display the ratios for background and PRS data. An example data display is presented in Figure 3. This plot shows the bivariate relationship between beryllium and iron for Technical Area 10 surface samples and Laboratory-wide soil background data.

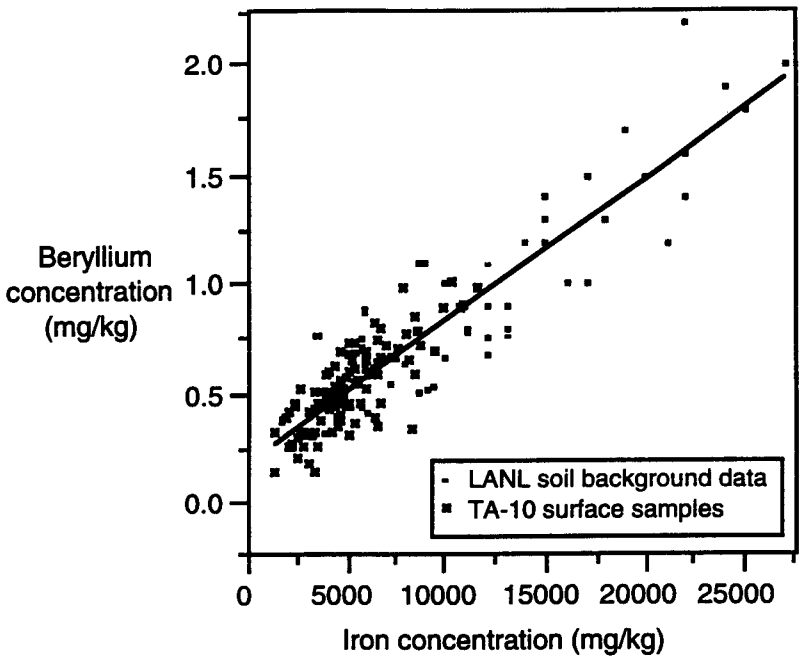

Figure 3. BIVARIATE PLOT OF BERYLLIUM AND IRON (NITRIC ACID FRACTION) FROM THE LABORATORY SOIL BACKGROUND DATA AND TA-10 SURFACE SAMPLES. CORRELATION COEFFICIENT IS 0.916 FOR 174 BACKGROUND SAMPLES.

Another example is the strong correlation between concentrations of thorium and uranium in the Bandelier Tuff, presented in Figure 4. The bivariate plot shows that each rock unit has similar ratios of thorium to uranium (the uranium concentration is roughly 30% of the thorium concentration).

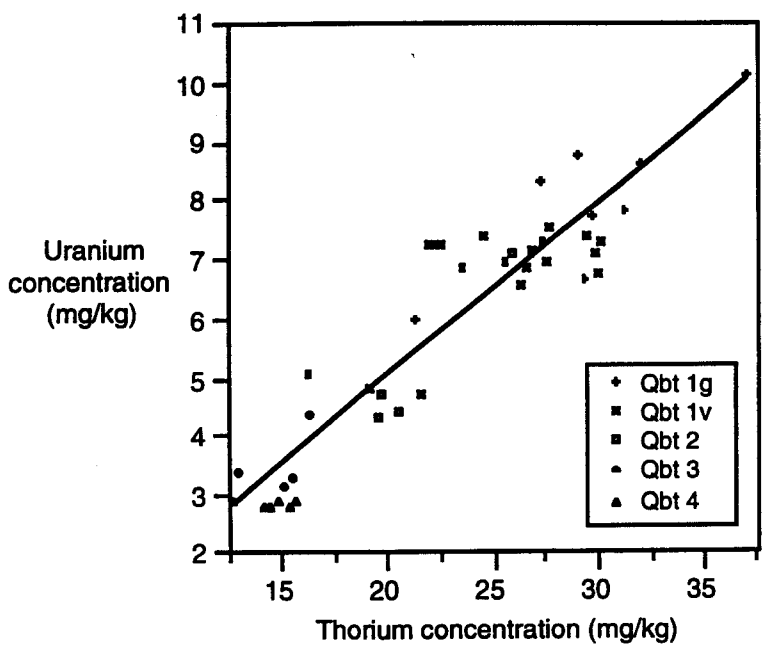

Figure 4. BIVARIATE PLOT OF URANIUM AND THORIUM (WHOLE ROCK ANALYSIS) FROM BANDELIER TUFF SAMPLES IDENTIFIED BY BANDELIER TUFF UNIT. CORRELATION COEFFICIENT IS 0.933 FOR 44 SAMPLES.

Generating appropriate subsets of background data can be performed very cost-effectively by using interelement correlations to statistically subsample Laboratory-wide data to create a

conditional set of site-specific background data. At a minimum, this statistical subsampling requires that the concentration of one or more of the major inorganic elements (aluminum, iron, or potassium) can be shown, through archival information, to have never been released at a PRS, and that other inorganics are highly correlated to at least one major element. The concentration range and statistical distribution of the major element results at a PRS are used to subsample the expected concentration of a trace element in the Laboratory-wide background data. For example, if a PRS had uniform concentration of iron between 5000 and 10000 mg/kg, the expected range of beryllium concentrations would be predicted to be between 0.3 and 1.1 mg/kg. PRS beryllium concentrations greater than 1.1 mg/kg would be outside the range of a statistically-based subsample of the Laboratory-wide data. This approach is more completely discussed in Campbell (1994, 1294), and data analysts unfamiliar with this statistical subsampling approach should contact the Decision Support Council for more information.

If site-specific background data are needed, statistical guidance can be used to help determine an appropriate number of background samples. One such approach, the minimum detectable difference procedure (EPA 1989, 0303), is mentioned in the Summary of Regulations and Guidance Governing Statistical Comparisons to Background section of this paper. This procedure requires three types of input: 1) the difference between the mean concentration of site and background data that is desired to be detected (e.g., 50% of the background mean); 2) the desired probability of detecting that difference (e.g., 20%); and 3) the expected variability in the concentration data (usually expressed as the relative variability or coefficient of variation, e.g., 100% is typical). Given these inputs, 20 samples per background media are typically considered adequate for making background comparisons. As stated above, it is critical that consistent sample digestion and analytical methods are used for the background and PRS data. Before collecting site-specific background data, the potential use of the existing Laboratory data should be fully explored and advice on a recommended design for background data collection, including sample digestion and analysis procedures, should be sought from subject matter experts on the Decision Support and Earth Science Councils.

Recommendations for Collection of Information to Support Background Data Selection

Laboratory soil background data have been collected according to soil horizons (A, B, C) and analysis of these data indicates that naturally occurring levels of inorganic chemicals will vary as a function of certain soil properties (e.g., clay and iron content, see Longmire et al., 1995 1266). In addition, the soil for many sites where data will be collected may have been disturbed and may now consist of heterogeneous fill material. Careful documentation of sampled material is necessary to ensure that data analysts will have sufficient information to select the most appropriate Laboratory background data set for comparison of site-specific data. Background data sets can be chosen with greater confidence when several key soil properties (color, structure, presence of cutans[2], approximate gravel content, and presence of organic matter) are recorded during collection of PRS samples. Recording appropriate key soil information during sample collection is easily achievable by following a simple check-list that your Earth Science Council representative can provide.

The Decision Support and Earth Science Councils can provide further guidance and technical support for sampling and analysis plan development and to support sampling teams in the field.

RECOMMENDED STATISTICAL METHODS FOR BACKGROUND COMPARISONS

Because background comparisons are used to make decisions throughout the RCRA process, from site screening to corrective measures implementation, data analysts must use statistical

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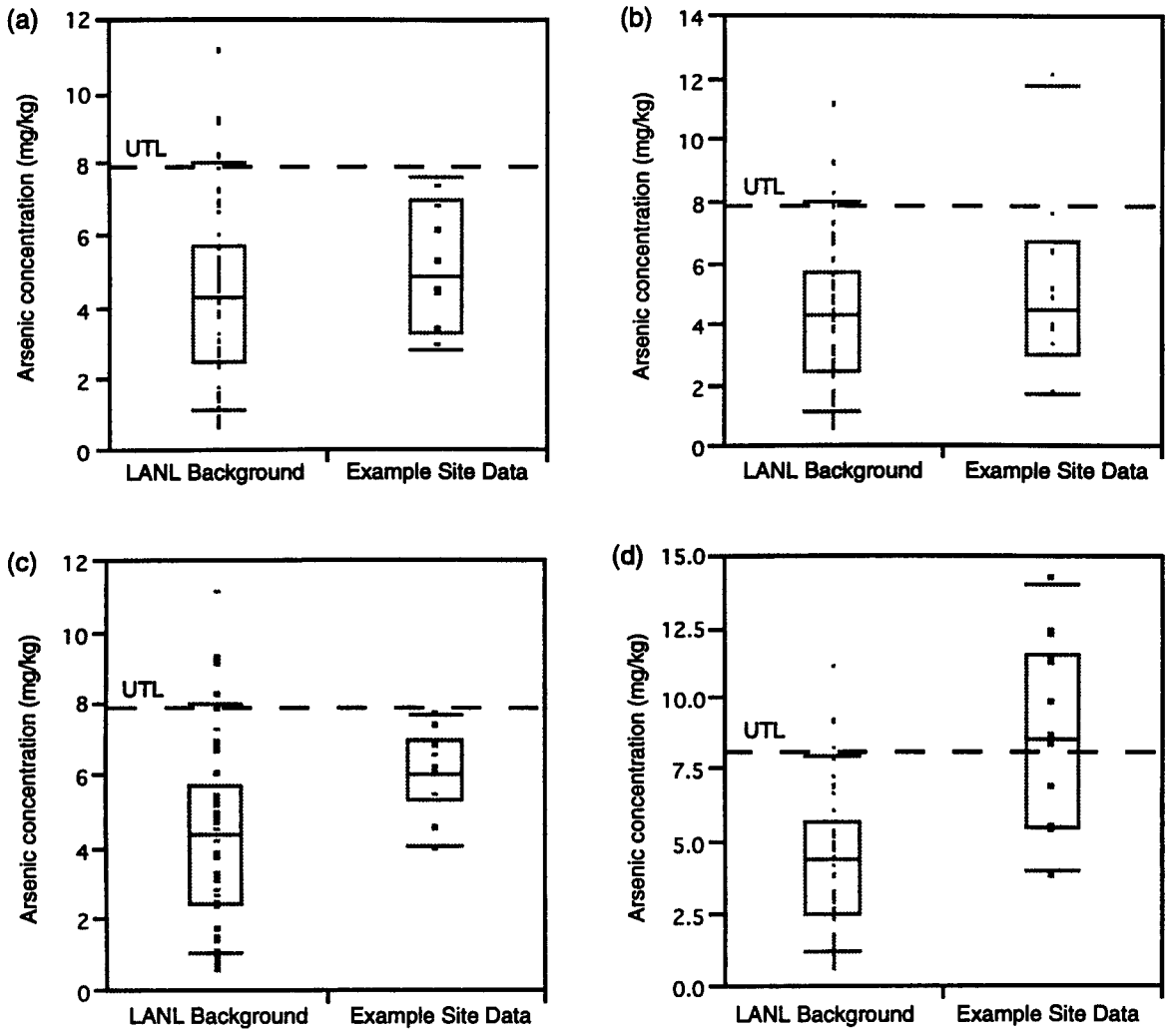
[2] Cutans are concentration of a particular soil constituent (e.g. clay, organic matter, iron oxides) along soil surface features (e.g. ped faces, pores) and coating the exterior of soil particles (e.g. sand, gravel).

