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Justification for Class III Permit Modification April 2000 Solid Waste Management Unit 115 Operable Unit 1335 Round 6

Sandia National Laboratories/NM

Justification for Class III Permit Modification

April 2000

Solid Waste Management Unit 115
Operable Unit 1335
Round 6

(RCRA Permit No. NM5890110518)

NFA Originally Submitted January 7, 1997

RSI Originally Submitted September 1999

NFA

Justification for
Class III Permit Modification

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Solid Waste Management Unit 115
Operable Unit 1335
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PROPOSAL FOR CONFIRMATORY SAMPLING NO FURTHER ACTION ENVIRONMENTAL RESTORATION SITE 115, FIRING SITE (BUILDING 9930) OPERABLE UNIT 1335

January 1997

Prepared by
Sandia National Laboratories/New Mexico
Environmental Restoration Project
Albuquerque, New Mexico

Prepared for the
U.S. Department of Energy

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ACRONYMS AND ABBREVIATIONS

ac	acre(s)
CEARP	Comprehensive Environmental Assessment and Response Program
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
DOE	U.S. Department of Energy
EORC	Environmental Operations Records Center
EPA	U.S. Environmental Protection Agency
ER	environmental restoration
HE	high explosives
HSWA	Hazardous and Solid Waste Amendments
KAFB	Kirtland Air Force Base
LAS	Lockheed Analytical Services
LMF	Large Melt Facility
MDL	minimum detection limit
MS	matrix spike
MSD	matrix spike duplicate
NFA	no further action
PID	photoionization detector
ppm	parts per million
PQL	practical quantitation limit
PRS	potential release site
QC	quality control
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
SNL/NM	Sandia National Laboratories/New Mexico
sq ft	square foot (feet)
SWMU	solid waste management unit
TAL	target analyte list
UXO	unexploded ordnance

1.0 INTRODUCTION

1.1 ER Site Identification Number and Name

Sandia National Laboratories/New Mexico (SNL/NM) is proposing a confirmatory sampling no further action (NFA) decision for Environmental Restoration (ER) Site 115, Firing Site (Building 9930), Operable Unit 1335. ER Site 115 was identified in the Hazardous and Solid Waste Amendments (HSWA) Module IV (EPA August 1993) of the SNL/NM Resource Conservation and Recovery Act (RCRA) Hazardous Waste Management Facility Permit (NM5890110518) (EPA August 1992).

1.2 SNL/NM Confirmatory Sampling NFA Process

This proposal for a determination of a confirmatory sampling NFA decision has been prepared using the criteria presented in Annex B of the Environmental Restoration Document of Understanding (NMED November 1995). Specifically, this proposal will "contain information demonstrating that there are no releases of hazardous waste (including hazardous constituents) from solid waste management units (SWMU) at the facility that may pose a threat to human health or the environment" (as proposed in the Code of Federal Regulations (CFR) Title 40 Part 264.51[a][2]) (EPA July 1990). The HSWA Module IV contains the same requirements for an NFA demonstration:

> Based on the results of the RFI [RCRA Facility Investigation] and other relevant information, the Permittee may submit an application to the Administrative Authority for a Class III permit modification under 40 CFR 270.42(c) to terminate the RFI/corrective measures study process for a specific unit. This permit modification application must contain information demonstrating that there are no releases of hazardous waste including hazardous constituents from a particular SWMU at the facility that pose threats to human health and/or the environment, as well as additional information required in 40 CFR 270.42(c) (EPA August 1993).

If the available archival evidence is not considered convincing, SNL/NM performs confirmatory sampling to increase the weight of the evidence and allow an informed decision regarding whether to proceed with the administrative-type NFA or to return to the site characterization program for additional data collection (SNL/NM February 1995).

The U.S. Environmental Protection Agency (EPA) acknowledged that the extent of sampling required may vary greatly, stating that

> the agency does not intend this rule [the second codification of HSWA] to require extensive sampling and monitoring at every SWMU. . . . Sampling is generally required only in situations where there is insufficient evidence on which to make an initial release determination.

> . . . The actual extent of sampling will vary . . . depending on the amount and quality of existing information available (EPA December 1987).

In requesting a confirmatory sampling NFA decision for ER Site 115, this proposal is using existing administrative/archival information and the results of confirmatory sampling conducted in August 1995 to satisfy the permit requirements. Appendix A presents the sampling and analysis plan that was implemented. A site is eligible for an NFA proposal if it meets one or more of the following criteria set forth in the Environmental Restoration Document of Understanding (NMED November 1995).

- NFA Criterion 1: The site cannot be located or has been found not to exist, is a duplicate potential release site (PRS) or is located within and therefore, investigated as part of another PRS.
- NFA Criterion 2: 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.
- NFA Criterion 3: No release to the environment has occurred, nor is likely to occur in the future.
- NFA Criterion 4: There was a release, but the site was characterized and/or remediated under another authority which adequately addresses corrective action, and documentation, such as a closure letter, is available.
- NFA Criterion 5: The PRS has been characterized or remediated in accordance with current applicable state or federal regulations, and the available data indicate that contaminants pose an acceptable level of risk under current and projected future land use.

Specifically, ER Site 115 is being proposed for a confirmatory sampling NFA decision because no release to the environment has occurred, nor is likely to occur in the future (NFA Criterion 3).

1.3 Local Setting

SNL/NM occupies 2,829 acres (ac) of land owned by the U.S. Department of Energy (DOE) with an additional 14,920 ac of land provided by land-use permits with Kirtland Air Force Base (KAFB), the U.S. Forest Service, the State of New Mexico, and the Isleta Pueblo. SNL/NM has been involved in nuclear weapons research, components development, assembly, testing, and other nuclear activities since 1945.

ER Site 115 (Figure 1-1) is located on KAFB to the east of SNL/NM Technical Area III. The site is located approximately 4,500 feet west of Lovelace Road. The area of the firing activities within ER Site 115 is approximately 0.5 ac of land.

The nearest well to ER Site 115 is the Large Melt Facility monitoring well (LMF-1), approximately 1/2 mile to the east. Depth to groundwater at LMF-1 was measured at 347 feet below ground surface in November 1995 (SNL/NM March 1996).

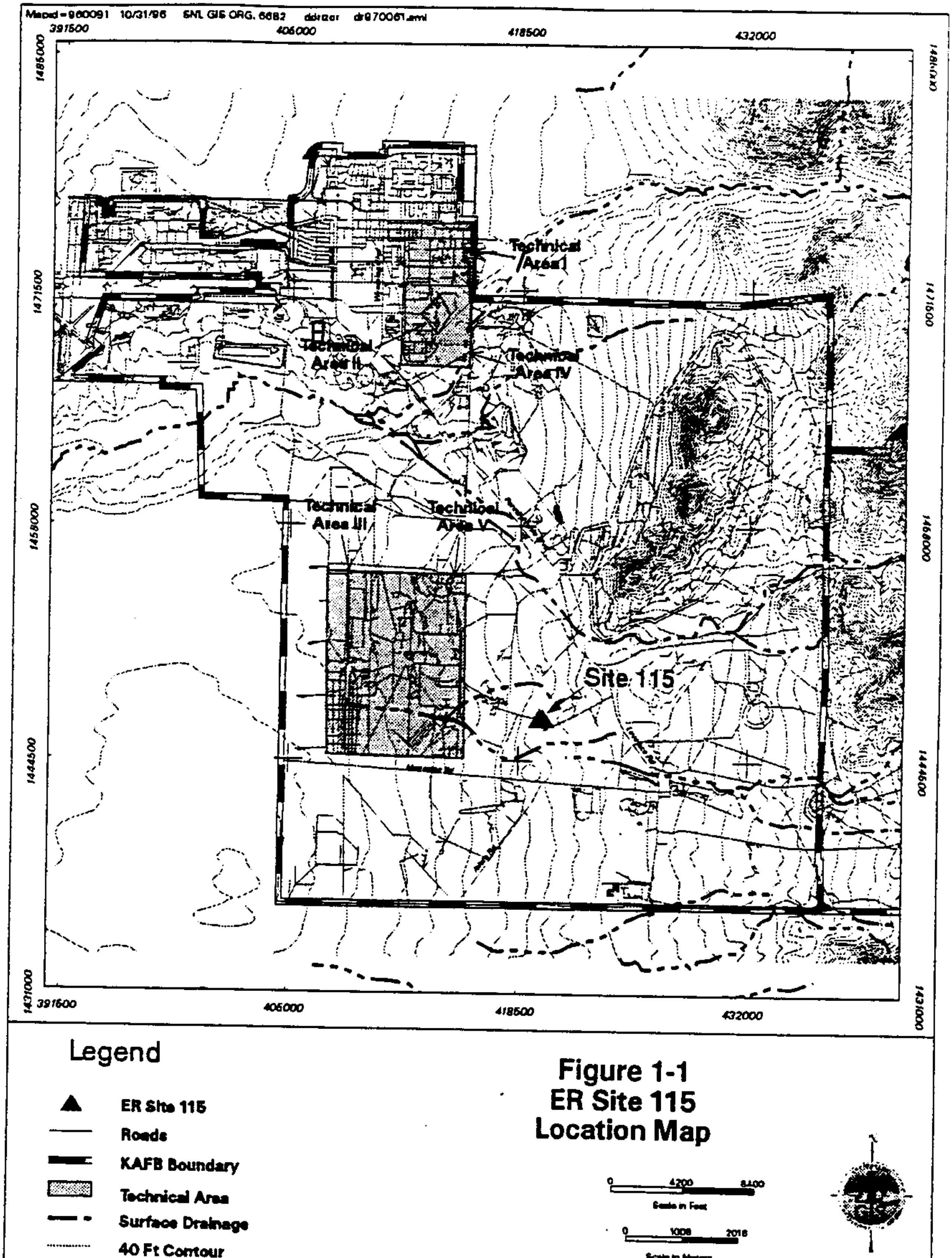


Figure 1-1
ER Site 115
Location Map

Sandia National Laboratories, New Mexico
Environmental Geographic Information System

2.0 HISTORY OF THE SWMU

2.1 Sources of Supporting Information

In preparation for requesting a confirmatory sampling NFA decision for ER Site 115, SNL/NM conducted a background archival study and collected soil samples to confirm that no release of hazardous constituents occurred. Historical background information sources included existing records and reports of site activity. Additionally, analytical results from confirmatory samples verify that during the site operational activity, hazardous waste or constituents clearly were not released into the environment.

The following information sources, hierarchically listed with respect to assigned validity, were available for use in evaluating ER Site 115:

- Twenty-six soil-sample analyses obtained from a random grid sampling pattern at the site.
- Three interviews with SNL/NM facility personnel.
- An unexploded ordnance (UXO) surface clearance survey completed in February of 1994 (SNL/NM September 1994).
- A surface gamma radiation survey completed in March of 1994 (RUST Geotech Inc. 1994).
- The Comprehensive Environmental Assessment and Response Program (CEARP) Phase I report (DOE September 1987) and CEARP records contained in the SNL/NM Environmental Operations Records Center (EORC).
- The RCRA Facility Assessment (RFA) report (EPA April 1987).

Using this information, a brief history of ER Site 115 and a discussion of all relevant evidence regarding past practices and releases at the site have been prepared and are presented in this proposal for a confirmatory sampling NFA decision.

2.2 Previous Audits, Inspections, and Findings

ER Site 115 was identified during investigations conducted under the CEARP (DOE September 1987) and the RFA (EPA April 1987). The CEARP noted that, according to interviews conducted with two individuals in 1984, mercury was used for one test and was widely dispersed in the area. However, when one of the individuals was re-interviewed in 1995 he had no recollection of any tests involving mercury. The other interviewee could not be located for a follow-up interview.

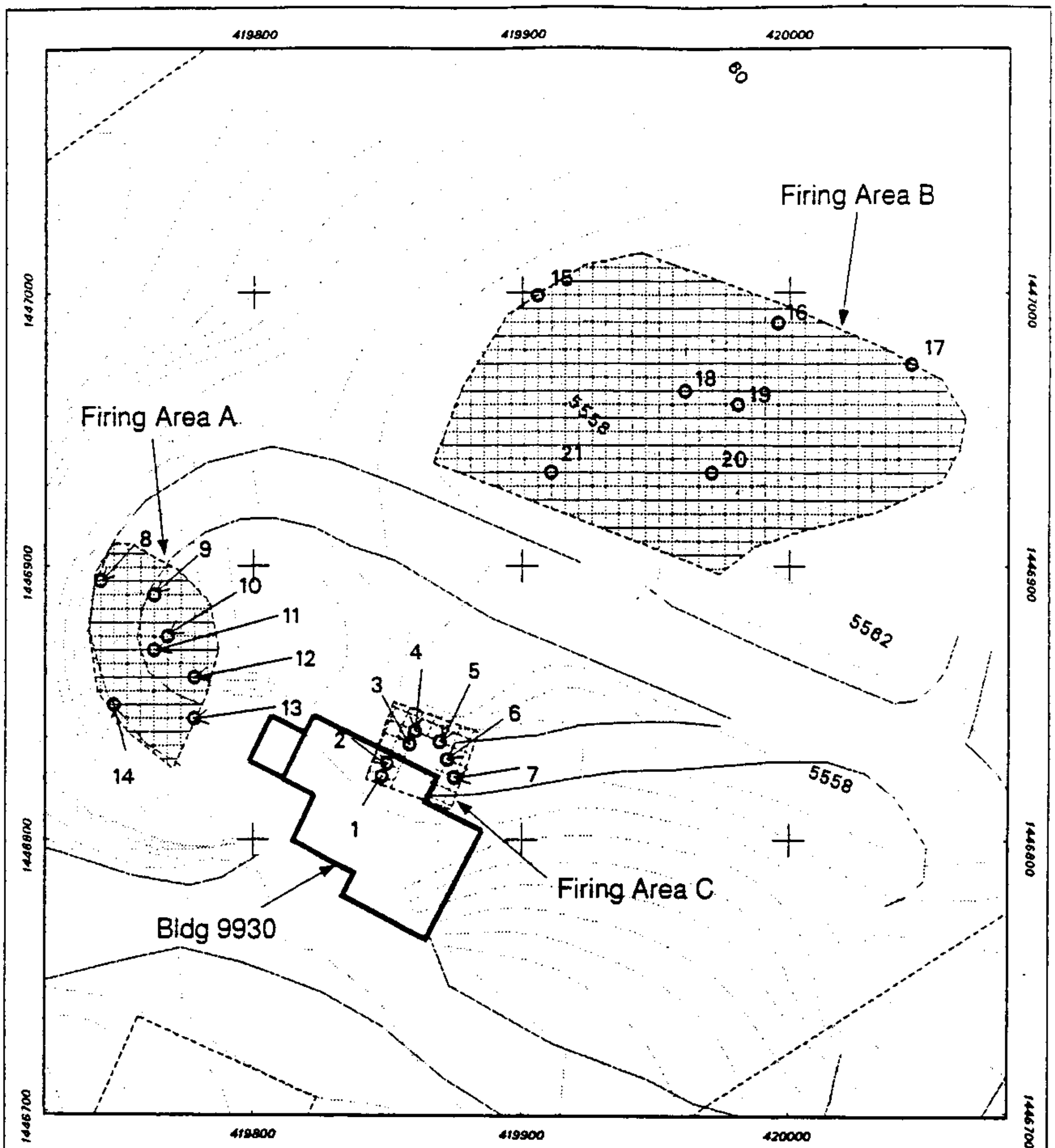
In addition to the CEARP inspection, the EPA conducted an RFA. The RFA report (EPA April 1987) presents the same information as the CEARP.