methods that can be applied to a broad range of decisions. This guidance defines two statistical methods for background comparisons, which meet the requirements for RCRA decision making[3]. In the first method, the Hot Measurement comparison, site concentration data are compared with a statistic representing the upper percentile of background concentrations[4]. In the second method, the distributional shift test, the mean (mean rank, quantile) of site data is compared with the mean (mean rank, quantile) of background data to determine whether the former is statistically greater than the latter. Used together or separately, these tests help demonstrate whether a release has occurred at a PRS and help define what risk consequence the release may have. Figure 5 illustrates the differences between site data and background data detected by the two methods.



(a) Site data are within range of background: no distributional shift or hot measurements (i.e., no value is greater than the upper tolerance limit (UTL)).
(b) Site data fail hot measurement comparison: one of eleven arsenic concentrations exceeds the UTL of 7.82 mg/kg.
(c) Site data show a distributional shift: the Wilcoxon rank sum test shows site data tend to be greater than] background data.
(d) Site data show both a distributional shift and a failure of the hot measurement comparison: seven of ten arsenic concentrations exceed the UTL of 7.82 mg/kg and the site data tend to be greater than the background data.

Figure 5. BOX PLOT COMPARISONS OF EXAMPLE SITE DATA WITH LABORATORY BACKGROUND DATA.

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[3] The methods are among those discussed in the RCRA groundwater monitoring guidance document.

[4] The Slippage test is briefly discussed below, and is an alternative to the Hot Measurement test.

The decision to be supported by the background comparison determines which test is appropriate (see Figure 1). When performing screening assessment, a single high value requires further analysis, and the hot measurement comparison is recommended. Additional statistical tests may be needed to support screening assessments in those cases in which the hot measurement comparison provides inconclusive results. When extensive data are collected to support a risk assessment or corrective action and a shift in the distribution could lead to further action at the site, the distributional shift test is more appropriate. The rationale for selecting a statistical method that differs from those presented in this guidance will be clearly indicated in the ER Project report that summarizes the background comparison.

Because the selection of a particular statistical method depends on the statistical distributions of site and background data, data analysts are encouraged to prepare graphical data displays to communicate the results of data comparisons. Box plots, in which background and site data can be compared side-by-side, are most useful. The box plots in Figure 5 show actual values (as filled squares) for each data group (Laboratory background and example PRS data). The ends of each box represent the "inter-quartile" range which is specified by the 25th and 75th percentiles of the data distribution. The line within the box represents the median (50th percentile) of the data distribution. Thus the box indicates concentration values for the central half of the data and concentration shifts can be readily assessed by comparing boxes. If the majority of the data are represented by a single concentration value (usually the detection limit), the box is reduced to a single line. The solid line spanning the series of box plots is the mean value for the entire data set, and the lines above and below the boxes represent the 10th and 90th percentiles of the data. In addition to box plots, data analysts should also consider using histograms and probability plots to provide tangible evidence of similarities or differences between site and background data.

The level of effort spent to evaluate potential differences between PRS and background data should be related to the site-specific information available. For example, if historical information indicates that beryllium was released at a firing site, the potential differences between beryllium concentration data from firing site activities and background data should be carefully evaluated to determine the levels of anthropogenic beryllium added to the environment. In all cases, data comparisons will be documented in the appropriate ER Project report.

Hot Measurement Comparison

The Hot Measurement comparison uses a threshold value that represents high natural background concentrations. No matter what parameters are chosen to define the threshold, there exists a probability that a natural background measurement will exceed the hot measurement threshold. The frequency of false positive results is minimized by using a threshold statistically related to higher background concentrations. The confidence limit on a percentile of the distribution, termed the tolerance limit, is such a value and is one of the background comparison methods recommended by EPA (1989, 1141). The ER Project has selected the 95th percentile for calculating the upper tolerance limit (UTL), based on the general guidance in the RCRA groundwater document. EPA recommends calculating an upper 95% confidence limit for the target percentile (EPA 1989, 1141). The UTL for the 95th percentile at 95% confidence can be calculated using Equation (1).

$$\text{UTL} = \text{mean} + \text{standard deviation} * k_{0.95,0.95} \qquad (1)$$

The k-factor depends on the number of background samples; complete tables of k-factors are published in the RCRA groundwater statistical analysis document (EPA 1989, 1141) and in Gilbert (1987, 0312). Table 1 presents k-factors selected to represent the range of values used to compute UTLs for Laboratory background soil samples. To apply Equation (1), the background data must be normally distributed or transformed to normality (e.g., by using a square-root or log-transformation). If data deviate sufficiently from normality, nonparametric methods for calculating tolerance limits should be considered (e.g., Gilbert [1987, 0312]). Alternatively, when appropriate, the data analyst may trim outliers from the distribution and calculate the UTL based on the trimmed mean and standard deviation.

TABLE 1
SELECTED K-FACTORS USED TO CALCULATE UTL[a]

Number of Background Samples	$k_{0.95,0.95}$
10	2.911
20	2.396
30	2.220
40	2.126
50	2.065
100	1.927

a. reprinted from Gilbert (1987, 0312)

An alternative to the UTL is the maximum reported concentration. It should be noted that when few background samples are available, using the maximum concentration will result in an underestimation of the upper background percentile. In general, the sample maximum concentration (for "n" samples) is an estimate of the 100 • [(n-0.5)/n]th percentile. Thus, if 10 samples are collected, the sample maximum concentration is an estimate of the 95% percentile. Because the observed maximum is extremely sensitive to background sample size, it is not recommended for use as a hot measurement threshold. Rarely detected analytes, which include antimony, cadmium, mercury, selenium and thallium, are an exception to this general recommendation. For this limited subset of rarely detected analytes, the maximum detected background concentration is used as the hot measurement threshold.

Background screening values[5] for inorganics in Laboratory-wide soil, sediment, and Bandelier Tuff are summarized in Tables 2, 3, and 4. As discussed earlier (see Laboratory Background Comparison Approach), use of the appropriate subset of Laboratory-wide background data is essential, and the rationale for selecting background data should be fully documented. The background screening values found in Tables 2 through 4 should be used only if comparable sample preparation and analytical methods are used for background and PRS samples. In addition, the background screening values are available on the FIMAD (Facility for Information Management and Display) home page and data analysts are encouraged to use the most recent values for background comparisons. Readers interested in details on the calculation of the background screening values are referred to Longmire and others (Longmire et al. 1995, 1266).

The hot measurement comparison is made between the maximum detected site sample and the background screening value (UTL or maximum). Exceeding the UTL as a background screening value is not definitive evidence that a release has occurred at a PRS. Assuming the PRS is at background and the statistical model is correct, there is a 5% probability that the 95th percentile will be exceeded by each sample collected from the PRS. Furthermore, a typical inorganic chemical suite requires comparison of 23 analytes with background. If the concentrations of the 23 inorganic analytes vary independently, the 5% probability that each PRS sample exceeds the 95th percentile increases to a 69% probability that at least one of the 23 ninety-fifth percentiles will be exceeded in a single sample. Additionally, given that the probability values for these multiple comparisons have not been adjusted, the overall confidence level for 23 analytes will be substantially less than 95%. In addition to the strictly probability-based discussion presented above, the possibility of exceeding a UTL due to an unusual, but naturally occurring, soil matrix is a further consideration. Consequently, the results of a hot measurement comparison must be carefully evaluated.

The results of the UTL or maximum comparison should also be evaluated with respect to potential human health or ecological effect concentrations. Some inorganic chemicals (arsenic, beryllium and manganese in particular) represent a special case. Because soil and tuff background levels for arsenic, beryllium or manganese at the Laboratory exceed risk-based screening levels, no screening action levels (SALs) are being used for these chemicals for the Laboratory ER Project. Two inorganics (aluminum and thallium) have background UTLs that represent a significant

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5 Because both maximums and UTLs can be used as hot measurement thresholds, the more generic term "background screening value" is used to describe the values presented in Tables 2 through 4.

fraction of the SAL (10 to 50%). If, in a comparison similar to a multiple chemical evaluation, all inorganic chemicals had a concentration equal to the UTL, the total of the inorganic UTLs divided by the corresponding SAL (in effect normalizing the UTL-to-SAL ratio) would equal 116%. Thus, concentrations of most naturally occurring inorganic chemicals are significantly lower than their respective SALs, except aluminum, arsenic, beryllium, manganese and thallium. Consequently, background comparisons are more important where releases of aluminum, arsenic, beryllium, manganese and thallium are suspected.

Both the multiple chemical evaluation and the UTL-to-SAL comparison help determine what level of effort should be expended to evaluate deviations from background. When only a single statistical comparison with background is performed, the UTL comparison is adequate for most naturally occurring inorganic chemicals because probability levels are not compromised. Under this circumstance, the UTL is the simplest comparison and is functionally most similar to comparisons of site data to target risk levels or SALs.