2.3 Historical Operations

ER Site 115, Firing Site (Building 9930) (Figure 2-1) is an explosive test facility where detonators, timers, and other weapon components are tested. It was built in 1961 to test explosive components (Appendix A). It was used from 1965 to 1968 to test small (less than a cubic foot) components such as detonators and timers (Appendix A). From an unspecified period after the early explosive testing until 1978 the facility was used for the storage of hydraulic equipment. From 1977 to 1978 it was used to store small arms ammunition. The hydraulic equipment was removed in 1978, when the facility was converted back into an explosive test site.

ER Site 115 is divided into three explosive test locations (marked A, B, and C on Figure 2-1). Location A is an open explosive test chamber or boom box (Appendix A). Approximately 500 shots per year were fired at Location A in past years; currently only 100-200 shots per year are being fired. The high explosives (HE) charge in most shots is in the milligram quantity range; however, the charge can contain up to a maximum of 10 pounds of HE. Dispersion of the debris is limited by an earthen berm that surrounds test Location A, and debris is not usually collected (Appendix A). Soil contaminants resulting from dispersed metal fragments and explosives would be limited to the area within the berm.

Locations B and C are no longer used. A total of 5 to 6 shots were conducted at Location B with a maximum of 50 pounds of HE per shot (Appendix A). Test Location C contains a test device simulating only the firing chamber portion of a Davis gun (Appendix A). Less than 10 tests were conducted. A maximum of 30 pounds of single-based or double-based gun propellant and approximately 10 pounds of HE were used for each shot. The gun propellant contains nitrocellulose and may contain nitroglycerin.



Legend

- 2 Foot Contour
- Sampling Grid on 5 Foot Centers
- Road
- Building
- ER Site 115
- Randomly Selected Sampling Point

Sandia National Laboratories, New Mexico
Environmental Restoration Geographic Information System

Figure 2-1
Soil Sampling Locations at ER Site 115

Scale in Feet: 0 30 60

Scale in Meters: 0 7.2 14.4

Unclassified

1:720
1 in = 60'

DWStech SNL GIS ORG. 6682 11/06/96 MAPID=970060

3.0 EVALUATION OF RELEVANT EVIDENCE

3.1 Unit Characteristics

ER Site 115 is an explosives test site that consists of 3 separate explosives test locations. Location A is 2,719 square feet (sq ft), Location B is 14,729 sq ft, and Location C is 3,668 sq ft.

3.2 Operating Practices

Currently, ER Site 115, Firing Site Location A, is used to test detonators, timers, and other weapons components. Past experiments include testing the firing chamber portion of a Davis gun as well as testing detonators, timers, and other weapons components. The site is rated for explosive tests involving up to 7 pounds of cased explosives and 50 pounds of uncased explosives. The casing is generally steel, copper, or aluminum, and debris is generated by the tests (Appendix A). The area affected by testing has been estimated to be the area enclosed by a circle of radius 200 feet centered on Building 9930 (Appendix A).

3.3 Presence or Absence of Visual Evidence

No visible evidence of soil discoloration or staining indicating residual contamination was observed at the site during soil sampling in July 1995.

3.4 Results of Previous Sampling/Surveys

3.4.1 Unexploded Ordnance/High Explosives Survey

A UXO visual surface survey was completed at ER Site 115 by KAFB Explosive Ordnance Disposal personnel on March 4, 1994. No UXO/HE or ordnance debris was found at ER Site 115 (SNL/NM September 1994).

3.4.2 Gamma Radiation Survey

RUST Geotech Inc. conducted a surface gamma radiation survey at ER Site 115 in 1994. The survey was performed on 6-foot centers over the exterior surface of the site. Areas excluded from the survey were the interior of Building 9930 and inaccessible areas beneath exterior structures. The background gamma exposure rates range from 10 to 12 microroentgen per hour. One area source of gamma activity was at or above 1.3 times the natural background level found within the survey boundaries. However, this area source was found to be a natural geologic formation.

3.5 Assessment of Gaps in Information

Confirmatory soil samples were collected at ER Site 115 in July 1995 (Section 3.6), and there are no additional data gaps identified.

3.6 Confirmatory Sampling

Twenty-one soil samples and one duplicate sample were collected from twenty-one locations at the ground surface. Field screening for organic vapors was performed at the sampling locations during the sampling activities. Sampling equipment was cleaned, and field blanks were collected. The sampling and analysis plan (Appendix A) provides details on the sampling event.

3.6.1 Field Screening

During soil sampling activities at ER Site 115, field-screening measurements were taken of all soil sampling horizons. The field screening was conducted in accordance with the methodologies prescribed in the sampling and analysis plan (Appendix A) and was performed with a photoionization detector (PID) for organic vapors. Organic vapors detected by the PID monitor during sampling activities never exceeded the action level of 5 parts per million above the background reading that would warrant an upgrade to health and safety Level C attire.

3.6.2 Laboratory Analysis Results for Soil Samples

The analytical data package and quality assurance/quality control (QC) documentation are available and can be viewed in the SNL/NM EORC. The 21 soil samples were analyzed for metals and explosives at SNL/NM ER Chemical Laboratory located in Albuquerque, New Mexico. Five of the twenty-one samples were split. These splits served as five verification samples and were sent to Lockheed Analytical Services (LAS) located in Las Vegas, Nevada. The duplicate sample was also sent to LAS.

Tables 3-1 and 3-2 present the analytical results for explosives from LAS and SNL/NM ER Chemical Laboratory, respectively. Soil samples were analyzed for explosives using EPA Method 8330 (EPA November 1986). No explosives were detected in any of the samples at LAS at the practical quantitation limit (PQL), nor were explosives detected at the minimum detection limit (MDL) at SNL/NM.

Tables 3-3 and 3-4 present the analytical results for metals analyzed at LAS and SNL/NM ER Chemical Laboratory, respectively. Soil samples were analyzed for metals using EPA Method 6010 (EPA November 1986). At LAS mercury, selenium, and silver were not detected in any of the samples at the laboratory reporting limit. Detected concentrations for beryllium, cadmium, chromium, and lead all fall within SNL/NM reported background ranges for those metals. LAS reported one barium concentration (Sample ID 025050-07 115-GR-020-0-SS-07)

Table 3-1

Summary of Explosives Results for ER Site 115 Soil Samples
Lockheed Analytical Services

Sample Location: ER Sample ID: LAL Sample No: Sample Type: Sample Depth: Sample Date:		115-005 025046-06 115-GR-005-0-SS-06 L5078-1 On-site Surface 08/02/95	115-010 025047-06 115-GR-010-0-SS-06 L5078-3 On-site Surface 08/02/95	115-010 025047-09 115-GR-010-0-SS-06 L5078-4 Duplicate Surface 08/02/95	115-015 025048-06 115-GR-015-0-SS-06 L5078-7 On-site Surface 08/02/95	115-020 025049-06 115-GR-020-0-SS-06 L5078-9 On-site Surface 08/02/95	115-021 025050-06 115-GR-021-0-SS-06 L5078-11 On-site Surface 08/02/95
	PQL[b] (µg/g)	(µg/g)	(µg/g)	(µg/g)	(µg/g)	(µg/g)	(µg/g)
Explosives[a]							
1,3-Dinitrobenzene	0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
HMX	2.20	<2.20	<2.20	<2.20	<2.20	<2.20	<2.20
Nitrobenzene	0.26	<0.26	<0.26	<0.26	<0.26	<0.26	<0.26
2-Nitrotoluene	0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
3-Nitrotoluene	0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
4-Nitrotoluene	0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
RDX	1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
Tetryl	0.65	<0.65	<0.65	<0.65	<0.65	<0.65	<0.65
1,3,5-Trinitrobenzene	0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
2,4,6-Trinitrotoluene	0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
2-Am-4,6-DNT	0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
4-Am-2,6-DNT	0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
2,6-Dinitrotoluene	0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
2,4-Dinitrotoluene	0.26	<0.26	<0.26	<0.26	<0.26	<0.26	<0.26

[a]Explosives analyzed by EPA Method 8330 (EPA November 1986).
[b]Practical quantitation limit.
DNT = Dinitrotoluene.
HMX = Cyclotetramethylene tetranitramine.
RDX = Cyclotrimethylene trinitramine.
Tetryl = Tetranitromethylaniline.
µg/g = Microgram(s) per gram.

that exceeds the SNL/NM reported background concentration for the Southwest Area of SNL/NM. However, this concentration is within the range of barium background concentrations for other areas of SNL/NM. Two arsenic concentrations (Sample ID 025047-017 115-GR-010-0-SS-07 and 025047-08 115-GR-010-SS-07, duplicate) exceed the SNL/NM reported background levels. Arsenic is not a constituent of concern as it was not used at this site. Therefore, the detected value is considered a high background value.

The SNL/NM ER laboratory reported values for arsenic, cadmium, chromium, selenium, and silver were all below the MDLs. All values for mercury were below PQLs, while most were also below MDLs. Values reported for beryllium were below PQLs, while most were also below MDLs. Detected concentrations for barium and beryllium were well within the SNL/NM and KAFB reported background ranges for these constituents. One value reported for lead (Sample ID 115-GR-015-0-SS) was greater than the SNL/NM reported background range, and one value reported for lead was greater than the PQL but within the range of SNL/NM reported background concentration. The proposed action level for lead currently being

Table 3-2

Summary of Explosives Results for ER Site 115 Soil Samples
SNL/NM ER Chemical Laboratory

Sample Location: ER Sample ID: Sample Type: Sample Depth: Sample Date:	MDL[b] (mg/kg)	Site 115 115-GR-001-0-SS On-site Surface 08/02/95 (mg/kg)	Site 115 115-GR-002-0-SS On-site Surface 08/02/95 (mg/kg)	Site 115 115-GR-003-0-SS On-site Surface 08/02/95 (mg/kg)	Site 115 115-GR-004-0-SS On-site Surface 08/02/95 (mg/kg)	Site 115 115-GR-005-0-SS On-site Surface 08/02/95 (mg/kg)	Site 115 115-GR-006-0-SS On-site Surface 08/02/95 (mg/kg)	Site 115 115-GR-007-0-SS On-site Surface 08/02/95 (mg/kg)	Site 115 115-GR-008-0-SS On-site Surface 08/02/95 (mg/kg)
Explosives[a]									
HMX	100	<100	<100	<100	<100	<100	<100	<100	<100
NG	30	<30	<30	<30	<30	<30	<30	<30	<30
PETN	150	<150	<150	<150	<150	<150	<150	<150	<150
RDX	150	<150	<150	<150	<150	<150	<150	<150	<150
TNT	76	<76	<76	<76	<76	<76	<76	<76	<76

Sample Location: ER Sample ID: Sample Type: Sample Depth: Sample Date:	MDL[b] (mg/kg)	Site 115 115-GR-009-0-SS On-site Surface 08/02/95 (mg/kg)	Site 115 115-GR-010-0-SS On-site Surface 08/02/95 (mg/kg)	Site 115 115-GR-011-0-SS On-site Surface 08/02/95 (mg/kg)	Site 115 115-GR-012-0-SS On-site Surface 08/02/95 (mg/kg)	Site 115 115-GR-013-0-SS On-site Surface 08/02/95 (mg/kg)	Site 115 115-GR-014-0-SS On-site Surface 08/02/95 (mg/kg)	Site 115 115-GR-015-0-SS On-site Surface 08/02/95 (mg/kg)	Site 115 115-GR-016-0-SS On-site Surface 08/02/95 (mg/kg)
Explosives[a]									
HMX	100	<100	<100	<100	<100	<100	<100	<100	<100
NG	30	<30	<30	<30	<30	<30	<30	<30	<30
PETN	150	<150	<150	<150	<150	<150	<150	<150	<150
RDX	150	<150	<150	<150	<150	<150	<150	<150	<150
TNT	76	<76	<76	<76	<76	<76	<76	<76	Trace

Sample Location: ER Sample ID: Sample Type: Sample Depth: Sample Date:	MDL[b] (mg/kg)	Site 115 115-GR-017-0-SS On-site Surface 08/02/95 (mg/kg)	Site 115 115-GR-018-0-SS On-site Surface 08/02/95 (mg/kg)	Site 115 115-GR-019-0-SS On-site Surface 08/02/95 (mg/kg)	Site 115 115-GR-020-0-SS On-site Surface 08/02/95 (mg/kg)	Site 115 115-GR-021-0-SS On-site Surface 08/02/95 (mg/kg)
Explosives[a]						
HMX	100	<100	<100	<100	<100	<100
NG	30	<30	<30	<30	<30	<30
PETN	150	<150	<150	<150	<150	<150
RDX	150	<150	<150	<150	<150	<150
TNT	76	<76	<76	<76	<76	<76

[a]Explosives analyzed using modified EPA Method 8330 (EPA November 1986).
[b]MDL = Minimum detection limit.
HMX = Cyclotetramethylene tetranitramine.
mg/kg = Milligram(s) per kilogram.
NG = Nitroglycerin.
PETN = Pentaerythritol tetranitrate.
RDX = Cyclotrimethylene trinitramine.
TNT = Trinitrotoluene.

Table 3-3

Summary of Metals Results for ER Site 115 Soil Samples Lockheed Analytical Services

Sample Location: ER Sample ID: LAL Sample No: Sample Type: Sample Depth: Sample Date:		115-005 025046-07 115-GR-005-0-SS-07 L5078-2 On-site Surface 08/02/95	115-010 025047-07 115-GR-010-0-SS-07 L5078-5 On-site Surface 08/02/95	115-010 025047-08 115-GR-010-0-SS-07 L5078-6 Duplicate Surface 08/02/95	115-015 025048-07 115-GR-015-0-SS-07 L5078-8 On-site Surface 08/02/95	115-020 025049-07 115-GR-020-0-SS-07 L5078-10 On-site Surface 08/02/95	115-021 025050-07 115-GR-021-0-SS-07 L5078-12 On-site Surface 08/02/95	Background Concentration Range (Surface)[c]
	LRL[b] (mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	
Metals[a]								
Arsenic	2.0	5.0	43.0	37.0	5.7	2.7	7.9	0.015–9.7
Barium	40.0	120.0	58.0	58.0	82.0	58.0	290.0	0.066–232
Beryllium	1.0	<1.0	1.0	<1.0	<1.0	<1.0	<1.0	0.1–1.6
Cadmium	1.0	1.5	<1.0	<1.0	<1.0	<1.0	<1.0	0.1–7.1
Chromium	2.0	12.0	2.9	2.2	7.1	6.6	7.6	0.004–240
Lead	0.60	44.0	18.0	17.0	11.0	4.1	6.6	0.005–104
Mercury	0.10	<0.1	<0.10	<0.10	<0.10	<0.1	<0.10	0.01–0.68
Selenium	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	0.37–17.2
Silver	2.0	<2.0	<2.0	<2.1[d]	<2.0	<2.0	<2.1[d]	0.0015–4.0

[a]Metals analyzed by EPA Method 6010 (EPA November 1986).
[b]Laboratory reporting limit.
[c]IT March 1996.
[d]Laboratory reporting limit adjusted; preparation dilution ≠1.0.
mg/kg = Milligram(s) per kilogram.