TABLE 2
SUMMARY OF MEASURED INORGANIC CHEMICAL BACKGROUND SCREENING VALUES BY SOIL HORIZON

Chemical[1] (mg/kg)	Soil Master Horizon			All Soil Horizon Data
	A	B	C	
Aluminum[2]	26600	43600	38700	38700
Antimony[2]	0.5	1	<5	1
Arsenic[3]	6.99	8.12	6.58	7.82
Barium[2]	263	321	286	315
Beryllium[2]	1.41	1.91	1.95	1.95
Cadmium[2]	1.4	2.7	<0.4	2.7
Calcium[2]	4030	6480	5930	6120
Chloride[4]	25.0	78.2	170	75.9
Chromium[2]	19.3	19.0	17.0	19.3
Cobalt[2]	31.0	14.8	41.2	19.2
Copper[2]	15.5	14.3	13.4	15.5
Iron[2]	18100	21800	18500	21300
Lead[2]	28.4	22.3	21.9	23.3
Magnesium[2]	3460	4480	4610	4610
Manganese[2]	1000	673	463	714
Mercury[6]	<0.1	0.1	0.1	0.1
Nickel[2]	12.2	16.0	13.3	15.2
Potassium[2]	3070	3420	3410	3410
Selenium[3]	0.7	1.3	1.7	1.7
Sodium[2]	602	798	2680	915
Sulfate[4]	42.7	249	712	317
Tantalum[5]	<0.9	<0.9	<0.9	<0.9
Thallium[5]	0.4	1	0.6	1
Thorium[5]	13.3	15.0	12.3	14.6
Uranium[5]	1.87	1.72	1.36	1.87
Vanadium[2]	42.8	42.0	32.0	41.9
Zinc[2]	47.1	51.5	50.8	50.8

1 - Sample preparation was by EPA method 3050, except for chloride and sulfide, which were extracted by distilled water.
2 - Inductively Coupled Plasma Emission Spectroscopy
3 - Electrothermal Vapor Atomic Absorbance Spectroscopy
4 - Ion Chromatography
5 - Inductively Coupled Plasma Mass Spectroscopy
6 - Cold Vapor Atomic Absorption Spectroscopy

TABLE 3
SUMMARY OF MEASURED INORGANIC CHEMICAL BACKGROUND SCREENING VALUES BY ROCK UNIT

Chemical[1] (mg/kg)	Tt	Qbo	Qct	Qbt 1g	Qbt 1v	Qbt 2	Qbt 3	Qbt 4[8]
Aluminum[2]	4500	1800	3400	3700	8170	3700	3700	15700
Antimony[5]	<0.3	<0.3	0.2	<0.3	0.3	0.3	0.4	<0.3
Arsenic[3]	<0.5	<0.5	0.5	0.7	2	2	5	2.18
Barium[2]	69	23	18	28.0	28.0	28.0	28.0	56.6
Beryllium[2]	0.21	1.2	0.95	1.53	1.53	1.53	1.53	1.82
Calcium[2]	2700	890	1500	4140	4140	1520	1520	2770
Chloride[4]	67	7.7	379	405	405	107	64.8	465
Chromium[2]	10	2.3	1.8	0.94	1.7	1.6	2.1	10.9
Cobalt[7]	NA	8.88	NA	1.27	1.78	1.34	1.39	3.14
Copper[2]	16	2.6	2.2	2.4	2.6	2	2	6.43
Iron[2]	13000	3700	2400	3250	9040	9040	9040	19500
Lead[5]	6.7	5	7.1	16.2	21.9	16.2	16.2	11.0
Magnesium[2]	950	510	510	548	628	548	628	2950
Manganese[2]	280	170	90	273	533	533	426	656
Nickel[2]	15	2.8	<2	<2	2	<2	2.6	8.72
Potassium[2]	1100	960	1600	2730	5540	2730	735	4540
Silver[2]	<1	<1	<1	<2	<2	<1	1.9	<1
Sodium[2]	610	1900	3500	4290	4290	1940	1940	3290
Sulfate[4]	38.6	12.7	548	815	815	815	815	1430
Tantalum[5]	0.2	0.9	0.3	0.3	0.5	2	0.8	0.5
Thallium[5]	<0.3	0.9	<0.2	0.7	1.7	1.3	1.7	0.49
Thorium[5]	6.4	1.4	4.2	7.69	22.1	11.5	9.29	6.1
Uranium[5]	0.6	0.2	0.4	1.39	5.93	2.48	1.64	0.9
Vanadium[2]	29	2.8	3.8	1.67	4.01	4.01	4.01	20.2
Zinc[2]	41	21	17	56.3	84.6	59.0	59.0	75.4

1 - Sample preparation was by EPA method 3050, except for chloride and sulfide, which were extracted by distilled water
2 - Inductively Coupled Plasma Emission Spectroscopy
3 - Electrothermal Vapor Atomic Absorbance Spectroscopy
4 - Ion Chromatography
5 - Inductively Coupled Plasma Mass Spectroscopy
6 - Cold Vapor Atomic Absorption Spectroscopy
7 - Maximum detect of Instrumental Neutron Activation Analysis
8 - Background screening values are from Broxton et al. (1996, 1305)
NA - Not available

TABLE 4
SUMMARY OF BACKGROUND SCREENING VALUES FOR SEDIMENT SAMPLES

Chemical[1] (mg/kg)	Screening Value	Chemical[1]	Screening Value
Aluminum[2]	11800	Magnesium[2]	2310
Arsenic[3]	3.94	Manganese[2]	490
Barium[2]	141.	Nickel[2]	10.0
Beryllium[2]	1.40	Potassium[2]	2850
Calcium[2]	3340	Sodium[2]	195
Chloride[4]	NA	Sulfate[4]	NA
Chromium[2]	8.77	Thorium[5]	11.1
Cobalt[2]	5.16	Uranium[5]	1.29
Copper[2]	9.85	Vanadium[2]	21.3
Iron[2]	14400	Zinc[2]	62.1
Lead[2]	13.8		

1 - Sample preparation was by EPA method 3050, except for chloride and sulfide, which were extracted by distilled water
2 - Inductively Coupled Plasma Emission Spectroscopy
3 - Electrothermal Vapor Atomic Absorbance Spectroscopy
4 - Ion Chromatography
5 - Inductively Coupled Plasma Mass Spectroscopy
6 - Cold Vapor Atomic Absorption Spectroscopy
NA - Not available.

Slippage Test

The Slippage test is an alternative to the Hot Measurement or UTL comparison. It is based on the maximum observed background value and the number of site concentration values ("n") that exceed the maximum of the background data (Gilbert and Simpson 1990, 0972). The result of the Slippage test is a probability that "n" site samples exceed the maximum background concentration by chance alone. The Slippage test is potentially more useful than the UTL comparison because it is based on a statistical hypothesis test and not simply a statistic of a distribution. However, because the Slippage test is similar to the UTL comparison, performing it will not usually provide any additional information beyond the UTL comparison. Thus, performing one or more of the following distribution shift tests is recommended if additional statistical tests are warranted.

Distributional Shift Tests

A distributional shift test is used to determine whether site data are systematically greater than background data. Several types of distributional shift tests are available, and these tests are presented in two groups below. The preferred statistical method in each group is indicated where there are multiple options.

For detecting distribution shifts between all PRS data and the appropriate subset of Laboratory-wide background data, the following statistical tests can be used:

- The Student t-test is a parametric, statistical, two-sample test that determines whether the mean concentration of site data is statistically greater than the mean concentration of background data (Gilbert 1987, 0312). Data analysts should be aware that the t-test performs well for some deviations from normality, but in general, the t-test is not recommended, because it assumes that the data being compared are normally distributed.
- The Wilcoxon rank-sum test is the nonparametric equivalent to the t-test (Gilbert 1987, 0312; Gilbert and Simpson 1992, 0974). The Wilcoxon test pools site and background data into one aggregate set and determines whether the average rank of site data is greater than that of the background data. The Wilcoxon test is recommended when site data consist of few samples or when nondetects are relatively infrequent (<10%). The Wilcoxon rank-sum test is recommended as the default statistical test to determine distribution shifts between all data, because most environmental data are rarely fit by a normal distribution and frequency of detection for most inorganics is greater than 90%.
- The Gehan test, recommended when non-detects are relatively frequent (>10% and <50%), handles a single detection limit in a statistically robust manner (Gehan 1965, 1296). It is identical to the Wilcoxon rank-sum test when applied at sites for which no non-detects occur.
- The Peto-Prentice test is another variation on the Wilcoxon rank-sum test (Millard and Deverel 1988, 1295). The Peto-Prentice test, also recommended when non-detects are relatively frequent (>10% and <50%), handles multiple detection limits in a statistically robust manner. It is identical to the Wilcoxon rank-sum test when applied at sites for which no non-detects occur.

For detecting distribution shifts between the upper ranges of PRS data and the appropriate subset of Laboratory-wide background data, the following statistical test can be used:

- The Quantile test (Gilbert and Simpson 1992, 0974), which compares the upper quantile of background data with that of PRS data, is capable of detecting a statistical difference when only a small number of PRS concentrations are elevated. Because it does not artificially reduce statistical significance, the Quantile test is the most useful distributional shift test for PRSs at which samples from a release represent a small fraction of the overall data collected. For example, to detect

contamination from historical spills at unknown locations, an RFI work plan may call for samples to be collected from a grid. Most sample results show no contamination, but those in or near spill locations show elevated concentrations. The Quantile test can be used when the frequency of non-detects is approximately the same as the quantile being tested. For example, in a case having 75% non-detects in the combined background and PRS data set, application of a quantile test comparing 80th percentiles would be appropriate.

The ability to use either of types of distributional shift tests is dependent on the number of samples available for comparison. In general, at least 10 sample concentrations for comparison with background data are needed to provide adequate confidence for detecting a shift. Frequently, during Phase I of an RFI, inadequate numbers of samples are collected to warrant a distributional shift comparison.

To infer a significant result in a distributional shift test, a 95% confidence level is recommended. Given that multiple comparisons will be performed with the distributional shift test, the same statistical interpretation issues cited above for the hot measurement test are also relevant. In addition, the human health and ecological consequences of PRS concentration data above background must be considered along with differences in inorganic chemical concentrations between soil horizons.

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SOIL HORIZON PRIMER:

Soil horizons at the Laboratory generally are unconsolidated and consist of A, B, and C horizons. The A horizon occurs at the land surface, and therefore, accumulates humified organic matter typically mixed with a much larger fraction of minerals than found in the B or C horizons. A horizons can also occur as thin, disturbed soil horizons having only minimal amounts of humified organic matter. The latter are common where surface activity (e.g., grazing, overland traffic) has compacted or partially stripped original upper soil horizons.