Table 3-4
Summary of Metals Results for ER Site 115 Soil Samples
SNL/NM ER Chemical Laboratory

Sample Location: ER Sample ID: Sample Type: Sample Depth: Sample Date:	MDL[a] (mg/kg)	PQL[b] (mg/kg)	Site 115 115-GR-001-0-SS On-site Surface 08/02/95 (mg/kg)	Site 115 115-GR-002-0-SS On-site Surface 08/02/95 (mg/kg)	Site 115 115-GR-003-0-SS On-site Surface 08/02/95 (mg/kg)	Site 115 115-GR-004-0-SS On-site Surface 08/02/95 (mg/kg)	Site 115 115-GR-005-0-SS On-site Surface 08/02/95 (mg/kg)	Site 115 115-GR-006-0-SS On-site Surface 08/02/95 (mg/kg)	Site 115 115-GR-007-0-SS On-site Surface 08/02/95 (mg/kg)	Site 115 115-GR-008-0-SS On-site Surface 08/02/95 (mg/kg)
Metals[c]										
Arsenic	50	190	<50	<50	<50	<50	<50	<50	<50	<50
Barium	10	38	100	95	48	100	120	70	87	85
Beryllium	0.11	0.44	0.16 J	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11
Cadmium	10	38	<10	<10	<10	<10	<10	<10	<10	<10
Chromium	10	38	<10	<10	<10	<10	<10	<10	<10	<10
Lead	10	38	<10	<10	<10	<10	48	<10	<10	<10
Mercury	0.06	0.24	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06
Selenium	50	191	<50	<50	<50	<50	<50	<50	<50	<50
Silver	10	38	<10	<10	<10	<10	<10	<10	<10	<10

Sample Location: ER Sample ID: Sample Type: Sample Depth: Sample Date:	Background Concentration Range (Surface)[d]	Site 115 115-GR-009-0-SS On-site Surface 08/02/95 (mg/kg)	Site 115 115-GR-010-0-SS On-site Surface 08/02/95 (mg/kg)	Site 115 115-GR-011-0-SS On-site Surface 08/02/95 (mg/kg)	Site 115 115-GR-012-0-SS On-site Surface 08/02/95 (mg/kg)	Site 115 115-GR-013-0-SS On-site Surface 08/02/95 (mg/kg)	Site 115 115-GR-014-0-SS On-site Surface 08/02/95 (mg/kg)	Site 115 115-GR-015-0-SS On-site Surface 08/02/95 (mg/kg)	Site 115 115-GR-016-0-SS On-site Surface 08/02/95 (mg/kg)
Metals[c]									
Arsenic	0.015–9.7	<50	<50	<50	<50	<50	<50	<50	<50
Barium	0.086–232	67	49	65	46	38	140	100	66
Beryllium	0.1–1.6	<0.11	0.71	0.42 J	<0.11	<0.11	<0.11	<0.11	0.14 J
Cadmium	0.1–7.1	<10	<10	<10	<10	<10	<10	<10	<10
Chromium	0.004–240	<10	<10	<10	<10	<10	<10	<10	<10
Lead	0.005–104	<10	<10	<10	<10	<10	<10	230	<10
Mercury	0.01–0.68	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06
Selenium	0.37–17.2	<50	<50	<50	<50	<50	<50	<50	<50
Silver	0.0015–4.0	<10	<10	<10	<10	<10	<10	<10	<10

Refer to footnotes at end of table.

Table 3-4 *(Concluded)*
Summary of Metals Results for ER Site 115 Soil Samples
SNL/NM ER Chemical Laboratory

Sample Location: ER Sample ID: Sample Type: Sample Depth: Sample Date:	MDL[a]/PQL[b] (mg/kg)		Site 115 115-GR-017-0-SS On-site Surface 08/02/95 (mg/kg)	Site 115 115-GR-018-0-SS On-site Surface 08/02/95 (mg/kg)	Site 115 115-GR-019-0-SS On-site Surface 08/02/95 (mg/kg)	Site 115 115-GR-020-0-SS On-site Surface 08/02/95 (mg/kg)	Site 115 115-GR-021-0-SS On-site Surface 08/02/95 (mg/kg)	Background Concentration Range (Surface)[d]
Metals[c]								
Arsenic	50	190	<50	<50	<50	<50	<50	0.015–9.7
Barium	10	38	170	81	57	33[e]	220	0.086–232
Beryllium	0.11	0.44	<0.11	<0.15 J	<0.11	<0.11	NA	0.1–1.6
Cadmium	10	38	<10	<10	<10	<10	<10	0.1–7.1
Chromium	10	38	<10	<10	<10	<10	<10	0.004–240
Lead	10	38	<10	<10	<10	<10	<10	0.005–104
Mercury	0.06	0.24	0.07[e]	<0.06	0.19[e]	<0.06	<0.06	0.01–0.068
Selenium	50	191	<50	19[e]	<50	<50	<50	0.37–17.2
Silver	10	38	<10	<10	<10	<10	<10	0.015–4.0

[a]MDL = Minimum detection limit.
[b]PQL = Practical quantitation limit.
[c]Metals analyzed by modified EPA Method 6010/7000 (mercury by EPA Method 7174) (EPA November 1986).
[d]IT March 1996.
[e]Estimated value. The reported value is either above the highest calibration standard or less than the PQL.
mg/kg = Milligram per kilogram.
J = Estimated value that lies between the minimum detection limit and the practical quantitation limit.
NA = Not available.

negotiated for this area (industrial land use scenario) is 2,000 parts per million (ppm) (Klavetter 1996). The lead concentration of 230 ppm is well below this. All remaining lead results were below the MDL.

3.6.3 QC Summary

Field and laboratory QC samples were analyzed to evaluate data quality. The following subsections summarize the QC data and findings.

3.6.3.1 Data Verification and Validation

Verification and validation of chemical measurement data were performed in accordance with the SNL/NM EORC "Verification and Validation of Chemical and Radiochemical Data," Revision 0 (TOP [technical operating procedure] 94-03) (SNL/NM July 1994). Data validation was performed on the organic data using Level 1 and Level 2 checklists specified in the above-referenced procedure.

3.6.3.2 Field QC Data

Field QC samples submitted to the contract laboratory during sampling activities at ER Site 115 included one field duplicate sample and one field blank. A laboratory control sample and laboratory control sample duplicate were extracted and analyzed in addition to a matrix spike (MS) and matrix spike duplicate (MSD). Results for the QC samples are discussed below.

<u>Field Duplicate Sample</u>

One duplicate soil sample was collected from ER Site 115 at the ground surface (0 feet). The duplicate sample was analyzed for metals (ER Sample ID 025047-08) and explosives (ER Sample ID 025047-09) at LAS. The results of the duplicate explosives analysis are consistent with its counterpart (Table 3-1). The results of the duplicate metals analysis are consistent with its counterpart (i.e., ± 20 percent).

<u>Field Rinsate Blanks</u>

An aqueous field rinsate blank was collected for each laboratory following completion of soil sampling and final equipment decontamination at ER Site 115. Explosives were not detected in the blank samples (Table 3-5 and 3-6). An aqueous field rinsate blank was analyzed for target analyte list (TAL) metals at SNL/NM ER Chemical Laboratory (Table 3-7). No aqueous field rinsate blank was analyzed at LAS for TAL metals. The results obtained from analysis of the blank sample indicates that project samples were not cross-contaminated by the sampling equipment or containers.