The B horizon underlies the A horizon and shows little or no evidence of the parent rock structure. B horizons often contain increased geochemically reactive mineral phases (phyllosilicate clay minerals, iron oxyhydroxides, organic coatings) that may concentrate major and trace elements. In soils at the Laboratory, B horizons display a wide range of features, degrees of development, and characteristics resulting from several primary soil-forming processes and types of Laboratory illuvial[6] material. Laboratory B horizon soils consist of three subgroups: 1) weakly developed B horizons (B_w) that have minimal changes in physical and chemical properties relative to the parent material; 2) clay-rich B horizons that have increased in clay-sized material over time B_t); and 3) B horizons that have been influenced by the accumulation of calcium carbonate (B_k). Transitional soil horizons, sharing the physical and chemical properties of two soil horizons, may also occur and are indicated by two letters (e.g., AB, BA, BC). The dominant horizon, indicated by the first letter, is the appropriate horizon for background data comparisons.

C horizons, wide-spread at the Laboratory, consist of slightly altered and non-altered parent materials. Examples of minimally altered parent material would include accumulation of silica and calcium carbonate, mineral alteration through oxidation and reduction processes, and gleying[7].

All soil profiles across the Laboratory are underlain by R horizons that consist of consolidated bedrock that is usually highly fractured, but has undergone minimal chemical alteration. Laboratory background data include some R horizon soil samples, but no statistical evaluation of these samples has been made because of the small number of R horizon samples collected. Parent materials of the R horizons include alluvium, colluvium, Bandelier Tuff, El Cajete pumice, and other geological material. In most mesa top cases, Bandelier Tuff is the primary parent material. Thus, comparison to Bandelier Tuff background data should be evaluated for PRS samples that have been designated as R soil horizon samples.

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[6] Illuvial is the process of deposition of colloidal material (e.g. clay, iron oxides) within a horizon. Colloidal material is usually from an overlying horizon.

[7] Gleying is the reduction of iron (Fe+3 to Fe+2) under anaerobic (i.e., saturated or waterlogged) soil conditions.

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SUBJECT: INTERIM ACTION PLANS AND REPORTS

STATEMENT OF ISSUE

Interim actions (IAs) may be required to stabilize a site or to in some way reduce the risk to human health and the environment when the implementation of a final remedy is not possible for some time into the future. If an IA is required because of a required delay of final remedy, and it does not prevent the application of the final remedy, the action may be used in support of DOE performance measures. If the action is used in support of performance meausres or the action is required for regulatory reasons, a plan and report is required to document the action.

SUMMARY OF POLICY

Interim actions fall into the two general categories of (1) best management practices (BMP) and (2) engineered solutions. This policy provides outlines and guidance for the preparation of plans and reports covering both categories of interim actions. This policy also describes the different levels of information that may be required for documenting the two types of IAs.

DISCUSSION

The IA Process (96-PCT-005) explains the criteria and presents the decision logic to follow when implementing an IA.

Interim Actions as Best Management Practices (BMPs)

Interim actions will be implemented as BMPs to prevent exposure, lower risk, stabilize a problem, or prevent contaminants from migrating onto or off-site. A common example includes run-on or/ run-off control, but other actions such as fencing a Potential release site (PRS) also fall into this category. Although BMPs may not be complex, they are sometimes required by regulatory agenacies such as the New Mexico Environment Department (NMED) Surface Water Bureau. If they support a regulatory requirement, IA, plans and reports for BMPs will be submitted to both the regulator and DOE for review and/or approval.

Because they are generally simple solutions, plans and reports for BMPs should be low in complexity. One or two sentences, and where applicable, summary level data, under each section of the outlines provided with this policy should be adequate for planning and reporting purposes. A possible exception might include BMPs which require the documentation of monitoring data. In such cases, IA reports may include more data than reports for BMPs which do not require monitoring.

Interim Actions as Engineered Solutions

Interim actions which are engineered solutions may include a variety of intervening measures. Examples include source removals, capping, evacuating, and other activities that will accomplish the same objectives as those for BMPs. Plans and reports for this category will be submitted to DOE, for approval, and to the regulator for information purposes.

The length of plans and reports for IAs which are engineered solutions will vary depending upon the complexity of the action. Simple removals may require only two to three pages for either the plan or the report, but much lengthier documents may be required for more complex actions. Judgment must therefore be applied in determining length, but in general, the greater the degree of complexity and corresponding cost for the action, the greater will be the need to present the design specifications of the solution and the data to justify and/or document the results of the action.

Plans vs. Reports for Interim Actions

Because IA plans propose an activity and must therefore include data and supporting discussion to justify the proposal, the plans for IAs will in general be lengthier than the reports. However, exceptions will occur, and judgment must therefore be applied in determining the degree of reporting required relative to the depth of the plan that was prepared. For instance, an engineered solution, such as the evacuation of waste from a tank, will require a plan that presents a rationale supported by data on the contents of the tank and information on the condition of the structure to justify the need for immediate action. However, because such an IA may not include the need to collect more data, the report may be a simple description of implementation that is shorter in length than the plan. On the other hand, BMPs for storm water control will require a plan that is not complex. However, if the BMPs require monitoring to document effectiveness over a significant period of time, the result could be that the report is lengthier than the plan due the need to present and discuss the results of monitoring data.

In all instances, the Field Project Leaders must work closely with the DOE Field Project Coordinator to determine the appropriate level of detail to follow when writing an IA plan and/or report.

This policy was developed and reviewed with extensive input from various field unit, project office, and DOE personnel.

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Outline for Interim Action Plans

1.0 Rationale and Objective of Interim Action

Provide an executive summary which highlights the rationale and the desired objective of the interim action. Supporting information for presenting the rationale may include the following:

- Containment/lack of containment of COPCs; reduction in migration potential or other modification of pathway due to implementation of the interim action; etc.

- A statement of risk to human health and/or the environment; this may be emphasized relative to impacts that could occur if the interim action is not taken.

- A summary of any impacts to regulatory compliance, cost and involvement of final remedy, or schedule if the interim action is not taken.

2.0 Site Description and Characterization Data

Site description and characterization data are required to support the rationale of the interim action. Because BMPs are less complex, they will most likely require less supporting material in this section than interim actions which are engineered solutions.

Interim actions which are BMPs require only a brief site description. BMPs performed to protect water quality, however, must include an adequate description of the PRS location within a water course and/or relative to an aquifer. In terms of characterization data, the amount presented may be limited, but enough should be provided to indicate what risk or exposure is being addressed by the action. For instance, a BMP such as fencing, installed to simply prevent exposure, will require only a narrative discussion of the ranges and maximums of contaminants present at surface.

For interim actions which are engineered solutions, the site description should include a definition of the site type and a brief history of operations which have created contamination. Site characterization material will vary depending upon the complexity of the interim action required and may therefore include a variety of types of data. For instance, a simple removal may require only a narrative presentation of the range of constituents above SAL which are presenting the immediate threat to the environment. However, a more complex solution such as capping may require a table of data showing information such as nature and extent of contamination. Judgment must be applied on what to present, but at a minimum, the characterization information should include a discussion of the COPCs and the data necessary to quantitatively verify the need to conduct the interim action.

A site map should be presented in this section of the plan. The map should mark the location of sample points which have contributed information in support of the interim action. The map may be referred to in subsequent sections and should therefore be designed to accommodate discussion material presented later in the plan. For instance, if BMPs require monitoring, the location of future sample points should be marked on the map. If BMPs and other structures, such as fences or caps, are installed as part of the interim action, the map should show the planned location of the structures.

3.0 Interim Action

A full description of the proposed interim action design and a discussion of how it will function to reduce risk are presented in this section. For instance, if the interim action includes the installation of a cap, the material the cap is to be contructed of and the area over which it will be applied in addition to how the cap functions to reduce migration of contaminants should be described. For interim actions that are BMPs having a simple design, this section may focus more on how the action will function to reduce exposure and contain contamination.

4.0 Monitoring and Confirmatory Activities

Monitoring and confirmatory sampling may be required to document the effectiveness of the interim action. If so, a description of any post interim action monitoring or other kinds of confirmatory activities that may be associated with the interim action are provided in this section. For instance, in the case of BMPs which require monitoring, the schedule and design of sampling activities is presented. If confirmatory sampling is required, a discussion of the type and proposed location of the samples is included.

5.0 Maintenance and Inspection

BMPs and other types of interim actions designed to stabilize over a period of time could require maintenance and inspection. In such cases, material presented in this section should include the schedule of inspections and describe how corrective action will be applied if inspection indicates the need for structural maintenance.

6.0 Waste Management

Waste management activites may be required in support of certain interim actions such as hot spot removals. If waste management is required, this section should include a forecast of the types and volumes of waste to be generated. A discussion of the method of management and disposal of the waste should also be presented.

7.0 Schedule and Cost

This section includes a description of the schedule associated with the interim action, from initiation, through monitoring, if any, to projected completion or application of the final remedy. A table of dates or a Gantt chart could be used to organize the schedule information. In addition, the total cost of the implementation, including monitoring costs, if any, should be provided.

8.0 References

Annexes

Type and number of annexes may vary and could include: Correspondence with regulatory agencies; Applicable SOPs; Sampling Methodologies; H&S Plans; Waste Management Checklist, etc.

Outline for Interim Action Reports

1.0 Introduction

Provide an executive summary of the interim action performed, including the type of interim action, the reason for the implementation, and the documented effectiveness of the activity. If the Interima Action Plan provides important support to the report, the plan may be referenced.

2.0 Interim Action

A report on the implementation of the action is presented in this section. Photographs should be included. A discussion of any deviation from the activity as planned should also be provided.

3.0 Monitoring and Confirmatory Sampling

The results of any monitoring or confirmatory sampling data collected to document effectiveness of the interim action is provided in this section. If data for more than two samples is collected, the information should be presented in table format and include background values, SALs, sample depth, etc.

4.0 Inspection and Maintenance

Material presented in this section provides a report of the inspection and any associated maintenance activities that were performed in support of the interim action.

5.0 Waste Management

A report on the actual off-site dispensation of the waste should be provided in this section, if the information is available at the time of reporting. If the information is not available, a report of the expected results of how the waste is to be managed should be included.

6.0 Cost and Schedule

Actuals on cost and schedule are provided in this section if available. Any deviations from the projection of expenditures and implementation time frame should be explained.

Annexes

QA/QC for any data presented in Sections 3.0 and/or 4.0; other appendices as required.

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Date: April 12, 1996
Refer to: EM/ER:96-PCT-013

SUBJECT: POLICY FOR THE DERIVATION AND USE OF RADIONUCLIDE SOIL CLEANUP GUIDELINES

STATEMENT OF ISSUE

The Los Alamos National Laboratory's (the Laboratory's) Environmental Restoration (ER) Project has developed a policy for determining cleanup guidelines for radionuclides in soil to aid in ER Project decision-making. The intent of this policy is to ensure technical consistency in the calculation and application of radionuclide cleanup guidelines and to promote long-term defensibility of DOE-approved authorized and supplemental limits based upon these guidelines.

SUMMARY OF POLICY

The policy provides default exposure scenarios and RESRAD input parameters for calculating generic radionuclide cleanup guidelines for Laboratory mesa-top sites. Recommendations for developing site-specific cleanup levels are presented. Critical input parameters that affect the calculation of soil guidelines are evaluated. In addition, guidance on uncertainty analysis and comparision of site data to soil cleanup levels are provided.

DISCUSSION

A detailed discussion follows in the attached paper.

This policy was developed and reviewed with extensive input from various field unit, project office, and DOE personnel.

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DERIVATION AND USE OF RADIONUCLIDE SOIL CLEANUP GUIDELINES

The Los Alamos National Laboratory Environmental Restoration Project

Prepared by
Ralph Perona for the
Los Alamos National Laboratory
Environmental Restoration Decision Support Council

April 12, 1996

LA-UR-96-

INTRODUCTION

Soils (tuff, fill, true soil, or any combination of the above) contaminated with radionuclides are present in various locations as a result of activities at Los Alamos National Laboratory (the Laboratory). The Laboratory's ER Project is overseeing the characterization and remediation of radionuclide-contaminated soils. This paper addresses the technical aspects of calculating, justifying, and comparing site data to generic and site-specific radionuclide soil cleanup guidelines. The terms "generic" and "site-specific" soil cleanup guidelines are used in this paper to describe guidelines calculated with exclusively default model parameter values, and guidelines calculated with modified parameter values, respectively. As discussed in DOE/AL 1996 (1308), soil cleanup guidelines must be approved by the United States Department of Energy (DOE) Environmental Protection Division and the Office of Environmental Restoration, Southwestern Area Programs, in order to be applied as either authorized or supplemental limits at a site. The terms "authorized" and "supplemental" limits refer to soil cleanup guidelines approved by DOE, as defined in *Radiation Protection of the Public and the Environment* (DOE 1993, 1315). For simplicity, the term soil cleanup guideline will be used throughout this paper even though approval as an authorized or supplemental limit will normally precede certain activities described herein.

The objective of this document is to provide guidance to ER Project technical staff for the calculation and use of soil cleanup guidelines for radionuclides in mesa-top soils. Implementation of this guidance is intended to ensure that soil cleanup guidelines for radionuclides are calculated with an appropriate methodology and with reasonable and consistent model assumptions in all cases. The benefits of adopting a consistent technical approach to calculating soil cleanup guidelines is long-term defensibility of site-specific authorized or supplemental limits based on calculated soil cleanup guidelines, and a uniform standard of quality. Generic soil cleanup guidelines are intended to be used as a conservatively-biased screening tool to identify areas of potential concern under one of three basic land use scenarios and also provide a common point-of-departure for the calculation of site-specific soil cleanup guidelines.

The DOE Albuquerque Operations Office has issued a memorandum (DOE/AL 1996, 1308) stating that the annual dose rate limits put forward in the United States Environmental Protection Agency (EPA) proposed rule *Radiation Site Cleanup Regulation*, 40 CFR 196, (EPA 1994, 1316) be adopted as target dose limits for calculating soil cleanup guidelines. These target dose limits, 30 mrem/yr above background for industrial release and 15 mrem/yr above background for unrestricted residential release, are used in this document as default model parameters for calculation of generic soil cleanup guidelines. The RESRAD computer code developed by Argonne National Laboratory (Yu et. al. 1993, 1177) should be used to calculate soil cleanup guidelines for mesa-top soils.

A guiding principle for the identification of soil cleanup guidelines for proposal as authorized or supplemental limits is that the residual dose should be "as low as reasonably achievable" (ALARA). The ALARA principle will be applied to final selection of cleanup guidelines for an individual site. For example, cleanup guidelines calculated for unrestricted residential release may be implemented at an industrial site if cost effective because these levels generally result in a lower residual dose.

EXPOSURE SCENARIOS AND PATHWAYS

The exposure scenarios and pathways defined in this paper pertain to calculation of soil cleanup guidelines for mesa-top sites. Appropriate land use activities, exposure pathways, and contaminant transport characteristics may be quite different for canyon-bottom and mesa-top settings. Therefore, soil cleanup guidelines developed using this guidance will generally not be applicable to sites that are not located on a mesa top.

Three exposure scenarios have been identified for current and future mesa-top land use at the Laboratory: residential, recreational, and commercial/industrial. The residential scenario is typically the most appropriate for town site properties; the recreational scenario for buffer areas or areas where development is topographically limited; and the commercial/industrial scenario for those properties to be retained by the Laboratory and either currently in use by Laboratory employees or targeted for industrial development. At some sites, institutional controls that restrict access to a site may be implemented as agreed to by DOE, EPA, and stakeholders. In such cases, calculation of worker or public exposure may still be necessary to develop guidelines for maintenance of institutional controls.

The recreational exposure scenario is further divided into camper and trail-user scenarios. The trail-user scenario is appropriate primarily for hillside sites where ground suitable for camping activities is limited. This scenario encompasses several activities including hiking, horseback riding, and mountain biking. The trail user scenario may also be used as a basis for a scenario involving trespassers at a restricted-access site.

Soil ingestion, inhalation of fugitive dust, inhalation of radon gas, and external gamma irradiation have been identified as common exposure pathways for radionuclides in soil for all exposure scenarios. The residential and camper scenarios also include a plant ingestion exposure pathway; the former based on a home garden and the latter based on foraging of wild foodstuffs. Table 2-1 summarizes the exposure pathways for each exposure scenario.

Table 2-1
Exposure Pathways for Mesa -Top Laboratory Exposure Scenarios

Pathway	Residential Use	Commercial/ Industrial Use	Camping Use	Trail Use
external gamma irradiation	yes	yes	yes	yes
soil ingestion	yes	yes	yes	yes
water ingestion	no	no	no	no
ingestion of plant foods	yes	no	yes	no
ingestion of meat or animal products	no	no	no	no
inhalation of dust	yes	yes	yes	yes
inhalation of radon gas	yes	yes	yes	yes

Residential, trail user, and camper mesa-top exposure scenarios may also have a drinking water component in some locations, such as where springs discharge at the land surface. Site-specific modeling of radionuclide transport to the shallow aquifer should be considered in cases. In other locations, modeling of a drinking water pathway associated with an individual radiological site on a mesa top in the Los Alamos area is generally impractical because the distance to the main aquifer is several hundreds of feet. As discussed in Section 2.1, default RESRAD parameters recommended in this paper result in no leaching of radionuclides from the contaminated zone and therefore maximize potential on-site dose rates from radionuclides in soil.

RESRAD Parameters for Calculation of Generic Soil Cleanup Guidelines

Scenario-specific RESRAD parameters used in the calculation of generic soil cleanup guidelines are provided in Table A-1 of Attachment A. These parameters were selected to result in a reasonable maximum exposure for a receptor evaluated using each exposure scenario. In other words, if the scenario-specific generic soil cleanup guidelines are employed at any site, it may be safely concluded that they will result in a dose of less than the target dose limit for a receptor via the specific exposure pathways addressed for each exposure scenario.

Certain parameters listed in Table A-1 are critical to the manner in which the soil cleanup guidelines are modeled and are subject to a high level of uncertainty. These parameters include the area of contamination, the thickness of the contaminated zone, the erosion rate of the contaminated zone, the evapotranspiration coefficient, and mass loading for inhalation. In addition, the length of the modeling period can influence soil cleanup guidelines for certain radionuclides associated with radioactive progeny.

The size of the contaminated area may affect dose via soil ingestion, dust inhalation and external gamma irradiation. RESRAD modifies daily soil and air intake values to reflect the potential contribution to total daily intake associated with the site. These modifications are based on land use assumptions consistent with a residential scenario. For external gamma irradiation, RESRAD calculates an infinite soil source to be equal to or greater in size than a circular area twenty meters in diameter. The RESRAD default value of 10 000 m^2, adopted for the generic soil cleanup guidelines, results in essentially no modification of inhalation and ingestion exposure as well as providing for an infinite source for external gamma.

The thickness and erosion rate of the contaminated zone, as well as the infiltration rate, can greatly affect soil cleanup guidelines of radionuclides for which ingrowth of daughter progeny results in increasing dose with time. Some of the radionuclides affected include U-233, U-234, U-235, U-238, Th-230, Th-232, and, to a lesser extent, Ra-226 and Ra-228. Under static conditions (*i.e.*, the contaminated zone is not depleted by erosion or infiltration of water), progeny continue to ingrow at a rate proportional to the half-life of the daughters. For example, U-238 (half-life = 4.5E+09 yr) requires approximately a quarter of a million years for the activity of U-234 to reach half the parent activity. Therefore, assumptions controlling contaminant migration can determine the cleanup level for certain radionuclides if the modeling period is lengthy.

Generic soil cleanup guidelines are calculated assuming minimal erosion, an initial uniform depth of contamination of 3 m, and an evapotranspiration coefficient that specifies no infiltration. These assumptions result in a static contaminated zone, as described above. A modeling period of 1,000 years is used as the time limit on dose calculations because 40 CFR 196, which is the basis of the target dose limits, also specifies that the dose limits be applied for a 1 000 year period. Radionuclides with generic soil cleanup values based on dose at received from progeny after an ingrowth period of 1 000 years include Th-230, U-233, U-234, U-235, and U-238.

For calculating generic soil cleanup guidelines, the evapotranspiration coefficient has been set at the RESRAD limit of 0.999, effectively eliminating leaching of radionuclides from the contaminated zone by water and resulting in a maximal soil-based dose. This value is based on the fact that annual estimated evapotranspiration for the Los Alamos area exceeds the average annual precipitation. Because the value used for the evapotranspiration coefficient results in no infiltration, vadose and saturated zone hydrogeologic parameters in RESRAD have no influence on the generic soil cleanup guidelines. Although a value of 0.999 is generally unrealistic for any individual site (plant growth would be impossible), calculation of a specific value must proceed on a site-by-site basis.