Table 3-5

Summary of Explosives Results for ER Site 115 Blank Samples

Lockheed Analytical Services

Sample Location: ER Sample ID: LAL Sample No: Sample Type: Sample Depth: Sample Date:		115-023 025052-09 115-GR-023-0-SS-09 L5078-14 Aqueous Field Blank NA 08/02/95
	PQL[b] (µg/L)	(µg/L)
Explosives[a]		
1,3-Dinitrobenzene	0.30	<0.30
HMX	1.00	<1.00
Nitrobenzene	0.50	<0.50
2-Nitrotoluene	0.25	<0.25
3-Nitrotoluene	0.25	<0.25
4-Nitrotoluene	0.25	<0.25
RDX	0.85	<0.85
Tetryl	1.00	<1.00
1,3,5-Trinitrobenzene	0.45	<0.45
2,4,6-Trinitrotoluene	0.26	<0.26
2-Am-4,6-DNT	0.26	<0.26
4-Am-2,6-DNT	0.26	<0.26
2,6-Dinitrotoluene	0.25	<0.25
2,4-Dinitrotoluene	0.26	<0.26

[a]Explosives analyzed by EPA Method 8330 (EPA November 1986).
[b]Practical quantitation limit.
DNT = Dinitrotoluene.
HMX = Cyclotetramethylene tetranitramine.
NA = Not applicable.
RDX = Cyclotrimethylene trinitramine
Tetryl = Tetranitromethylaniline.
µg/L = Microgram(s) per liter.

Table 3-6
Summary of Explosives Results for ER Site 115 Blank Samples
SNL/NM ER Chemical Laboratory

Sample Location: ER Sample ID: Sample Type: Sample Depth: Sample Date:		Site 115 115-GR-022-0-R Equipment Rinsate NA 08/02/95	Site 115 115-GR-023-0-FB Field Blank NA 08/02/95
	MDL[b] (µg/L)	(µg/L)	(µg/L)
Explosives[a]			
HMX	100	<100	<100
NG	30	<30	<30
PETN	150	<150	<150
RDX	150	<150	<150
TNT	76	<76	<76

[a]Explosives analyzed using modified EPA Method 8330 (EPA November 1986).
[b]MDL = Minimum detection limit.
HMX = Cyclotetramethylene tetranitramine.
NA = Not applicable.
NG = Nitroglycerin.
PETN = Pentaerythritol tetranitrate.
RDX = Cyclotrimethylene trinitramine.
TNT = Trinitrotoluene.
µg/L = Micrograms per liter.

Table 3-7

Summary of Metals Results for ER Site 115 Blank Samples
SNL/NM ER Chemical Laboratory

Sample Location: ER Sample ID: Sample Type: Sample Depth: Sample Date:	MDL[a]/PQL[b] (mg/L)		Site 115 115-GR-022-0-R Equipment Rinsate NA 08/02/95 (mg/L)	Site 115 115-GR-023-0-FB Field Blank NA 08/02/95 (mg/L)
Metals[c]				
Arsenic	0.50	1.9	<0.50	<0.50
Barium	0.10	0.38	<0.10	<0.10
Beryllium	0.0003	0.0012	<0.0003	<0.0003
Cadmium	0.10	0.38	<0.10	<0.10
Chromium	0.10	0.38	<0.10	<0.10
Lead	0.10	0.38	<0.10	<0.10
Mercury	0.0006	0.0024	NT	NT
Selenium	0.50	1.9	<0.50	<0.50
Silver	0.10	0.38	<0.10	<0.10

[a]MDL = Minimum detection limit.
[b]PQL = Practical quantitation limit.
[c]Metals analyzed by EPA Method 6010/7000 (Mercury by EPA Method 7179) (EPA November 1986).
mg/L = Milligrams per liter.
NA = Not applicable.
NT = Not tested.

Matrix Spike Analysis

Analyses of MS and MSD were performed to assess sample matrix effects on analytical accuracy, in accordance with requirements of the sampling plan (Appendix A). The MS was performed for all fractions of the sample in accordance with approved laboratory procedures. MS results were reported in the laboratory analytical data report as percent recovery and relative percent difference calculations. Samples were analyzed for explosives and metals. The MS and MSD for explosives were within the QC limits established for percent recovery and relative percent difference (Table 3-8) with the exception of the following for percent recovery: 1,3-dinitrobenzene; cyclotetramethylene tetranitramine (HMX); nitrobenzene; 2-nitrotoluene; 3-nitrotoluene; 4-nitrotoluene; 1,3,5-trinitrobenzene; 2,4,6-trinitrotoluene; 2-Am-4,6-dinitrotoluene (DNT); and 2,6 dinitrotoluene. The following were not within the QC limits for relative percent difference: 1,3-dinitrobenzene; 2-nitrotoluene; 3-nitrotoluene; 4-nitrotoluene; tetryl; 1,3,5-trinitrobenzene; 2,4,6-trinitrotoluene; 2-Am-4,6-DNT; and 2,6 dinitrotoluene; 2,4 dinitrotoluene. However, the relative percent differences between the laboratory control sample and the laboratory control sample duplicate recoveries were within QC limits; therefore, the discrepancies between the MS and MSD are believed to be caused by matrix interference. The MS and MSD for metals were within QC limits (Table 3-9).

3.6.4 Laboratory QC Data

Laboratory QC samples were analyzed at LAS, and the data were included in the analytical reports with cross-references to the corresponding ER samples. Laboratory QC data include laboratory control and laboratory control duplicate analyses for soil and water samples and a method blank analysis. Tables 3-10 and 3-11 provide results for the laboratory QC analyses of these samples.

3.6.5 Nonconformances/Variances to Sampling and Analysis Plan

A nonconformance is an unplanned and unintended deviation from the established sampling and analysis plan or procedures. A variance is an approved and controlled change to the established sampling and analysis plan or procedures. There were no nonconformance/ variance issues associated with the sampling at ER Site 115.

3.7 Rationale for Pursuing a Confirmatory Sampling NFA Decision

SNL/NM is proposing a confirmatory sampling NFA decision for ER Site 115 because no release to the environment has occurred, nor is likely to occur in the future (NFA Criterion 3).

Table 3-8

Summary of Explosives Results for Matrix Spike and Matrix Spike Duplicate ER Site 115 Soil Samples, Lockheed Analytical Services

Laboratory Sample ID	Analyte	Spike Added (µg/g)	Matrix Spike Concentration (µg/g)	Percent Recovery	Relative Percent Difference	QC Limits	
						Percent Recovery	Relative Percent Difference
26202MS	Explosives[a]				NA[b]		NA[b]
	1,3-Dinitrobenzene	4.11	6.41	156		60-130	
	HMX	4.11	2.38	58		60-130	
	Nitrobenzene	4.11	5.72	139		60-130	
	2-Nitrotoluene	4.11	6.52	158		60-130	
	3-Nitrotoluene	4.11	6.85	167		60-130	
	4-Nitrotoluene	4.11	6.84	166		60-130	
	RDX	4.11	3.11	76		60-130	
	Tetryl	4.11	4.13	100		60-130	
	1,3,5-Trinitrobenzene	4.11	6.69	163		60-130	
	2,4,6-Trinitrotoluene	4.11	9.18	223		60-130	
	2-Am-4,6-DNT	4.11	5.64	137		60-130	
	4-Am-2,6-DNT	4.11	3.67	89		60-130	
	2,6-Dinitrotoluene	4.11	11.0	268		60-130	
	2,4-Dinitrotoluene	4.11	4.98	121		60-130	
26202MSD	Explosives[a]						
	1,3-Dinitrobenzene	4.13	2.88	70	76	60-130	30
	HMX	4.13	2.16	52	10	60-130	30
	Nitrobenzene	4.13	2.68	65	73	60-130	30
	2-Nitrotoluene	4.13	2.52	61	89	60-130	30
	3-Nitrotoluene	4.13	2.71	66	87	60-130	30
	4-Nitrotoluene	4.13	2.62	63	90	60-130	30
	RDX	4.13	2.38	58	27	60-130	30
	Tetryl	4.13	1.46	35	96	60-130	30
	1,3,5-Trinitrobenzene	4.13	2.57	62	90	60-130	30
	2,4,6-Trinitrotoluene	4.13	2.11	51	126	60-130	30
	2-Am-4,6-DNT	4.13	4.25	103	29	60-130	30
	4-Am-2,6-DNT	4.13	3.73	90	1	60-130	30
	2,6-Dinitrotoluene	4.13	3.48	84	104	60-130	30
	2,4-Dinitrotoluene	4.13	2.73	66	59	60-130	30

[a]Explosives analyzed by EPA Method 8330 (EPA November 1986).
[b]Not applicable to matrix spike analysis.
DNT = Dinitrotoluene.
HMX = Cyclotetramethylene tetranitramine.
QC = Quality control.
RDX = Cyclotrimethylene trinitramine.
Tetryl = tetranitromethylaniline.
µg/g = Microgram(s) per gram.