DOSE LIMITS AND SELECTION OF CLEANUP GUIDELINES

To calculate cleanup guidelines for sites to be released for unrestricted public use, the DOE Albuquerque Operations Office (DOE/AL 1996, 1308) recommends that the dose limit of 15 mrem/yr above background in EPA's proposed rule 40 CFR 196 (EPA 1994, 1316) be adopted as a target dose limit. For sites that will not be immediately released for unrestricted public use, (such as those evaluated under a commercial/industrial scenario) the DOE Albuquerque Operations Office (DOE/AL 1996, 1308) recommends that the dose limit for industrial release (30 mrem/yr above background) in EPA's proposed rule be adopted as a target dose limit.

The target dose limits, used in conjunction with the conservatively biased RESRAD parameters suggested in Attachment A, are intended to provide generic soil cleanup guidelines that generally satisfy the ALARA principle within the bounds of each exposure scenario. If cleanup guidelines lower than the generic values are achievable, however, cost-benefit considerations may lead to the selection of a lower dose-based cleanup goal. On the other hand, cost-benefit considerations may lead to the selection of a dose-based cleanup goal that exceeds a generic soil cleanup guideline if achieving that guideline is infeasible. For example, sites that are restricted for public access and for which Laboratory employees are properly trained and apprised of site conditions, may warrant soil cleanup guidelines based on a less restrictive dose limit.

A component of the ALARA approach to selecting soil cleanup guidelines is identification of the appropriate exposure scenario for calculating either generic or site-specific cleanup guidelines. A guidance is currently being developed by the ER Project for land use selection. Application of soil cleanup guidelines based on a residential exposure scenario is desirable if these guidelines are achievable because residential soil cleanup guidelines are generally the most restrictive. It may be necessary to place restrictions on future land use activities if the authorized or supplemental limits approved for a site are based on soil cleanup guidelines calculated for less restrictive land use options.

As stated previously, the generic soil cleanup guidelines are intended to represent reasonable worst case exposure conditions within the bounds of each exposure scenario. It is extremely important to remember, however, that unique conditions can exist at a particular site that may warrant remedial activities even when the generic soil cleanup guidelines are not exceeded for the chosen scenario. This is particularly true if exposure routes may exist that are not incorporated into the RESRAD model or if off-site dose resulting from radionuclide transport may be of concern. For example, using an exposure scenario that does not evaluate plant ingestion, the generic soil cleanup level for Sr-90 may be quite high. Nevertheless, if plants can root in the contaminated soil Sr-90 may be mobilized and distributed in the air as fine particulates should the plant become desiccated or if it burns. Another example is the erosion of contaminated hillside soils into a canyon bottom where very different exposure conditions may exist. In summary, generic soil cleanup guidelines are conservatively biased within the bounds of the assumptions used in their calculation. It is contingent upon the end user to determine if other concerns outside the computational bounds of the RESRAD code require evaluation.

COMPARISON OF SITE DATA TO RADIONUCLIDE CLEANUP GUIDELINES

In general, cleanup guidelines can first be applied in situations where one or more radiological contaminants of potential concern (COPCs) have been identified at a site following a screening assessment. At this point, one of the factors in deciding whether the site is a candidate for an

accelerated cleanup is the feasibility of achieving a relatively quick and inexpensive remediation. The generic cleanup guidelines should be used to aid in such a decision. Depending on the objectives of the accelerated action, the value used for comparison to a cleanup guideline can be a maximum observed value or a statistic based on the site data. If a maximum observed value is used for comparison, the cleanup guidelines become, in effect, an extension of the site screening process.

The traditional use of cleanup guidelines is to determine whether a remedial action has been successful. In this case, either a maximum value or, more commonly, a statistic based on the verification samples is compared to the cleanup guidelines.

When using a statistic for comparison of site data to generic cleanup guidelines, the estimation of uniformly contaminated soil area and volume for calculating the statistic is critical. The Manual for Implementing Residual Radioactivity Material Guidelines Using RESRAD (Yu et al. 1993, 1177) recommends averaging radionuclide concentrations over an area of 100 m^2 and a depth of 0.15 m for all pathways. However, it also may be necessary to determine whether hot spots exist within the larger area because guidelines applied to homogenous soil sources are not necessarily protective when nonuniform contamination exists. Criteria for identifying and evaluating hot spots are presented in the RESRAD Manual (Yu et al. 1993, 1177). Additional guidance for demonstrating the attainment of soil cleanup guidelines are available from DOE, EPA, and the Nuclear Regulatory Commission [Multi-Agency Radiation Survey Investigation Manual (DRAFT, 1996 - NEED REF); Manual for Conducting Surveys in Support of License Termination (NUREG 5849, 1992 - NEED REF); Environmental Implementation Guide for Radiological Survey Procedures (DOE-DRAFT, 1992 - NEED REF); Statistical Methods for Evaluating the Attainment of Cleanup Standards (PNL-7409, 1994 - NEED REF), and; A Non-Parametric Statistical Methodology for the Design and Analysis of Final Status Decommissioning Surveys (NUREG 1505, 1995 - NEED REF)]

APPLYING SOIL CLEANUP GUIDELINES TO SITES WITH MULTIPLE RADIONUCLIDES

Soil cleanup guidelines are calculated for *individual* radionuclides and specific exposure scenarios, such that a receptor will not receive more than the target dose level. When two or more radionuclides are present, however, it is necessary to determine whether their collective impact may result in an annual dose above the target dose limit.

The process of evaluating the effects of multiple radionuclides is similar to that described for a multiple chemical evaluation described in the Risk-Based Corrective Action Process (LANL/SNL 1995, 1277). If one or more cleanup guidelines are exceeded, it is obvious that cleanup objectives have not been met. However, if no cleanup guidelines are exceeded, the concentration of each radionuclide (either the maximum observed value or a statistic) is divided by the cleanup level for that radionuclide, resulting in a value less than one. These values are then summed. If the sum exceeds unity, the cleanup objective has not yet been met, even though all radionuclides are present at concentrations below their respective cleanup guidelines.

CALCULATION AND PRESENTATION OF SITE-SPECIFIC RADIONUCLIDE CLEANUP GUIDELINES

For site-specific, or supplemental, cleanup guidelines the RESRAD input parameters are modified to reflect conditions existing at the individual site. The process of performing a site-specific exposure assessment for deriving cleanup guidelines, including characterization of potentially exposed populations, identification of relevant exposure pathways and routes of intake, and incorporation of site-specific contaminant fate and transport information, is essentially identical to that described in existing exposure assessment guidance (EPA 1989, 0305). However, there are certain parameters in the RESRAD code, in particular those discussed in Section 2.1, that should be reviewed for applicability when deriving site-specific cleanup guidelines.

The area and depth of soil contamination for the generic cleanup guidelines may be replaced by site-specific estimates. However, it is important to remember that the area and depth parameters in RESRAD assume uniform radionuclide concentrations in soil. It is not appropriate to average radionuclide concentrations over a predetermined exposure unit if the actual area of contamination differs in size and shape. Instead, the fraction of time a receptor spends in the contaminated zone should be modified to reflect the relative sizes of the contaminated zone and exposure area. A soil cleanup guideline for a large area of low radionuclide concentration may differ from that calculated for a smaller area of high concentration, even if the same mass of radionuclide is present in both areas. Kriging techniques may be useful for estimating an area and depth of uniform radionuclide concentration.

As discussed in Section 2.1, for generic soil cleanup guideline calculations the evapotranspiration coefficient parameter has been set at a value that effectively eliminates leaching of radionuclides from surface soil and maximizes surface dose. The evapotranspiration coefficient was estimated based on average annual precipitation and evapotranspiration rates for the Los Alamos area. However, precipitation patterns, soil and/or tuff characetristics, site topography, land use and other factors may result in net infiltration at a particular site. The services of a qualified hydrologist may be necessary to calculate a site-specific evapotranspiration coefficient.

When infiltration of water through the contaminated zone is modeled, the radionuclide-specific distribution coefficients for the contaminated and unsaturated zones can affect the rate of leaching of a radionuclide. The distribution coefficients describe equilibrium partitioning of a solute among soil solid and water phases. Attachment B contains preliminary default values of distribution coefficients for use when infiltration of water through the contaminated zone is modeled.

As discussed above, modification of specific parameters relating to human exposure to site contaminants is discussed in existing risk assessment guidance. For radionuclides in soil, RESRAD output can be useful for identifying key parameters that may merit closer attention. For example, alpha-emitting radionuclides are often characterized as contributing a significant fraction of total dose via the dust inhalation pathway. If RESRAD output for the site in question confirms this, and if these radionuclides are driving site cleanup, parameters such as the inhalation rate and the mass loading for inhalation should be examined to see if they conform with site-specific estimates or measurements. Similarly, if Sr-90 is driving site cleanup based on the plant ingestion pathway for a residential scenario, parameters such as annual vegetable consumption, fraction of vegetables grown in a home garden and mass loading for foliar deposition should receive particular attention.

REFERENCES

NOTE: Certain references designated by (NEED REF) will be provided in the next revision of this policy.

DOE/AL (US Department of Energy/Albuquerque Operations Office), March 14, 1996. "Radiological Cleanup Standards," Memorandum from Julianne F. Levings, Environmental Restoration Division Team Leader, to J. F. Guelker, G. P. Keary, M. A. Jackson, T. J. Taylor, and D. S. Ingle, Albuquerque, New Mexico. (DOE/AL 1996, 1308)

DOE (US Department of Energy), March 25, 1993. "Radiation Protection of the Public and the Environment, Proposed Rule," Title 10, Part 834, Federal Register, Vol. 58, No. 56. (DOE 1993, 1315). (It is anticipated that this proposed rule will become law by May, 1996)

EPA (US Environmental Protection Agency), May 11, 1994. "Environmental Protection Agency Radiation Site Cleanup Regulation," (preliminary working draft),Title 40, Part 196. (EPA 1994, 1316)

EPA (US Environmental Protection Agency), March 25, 1991. 'Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors," Interim Final,' OSWER Directive 9285.6-03, Office of Emergency and Remedial Response, Toxics Integration Branch, Washington, DC. (EPA 1991, 0746)

EPA (US Environmental Protection Agency), December 1989. "Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A)," Interim Final, EPA 540/1-89/002, Office of Emergency and Remedial Response, Washington, DC. (EPA 1989, 0305)

EPA (US Environmental Protection Agency), May 1989. "Exposure Factors Handbook," EPA/600/8-89/043, Office of Health and Environmental Assessment, Washington, DC. (EPA 1989, 0304)

Environmental Protection Group, December 1990. "Environmental Surveillance at Los Alamos During 1989," Los Alamos National Laboratory Report LA-12000-ENV, Los Alamos, New Mexico. (Environmental Protection Group 1990, 0497)

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NRC (US Nuclear Regulatory Commission), May 1994. "Scenarios for Assessing Potential Doses Associated with Residual Radioactivity," Policy and Guidance Directive PG-8-08, Division of Waste Management, Office of Nuclear Material Safety and Safeguards, Washington, DC. (NRC 1994, 1317)

Yu, C., A. J. Zielen, J. J. Cheng, Y.C. Yuan, L. G. Jones, D. J. LePoire, Y. Y. Wang, C. O. Loueiro, E. Gnanapragasam, E. Faillace, A. Wallo III, W. A. Williams, and H. Peterson, September 1993. "A Manual for Implementing Residual Radioactive Material Guidelines Using RESRAD, Version 5.0," ANL/EAD/LD-2, DOE/CH/8901, Environmental Assessment Division, Argonne National Laboratory, Argonne, Illinois. (Yu et al. 1993, 1177)

ATTACHMENT A

Suggested RESRAD Parameters for Calculating Screening-Level Radionuclide Cleanup Guidelines in Soil

Input parameters for calculating screening-level radionuclide soil cleanup guidelines using RESRAD are provided in Table A-1. Cleanup guidelines calculated using these parameters are intended to be protective for receptors at a mesa top site for a specific exposure scenario. Cleanup guidelines calculated using these parameters are not necessarily applicable to sites located in areas other than a mesa top environment.

References and rationale for specific parameter values are provided in the following text. For reasons described in the entry for the evapotranspiration coefficient, the majority of hydrogeological parameters are not defended because infiltration of water through the contaminated zone is reduced to effectively zero for these screening calculations. Values are still provided for these parameters because, although soil guidelines are not sensitive to such parameters in these screening calculations, inconsistent values could compromise model stability. Values for parameters specifically associated with radon isotopes and C-14 are all RESRAD default values.

Radiation dose limit - Based on a DOE Albuquerque Operations Office memorandum on radiological cleanup standards (DOE/AL 1996, 1308) recommending target annual dose rate limits of 30 mrem/yr above background for industrial release and 15 mrem/yr above background for unrestricted residential release, in accordance with EPA's proposed rule in 40 CFR 196 (EPA 1994, 1316).

Maximum time for dose evaluation - The value of 1000 years is based on EPA's proposed rule in 40 CFR 196. (EPA 1994, 1316), which has been cited in DOE/AL (1996, 1308) for setting target dose limits.

Area of contaminated zone - The RESRAD default value of 10000 m^2 is adopted because it maximizes dose via external irradiation and soil ingestion pathways, and represents an effectively infinite source for modeling dose via the inhalation exposure route.

Thickness of the contaminated zone - The value of 3 m represents an effectively infinite source for a modeling period of 1000 years. See the entry for contaminated zone erosion rate.

Length parallel to aquifer flow - The value of 100 m represents the square root of the area of the contaminated zone. Because infiltration to groundwater has been defeated, cleanup guidelines are not sensitive to this parameter.

Time since placement of material - This parameter is used in the calculation of site-specific distribution coefficients and should be set at zero for screening calculations.

Cover depth - The value of zero maximizes on-site exposure.

Density of contaminated zone - Best professional judgment of ER Project technical staff.

Contaminated zone erosion rate - The RESRAD default of 0.001 m/yr is adopted. At this rate, the depth of the contaminated zone is effectively infinite over the 1000 year modeling period because 2 m of contaminated soil will remain at the end of 1000 years.

Contaminated zone total porosity - The RESRAD default of 0.4 is adopted with concurrence of ER Project technical staff.

Contaminated zone effective porosity - The RESRAD default of 0.2 is adopted with concurrence of ER Project technical staff.

Evapotranspiration coefficient - The RESRAD maximum value of 0.999 is selected to effectively defeat infiltration of water through the contaminated zone. Because leaching of radionuclides from the contaminated zone is eliminated the surface dose over time is maximized, a conservative approach where distances to groundwater are many hundreds of feet. Realistic

evapotranspiration coefficients will generally be smaller (thus allowing for plant growth) but must be derived on a site-specific basis.

Inhalation rate - For camper and residential scenarios, the value is calculating using the default inhalation rate of 20 m^3/day published in EPA 1991 (0746). For the commercial/industrial scenario, the value is calculated assuming half of a workers time is spent at "light" (0.8 m^3/hr) and half at "moderate" (2.5 m^3/hr) levels of activity, as defined in EPA 1991 (0304). For the trail user scenario, the value is calculated assuming a "moderate" (2.5 m^3/hr) level of activity, as defined in EPA 1991 (0304).

Mass loading for inhalation - For all scenarios except trail user, a value of 0.00009 g/m3 is used based on air monitoring data reported in an Environmental Surveillance Report (ESG 1990, 0497). For the trail user scenario, where activities such as mountain biking or horse riding may generate higher local dust loadings, a value of 0.002 g/m3 is used (NRC 1994, 1317) because this value is described in the NRC report as representing dust loadings associated with such activities.

Dilution rate for airborne dust - The RESRAD default value of 3 m, which represents a conservatively biased estimate from national meteorological data, is used.

Exposure duration - Soil cleanup guidelines are only sensitive to this parameter if they are based on an allowable cancer risk, rather than an allowable dose limit.

Shielding factors - The RESRAD default values are used for these parameters.

Fraction of time spent indoors each year - For the commercial/industrial scenario, the exposure frequency is assumed to be 8 hr/d, 250 d/yr. This value is cited in both EPA 1991 (0746) and(NRC 1994 (1317). The fraction of this time spent indoors is assumed to be 80 percent, based on a recommendation in NRC 1994 (1317). The exposure frequency for a resident is assumed to be 350 d/yr (EPA 1991, 0746). The Exposure Factors Handbook (EPA 1991, 0304) cites the average amount of time spent at home to be 75 percent. Based on best professional judgment, a value of 90 percent of the time spent at home (approximately 22 hours) is used as a reasonable maximum value. Ninety percent of the 22 hours, or 20 hours, is assumed to be spent indoors based on best professional judgment. All camping and trail use activities are assumed to be exclusively outdoors.

Fraction of time spent outdoors each year - The values used for the commercial/industrial scenario are based on the assumptions stated in the entry for the fraction of time spent indoors. These values are 20 percent of time on-site for a worker, and ten percent of time in the home for a resident. For the trail user scenario, a receptor is assumed to spend two hr/d, 170 d/yr, in the contaminated area. For the camper scenario, a receptor is assumed to spend 28 days in the contaminated area, for 24 hr/d. The exposure time estimates are based on best professional judgment and are intended to represent a reasonable maximum exposure time.

Shape factor, external gamma - This value should be set at one because the assumed contaminated area of 10000 m^2 represents an effectively infinite area source for gamma irradiation in the RESRAD code.

Fruits, vegetables, and grain consumption - The value of 124 kg/yr for the residential scenario is based on the reasonable maximum value cited in EPA 1991 (0304) for ingestion of fruits and vegetables. Consumption of home-grown grain products is considered to be infeasible for the Los Alamos area based on climate and current land use. An ingestion rate of 4 kg/yr is assumed for the camper scenario, based on best professional judgment for the gathering of foragable foodstuffs while camping. Deliberate collection of wild plants, nuts, or berries for later consumption or other use is not evaluated in the residential or camper scenarios.

Leafy vegetable consumption - The RESRAD default value of 14 kg/yr is adopted for the residential scenario. A value of 1 kg/yr is used for the camper scenario based on best professional judgment.

Contamination fraction of plant food - The value of 0.36 (EPA 1991, 0304) is based on two upper bound values for the fractions that home-grown fruits and vegetables comprise of total yearly intakes. The EPA values are weighted according to the relative yearly ingestion rates of vegetables and fruits to calculate the value of 0.36.

Soil ingestion rate - The value of 36.5 g/yr used in each scenario is based on the adult daily soil ingestion rate of 100 mg/d recommended in EPA 1991 (0746). A soil ingestion rate for children is not incorporated into the RESRAD value because the dose conversion factors used to calculate dose from intake of, or external exposure to, radionuclides are based on adult receptors.

Mass loading for foliar deposition - The RESRAD default value is used for this parameter.

Depth of soil mixing layer - The RESRAD default value is used for this parameter.

Depth of roots - The RESRAD default value is used for this parameter.

Storage time for fruits, vegetables, and grain - The RESRAD default value is used for this parameter.

Storage time for leafy vegetables - The RESRAD default value is used for this parameter.