Table 3-9

Summary of Metals Results for Matrix Spike and Matrix Spike Duplicate ER Site 115 Soil Samples, Lockheed Analytical Services

Laboratory Sample ID	Analyte	Spike Added (mg/kg)	Matrix Spike Concentration (mg/kg)	Percent Recovery	Relative Percent Difference	QC Limits	
						Percent Recovery	Relative Percent Difference
L5078-2MS	Metals[a]				NA[b]		NA[b]
	Arsenic	398.5	372.5	92		80-120	
	Barium	398.5	551.2	108		80-120	
	Beryllium	9.962	9.444	95		80-120	
	Cadmium	9.962	8.806	73		80-120	
	Chromium	39.85	49.93	95		80-120	
	Lead	99.62	140.0	97		80-120	
	Mercury	0.4820	0.5234	109		80-120	
	Selenium	398.5	343.0	86		80-120	
	Silver	9.962	10.98	110		80-120	
L5078-2MSD	Metals[a]						
	Arsenic	401.6	367.0	90	1.5	80-120	20
	Barium	401.6	544.0	105	1.3	80-120	20
	Beryllium	10.04	9.338	93	1.1	80-120	20
	Cadmium	10.04	8.716	71	1.0	80-120	20
	Chromium	40.16	49.26	92	1.3	80-120	20
	Lead	100.4	137.5	94	1.8	80-120	20
	Mercury	0.4820	0.5287	110	1.0	80-120	20
	Selenium	401.6	336.1	84	2.0	80-120	20
	Silver	10.04	10.48	104	4.6	80-120	20

[a]Metals analyzed by EPA Method 6010 (EPA November 1986).
[b]Not applicable to matrix spike analysis.
mg/kg = Milligram(s) per kilogram.
QC = Quality control.

Table 3-10

Summary of Explosives Results for Laboratory Control, Laboratory Control Duplicate and Method Blank Samples, Lockheed Analytical Services

Laboratory Sample ID	Analyte	Spike Added (water, µg/L) (soil, µg/g)	Measured Concentration (water, µg/L) (soil, µg/g)	Percent Recovery	Relative Percent Difference	QC Limits	
						Percent Recovery	Relative Percent Difference
26172LCS Water	Explosives[a]				NA[b]		NA[b]
	1,3-Dinitrobenzene	2.00	1.80	90		60-120	
	HMX	2.00	1.37	69		60-120	
	Nitrobenzene	2.00	1.47	73		60-120	
	2-Nitrotoluene	2.00	1.75	88		60-120	
	3-Nitrotoluene	2.00	1.74	87		60-120	
	4-Nitrotoluene	2.00	1.96	98		60-120	
	RDX	2.00	1.57	78		60-120	
	Tetryl	2.00	1.66	83		60-120	
	1,3,5-Trinitrobenzene	2.00	1.67	83		60-120	
	2,4,6-Trinitrotoluene	2.00	1.83	91		60-120	
	2-Am-4,6-DNT	2.00	1.81	90		60-120	
	4-Am-2,6-DNT	2.00	1.84	92		60-120	
	2,6-Dinitrotoluene	2.00	1.77	89		60-120	
	2,4-Dinitrotoluene	2.00	1.84	92		60-120	
26172LCSD Water	Explosives[a]						
	1,3-Dinitrobenzene	2.00	1.90	95	6	60-120	30
	HMX	2.00	1.32	66	3	60-120	30
	Nitrobenzene	2.00	1.60	80	9	60-120	30
	2-Nitrotoluene	2.00	1.49	75	16	60-120	30
	3-Nitrotoluene	2.00	1.79	90	3	60-120	30
	4-Nitrotoluene	2.00	1.66	83	17	60-120	30
	RDX	2.00	1.83	92	15	60-120	30
	Tetryl	2.00	1.71	85	3	60-120	30
	1,3,5-Trinitrobenzene	2.00	1.79	90	8	60-120	30
	2,4,6-Trinitrotoluene	2.00	1.88	94	3	60-120	30
	2-Am-4,6-DNT	2.00	1.91	95	5	60-120	30
	4-Am-2,6-DNT	2.00	1.87	93	2	60-120	30
	2,6-Dinitrotoluene	2.00	1.78	89	1	60-120	30
	2,4-Dinitrotoluene	2.00	1.94	97	5	60-120	30

Refer to footnotes at end of table.

Table 3-10 *(Continued)*

Summary of Explosives Results for Laboratory Control, Laboratory Control Duplicate and Method Blank Samples, Lockheed Analytical Services

Laboratory Sample ID	Analyte	Spike Added (water, µg/L) (soil, µg/g)	Measured Concentration (water, µg/L) (soil, µg/g)	Percent Recovery	Relative Percent Difference	QC Limits	
						Percent Recovery	Relative Percent Difference
26202LCS Soil	Explosives[a]				NA[b]		NA[b]
	1,3-Dinitrobenzene	3.98	4.38	110		60-130	
	HMX	3.98	4.89	123		60-130	
	Nitrobenzene	3.98	4.60	116		60-130	
	2-Nitrotoluene	3.98	4.26	107		60-130	
	3-Nitrotoluene	3.98	4.17	105		60-130	
	4-Nitrotoluene	3.98	3.99	100		60-130	
	RDX	3.98	4.31	108		60-130	
	Tetryl	3.98	4.17	105		60-130	
	1,3,5-Trinitrobenzene	3.98	4.54	114		60-130	
	2,4,6-Trinitrotoluene	3.98	4.43	111		60-130	
	2-Am-4,6-DNT	3.98	4.75	119		60-130	
	4-Am-2,6-DNT	3.98	4.45	112		60-130	
	2,6-Dinitrotoluene	3.98	4.30	108		60-130	
	2,4-Dinitrotoluene	3.98	4.56	114		60-130	
26202LCSD Soil	Explosives[a]						
	1,3-Dinitrobenzene	3.98	4.23	106	4	60-130	30
	HMX	3.98	4.37	110	11	60-130	30
	Nitrobenzene	3.98	4.37	110	5	60-130	30
	2-Nitrotoluene	3.98	4.14	104	3	60-130	30
	3-Nitrotoluene	3.98	4.34	109	4	60-130	30
	4-Nitrotoluene	3.98	4.06	102	2	60-130	30
	RDX	3.98	4.05	102	6	60-130	30
	Tetryl	3.98	3.51	88	17	60-130	30
	1,3,5-Trinitrobenzene	3.98	4.28	107	6	60-130	30
	2,4,6-Trinitrotoluene	3.98	4.21	106	5	60-130	30
	2-Am-4,6-DNT	3.98	4.42	111	7	60-130	30
	4-Am-2,6-DNT	3.98	4.25	107	5	60-130	30
	2,6-Dinitrotoluene	3.98	4.09	103	5	60-130	30
	2,4-Dinitrotoluene	3.98	4.38	110	4	60-130	30

Refer to footnotes at end of table.