TABLE A-1
Cleanup Guidelines for Radionuclides in Soil at Los Alamos National Laboratory: Suggested Values for Mesa Top Scenario-Specific RESRAD Parameters

Parameter	Unit	Commercial/ Industrial[a,b]	Trail-User[a,c]	Camper[d]	Resident[d]
radiation dose limit	mrem/yr	30	15	15	15
maximum time for dose evaluation	yr	1000	1000	1000	1000
area of contaminated zone	m^2	10000	10000	10000	10000
thickness of contaminated zone	m	3	3	3	3
length parallel to aquifer flow	m	100	100	100	100
time since placement of material	yr	0	0	0	0
cover depth	m	0	0	0	0
density of cover material	g/cm^3	-	-	-	-
cover depth erosion rate	m/yr	-	-	-	-
density of contaminated zone	g/cm^3	1.6	1.6	1.6	1.6
contaminated zone erosion rate	m/yr	0.001	0.001	0.001	0.001
contaminated zone total porosity	-	0.4	0.4	0.4	0.4
contaminated zone effective porosity	-	0.2	0.2	0.2	0.2
contaminated zone hydraulic	m/yr	440	440	440	440
contaminated zone b parameter	-	4.05	4.05	4.05	4.05
humidity in air	g/cm^3	8	8	8	8
evapotranspiration coefficient[e]	-	0.999	0.999	0.999	0.999
precipitation	m/yr	0.48	0.48	0.48	0.48
irrigation	-	-	-	-	-
irrigation mode	-	-	-	-	-
runoff coefficient	-	0.52	0.52	0.52	0.52
watershed area	m^2	2.7E+07	2.7E+07	2.7E+07	2.7E+07
accuracy for water/soil computations	-	0.001	0.001	0.001	0.001
density of saturated zone	g/cm^3	1.6	1.6	1.6	1.6
saturated zone total porosity	-	0.3	0.3	0.3	0.3
saturated zone effective porosity	-	0.3	0.3	0.3	0.3
saturated zone hydraulic conductivity	m/yr	100	100	100	100
saturated zone hydraulic gradient	-	0.02	0.02	0.02	0.02
saturated zone b parameter	-	4.05	4.05	4.05	4.05
water table drop rate	m/yr	0.3	0.3	0.3	0.3
well pump intake depth below water table	m	10	10	10	10
model: nondispersion (ND) mass balance (MB)	-	ND	ND	ND	ND
well pumping rate	m^3/yr	250	250	250	250
number of unsaturated zone strata	-	2	2	2	2
unsat. zone 1 thickness	m	260	260	260	260
unsat. zone 1 soil density	g/cm^3	1.6	1.6	1.6	1.6

TABLE A-1 (cont.)
Cleanup Guidelines for Radionuclides in Soil at Los Alamos National Laboratory: Suggested Values for Mesa Top Scenario-Specific RESRAD Parameters

Parameter	Unit	Commercial/ Industrial[a,b]	Trail-User[a,c]	Camper[d]	Resident[d]
unsat. zone 1 total porosity	-	0.5	0.5	0.5	0.5
unsat. zone 1 effective porosity	-	0.4	0.4	0.4	0.4
unsat. zone 1 soil-specific b parameter	-	4.05	4.05	4.05	4.05
unsat. zone 1 hydraulic conductivity	m/yr	3	3	3	3
unsat. zone 2 thickness	m	100	100	100	100
unsat. zone 2 soil density	g/cm^3	1.6	1.6	1.6	1.6
unsat. zone 2 total porosity	-	0.5	0.5	0.5	0.5
unsat. zone 2 effective porosity	-	0.4	0.4	0.4	0.4
unsat. zone 2 soil-specific b parameter	-	4.05	4.05	4.05	4.05
unsat. zone 2 hydraulic conductivity	m/yr	370	370	370	370
inhalation rate	m^3/yr	14900	21900	7300	7300
mass loading for inhalation	g/m^3	9E-05	0.002	9E-05	9E-05
dilution length for airborne dust	m	3	3	3	3
exposure duration	yr	25	9	20	30
shielding factor, inhalation	-	0.4	0.4	0.4	0.4
shielding factor, external gamma	-	0.7	0.7	0.7	0.7
fraction of time spent indoors each year	-	0.184	0	0	0.800
fraction of time spent outdoors	-	0.046	0.039	0.077	0.080
shape factor, external gamma	-	1	1	1	1
fruits, vegetables and grain consumption	kg/yr	-	-	4	124
leafy vegetable consumption	kg/yr	-	-	1	14
milk consumption	-	-	-	-	-
meat and poultry consumption	-	-	-	-	-
fish consumption	-	-	-	-	-
soil ingestion rate	g/yr	36.5	36.5	36.5	36.5
drinking water intake	L/yr	-	-	-	-
contamination fraction of irrigation water[f]	-	-	-	-	0
contamination fraction of plant food	-	-	-	1	0.36
mass loading for foliar deposition	g/m^3	-	-	0.0001	0.0001
depth of soil mixing layer	m	0.15	0.15	0.15	0.15
depth of roots	m	-	-	0.9	0.9
drinking water fraction from groundwater	-	-	-	-	-
household water fraction from groundwater	-	-	-	-	-
irrigation water fraction from groundwater	-	-	-	-	-
C-12 concentration in water	g/cm^3	2E-05	2E-05	2E-05	2E-05
C-12 concentration in contaminated soil	g/g	0.03	0.03	0.03	0.03
fraction of vegetation carbon from soil	-	-	-	0.02	0.02
fraction of vegetation carbon from air	-	-	-	0.98	0.98
C-14 evasion layer thickness	m	0.3	0.3	0.3	0.3
C-14 evasion flux rate from soil	/sec	7E-07	7E-07	7E-07	7E-07
C-12 evasion flux rate from soil	/sec	1E-10	1E-10	1E-10	1E-10
fraction of grain in beef cattle feed	-	-	-	-	-
fraction of grain in milk cow feed	-	-	-	-	-
storage time for fruits, vegetables and grain	day	-	-	0.1	14
storage time for leafy vegetables[g]	day	-	-	-	1
thickness of building foundation	m	0.15	-	-	0.15
bulk density of building foundation	g/cm^3	2.4	-	-	2.4
total porosity of cover material	-	0.4	0.4	0.4	0.4
total porosity of building foundation	-	0.1	-	-	0.1
volumetric water content of cover	-	0.05	0.05	0.05	0.05
volumetric water content of foundation	-	0.03	-	-	0.03

TABLE A-1 (cont.)
Cleanup Guidelines for Radionuclides in Soil at Los Alamos National Laboratory: Suggested Values for Mesa Top Scenario-Specific RESRAD Parameters

Parameter	Unit	Commercial/ Industrial[a,b]	Trail-User[a,c]	Camper[d]	Resident[d]
diffusion coefficient for radon in cover	m/sec	2E-06	2E-06	2E-06	2E-06
diffusion coefficient for radon in	m/sec	3E-07	-	-	3E-07
diffusion coefficient for radon in	m/sec	2E-06	2E-06	2E-06	2E-06
radon vertical dimension of mixing	m	2	2	2	2
average annual wind speed	m/sec	3	3	3	3
average building air exchange rate	per hour	1	-	-	1
height of building interior	m	2.5	-	-	2.5
building interior area factor	-	0	-	-	0
building depth below ground surface	-	-1	-	-	-1
emanating power of Rn-222 gas	-	0.25	0.25	0.25	0.25
emanating power of Rn-222 gas	-	0.15	0.15	0.15	0.15

a Pathways evaluated include soil ingestion dust inhalation, radon inhalation, and external gamma.

b Assumes continued DOE control of land.

c The trail-user scenario encompasses hiking, horseback, and mountain biking.

d Pathways evaluated include soil ingestion, plant ingestion, dust inhalation, radon inhalation, and external gamma.

e No infiltration is predicted because the evapotranspiration coefficient -- 1, therefore the hydrogeological parameters that follow have no impact on dose rates.

f Contamination fractions for materials from unactivated pathways not included.

g Storage times for materials from unactivated pathways not included.

ATTACHMENT B

Suggested Distribution Coefficients for Calculating Site-Specific Radionuclide Cleanup Guidelines in Soil

Preliminary default values of radionuclide-specific distribution coefficients are provided in Table B-1. The majority of these data are taken from the following report: Geologic, Geohydrologic, and Geochemical Data Summary of Material Disposal Area G, TA-54, Los Alamos National Laboratory (Krier D, et al. 1995, LA-UR-95-2696 - NEED REF). This report is also contained as Appendix Two within Performance Assessment of Los Alamos National Laboratory TA-54, Area G, Low-Level Radioactive Waste Disposal Facility (Hollis D, et al., August 6 1995 - NEED REF). Distribution coefficients for Np-237, Sr-90, and uranium and plutonium isotopes were obtained from Patrick Longmire, CST-7 (Patrick Longmire, personal communication, April 8, 1996 - NEED REF).

Data for distribution coefficients are generally from two sources; direct measurements using soil or tuff samples from the Laboratory and values reported in the literature for tuff samples collected at Yucca Mountain, Nevada. The Yucca Mountain data are considered to be superior to general literature values for application at the Laboratory. Nevertheless, it is recommended that a user consult the Earth Sciences Council at the Laboratory prior to adopting these values for RESRAD modeling. The Earth Sciences Council should also be consulted before attempting to apply distribution coefficients for tuff in soil, and vice versa. Distribution coefficients for the appropriate media, collected using Laboratory samples, may be directly applied in RESRAD modeling.

Table B-1
Default Distribution Coefficients for Radionuclides at Los Alamos National Laboratory

Radionuclide	Distribution Coefficient (cm^3/g)	Comments
Actinium-227	130	estimated from Yucca Mountain tuff data
Americium-241	130	literature value from Yucca Mountain tuff
Carbon-14	0	literature value from Yucca Mountain tuff
Cerium-144	50	estimated from Yucca Mountain tuff data
Cobalt-60	0.45	Los Alamos; Bandelier tuff
Cesium-134	139	Los Alamos; soil
Cesium-137	139	Los Alamos; soil
Europium-152	50	literature value from Yucca Mountain tuff
Europium-154	50	literature value from Yucca Mountain tuff
Europium-155	50	literature value from Yucca Mountain tuff
Gadolinium-152	50	literature value from Yucca Mountain tuff
Iodine-129	0	literature value from Yucca Mountain tuff
Lead-210	25	literature value from Yucca Mountain tuff
Manganese-54	-	no data are available
Neptunium-237	0.395	Los Alamos; Bandelier tuff
Protactinium-231	100	literature value from Yucca Mountain tuff
Plutonium-238	48.38	Los Alamos; Bandelier tuff
Plutonium-239	48.38	Los Alamos; Bandelier tuff
Potassium-40	15	literature value
Radium-226	200	literature value from Yucca Mountain tuff
Radium-228	200	literature value from Yucca Mountain tuff
Ruthenium-106	-	no data are available

Table B-1 (cont.)
Default Distribution Coefficients for Radionuclides at Los Alamos National Laboratory

Radionuclide	Distribution Coefficient (cm^3/g)	Comments
Sodium-22	15	literature value
Strontium-90	36	Los Alamos; soil
Technetium-99	0.3	literature value from Yucca Mountain tuff
Thorium-228	500	literature value from Yucca Mountain tuff
Thorium-229	500	literature value from Yucca Mountain tuff
Thorium-230	500	literature value from Yucca Mountain tuff
Thorium-232	500	literature value from Yucca Mountain tuff
Tritium	0	literature value from Yucca Mountain tuff
Uranium-233	7.29	Los Alamos; Bandelier tuff
Uranium-234	7.29	Los Alamos; Bandelier tuff
Uranium-235	7.29	Los Alamos; Bandelier tuff
Uranium-238	7.29	Los Alamos; Bandelier tuff