Table 3-10 *(Concluded)*

Summary of Explosives Results for Laboratory Control, Laboratory Control Duplicate and Method Blank Samples, Lockheed Analytical Services

Laboratory Sample ID	Analyte	Spike Added (water, µg/L) (soil, µg/g)	Measured Concentration (water, µg/L) (soil, µg/g)	Percent Recovery	Relative Percent Difference	QC Limits	
						Percent Recovery	Relative Percent Difference
26202MB Soil	Explosives[a]	NA[b]		NA[b]	NA[b]	PQL[c] =	
	1,3-Dinitrobenzene		<0.25			0.25	
	HMX		<2.20			2.20	
	Nitrobenzene		<0.26			0.26	
	2-Nitrotoluene		<0.25			0.25	
	3-Nitrotoluene		<0.25			0.25	
	4-Nitrotoluene		<0.25			0.25	
	RDX		<1.00			1.00	
	Tetryl		<0.65			0.65	
	1,3,5-Trinitrobenzene		<0.25			0.25	
	2,4,6-Trinitrotoluene		<0.25			0.25	
	2-Am-4,6-DNT		<0.25			0.25	
	4-Am-2,6-DNT		<0.25			0.25	
	2,6-Dinitrotoluene		<0.25			0.25	
	2,4-Dinitrotoluene		<0.26			0.26	
26172MB Water	Explosives[a]	NA[b]		NA[b]	NA[b]	PQL[c] =	
	1,3-Dinitrobenzene		<0.30			0.30	
	HMX		<1.00			1.00	
	Nitrobenzene		<0.50			0.50	
	2-Nitrotoluene		<0.25			0.25	
	3-Nitrotoluene		<0.25			0.25	
	4-Nitrotoluene		<0.25			0.25	
	RDX		<0.85			0.85	
	Tetryl		<1.00			1.00	
	1,3,5-Trinitrobenzene		<0.45			0.45	
	2,4,6-Trinitrotoluene		<0.26			0.26	
	2-Am-4,6-DNT		<0.26			0.26	
	4-Am-2,6-DNT		<0.26			0.26	
	2,6-Dinitrotoluene		<0.25			0.25	
	2,4-Dinitrotoluene		<0.26			0.26	

[a]Explosives analyzed by EPA Method 8330 (EPA November 1986).
[b]Not applicable.
[c]Practical quantitation limit.
DNT = Dinitrotoluene.
HMX = Cyclotetramethylene tetranitramine.
µg/g = Microgram(s) per gram.
RDX = Cyclotrimethylene trinitramine.
Tetryl = Tetranitromethylaniline.
µg/L = Microgram(s) per liter.

Table 3-11

Summary of Metals Results for Laboratory Control, Laboratory Control Duplicate and Method Blank Samples, Lockheed Analytical Services

Laboratory Sample ID	Analyte	Spike Added (mg/kg)	Measured Concentration (mg/kg)	Percent Recovery	Relative Percent Difference	QC Limits	
						Percent Recovery	Relative Percent Difference
26141LCSS Soil	Metals[a]				NA[b]		NA[b]
	Arsenic	349.0	325.5	93.3		80-120	
	Barium	111.0	104.8	94.5		80-120	
	Beryllium	34.7	32.66	94.1		80-120	
	Cadmium	46.9	41.60	88.7		80-120	
	Chromium	115.0	122.1	106.2		80-120	
	Lead	52.4	47.88	91.4		80-120	
	Mercury	13.1	14.36	109.6		80-120	
	Selenium	185.0	168.4	91		80-120	
	Silver	154.0	164.7	106.9		80-120	
26141LCSSD Soil	Metals[a]						
	Arsenic	349.0	329.8	94.5	1.3	80-120	20
	Barium	111.0	103.1	92.9	1.7	80-120	20
	Beryllium	34.7	32.76	94.4	0.3	80-120	20
	Cadmium	46.9	42.12	89.8	1.2	80-120	20
	Chromium	115.0	123.7	107.6	1.3	80-120	20
	Lead	52.4	48.29	92.2	0.9	80-120	20
	Mercury	13.1	15.08	115.1	4.9	80-120	20
	Selenium	185.0	171.6	92.8	1.9	80-120	20
	Silver	154.0	166.8	108.3	1.3	80-120	20

[a]Metals analyzed by EPA Method 6010/7000 (Mercury by Method 7174) (EPA November 1986).
[b]Not applicable.

ER Site 115 was used to conduct explosives testing. Confirmatory sampling and analysis of soils at all three test locations indicate that explosives are not present at the site. The detected levels of arsenic are suspected of being anomalous high background values as arsenic was not used in the testing. The detected level for lead is below what is expected to be the action level for an industrial use scenario area. The detected levels of barium, beryllium, and cadmium are within the range of background values for SNL/NM (IT March 1996). No other hazardous metals were detected in the soil samples.

Therefore, based on archival information and analytical results from confirmatory sampling, ER Site 115 is recommended for a confirmatory sampling NFA decision because no release to the environment has occurred, nor is likely to occur in the future (NFA Criterion 3).

4.0 CONCLUSION

Based upon the evidence cited above, no potential remains for a release of hazardous waste (including hazardous constituents) that may pose a threat to human health or the environment. Therefore, ER Site 115 is recommended for a confirmatory sampling NFA determination based on NFA Criterion 3: no release to the environment has occurred, nor is it likely to occur in the future.

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APPENDIX A

Confirmatory Sampling and Analysis Plan for ER Site 115

DRAFT

ER Site 115, Building 9930, is an active explosive test site located on Kirtland Air Force Base, to the east of Technical Area III. The site is located approximately 4500 feet west of Lovelace Road (see Figure 1). The area of the firing activities within site 115 is approximately .5 acres. The area around the site is gently sloping to the west. The area is covered by desert grasses and cacti.

History

Site # 115, building 9930, is an explosive test facility where detonators, timers, and other weapons components for nuclear weapons are tested. It was built in 1961 to test explosive components (428). It was used to test small (less than a cubic foot) components such as detonators and timers, from 1965 to 1968 (634). From an unspecified period after the early explosive testing until 1978 the facility was used for the storage of hydraulic equipment. From 1977 to 1978 it was used to store small arms ammunition. The hydraulic equipment was removed in 1978, when the facility was converted back into an explosive test site.

Three explosive test locations have been used (marked A, B, and C on Figure 2). The size of the firing site areas is 2,719 sq. ft., 14,729 sq. ft. and 3,668 sq. ft. respectively. The site is rated for explosive tests involving up to 7 pounds of cased explosives and up to 50 pounds of uncased explosives (35). Casings used with the explosives are generally steel, copper, or aluminum, and debris is generated by the tests(35). A radius of about 200 feet from Building 9930 is effected (56).

Firing sites at locations A and B were used to test detonators, timers and other weapons components. Location A is an open explosive test chamber or boom box (35). Approximately 500 shots per year were fired at location A in past years. Currently 100-200 shots per year are being fired at location A. The HE charge in the shots ranges from mg quantities to a maximum of 10 pounds. Most shots are in the mg range. Explosives are detonated and photographed by high speed X-ray cameras. Dispersion of the debris is limited by a earthen berm that surrounds test location A, and debris is not usually collected (35). Soil contaminants resulting from dispersed metal fragments and explosives is confined to the bermed test area (35). The berm was added after earlier explosive testing activities, possibly in 1986 (426).

Firing site B is not bermed. Since Firing site B is further from building 9930, larger tests that might damage the structures at firing site A were conducted there(634). A total of 5-6 shots were conducted at the site(634). The maximum amount of HE used per shot was 50 lbs (634).

SNL ER GIS DEPT 7583 GIS MAP-ID - 940218 10-FEB-1994 Smbasemap

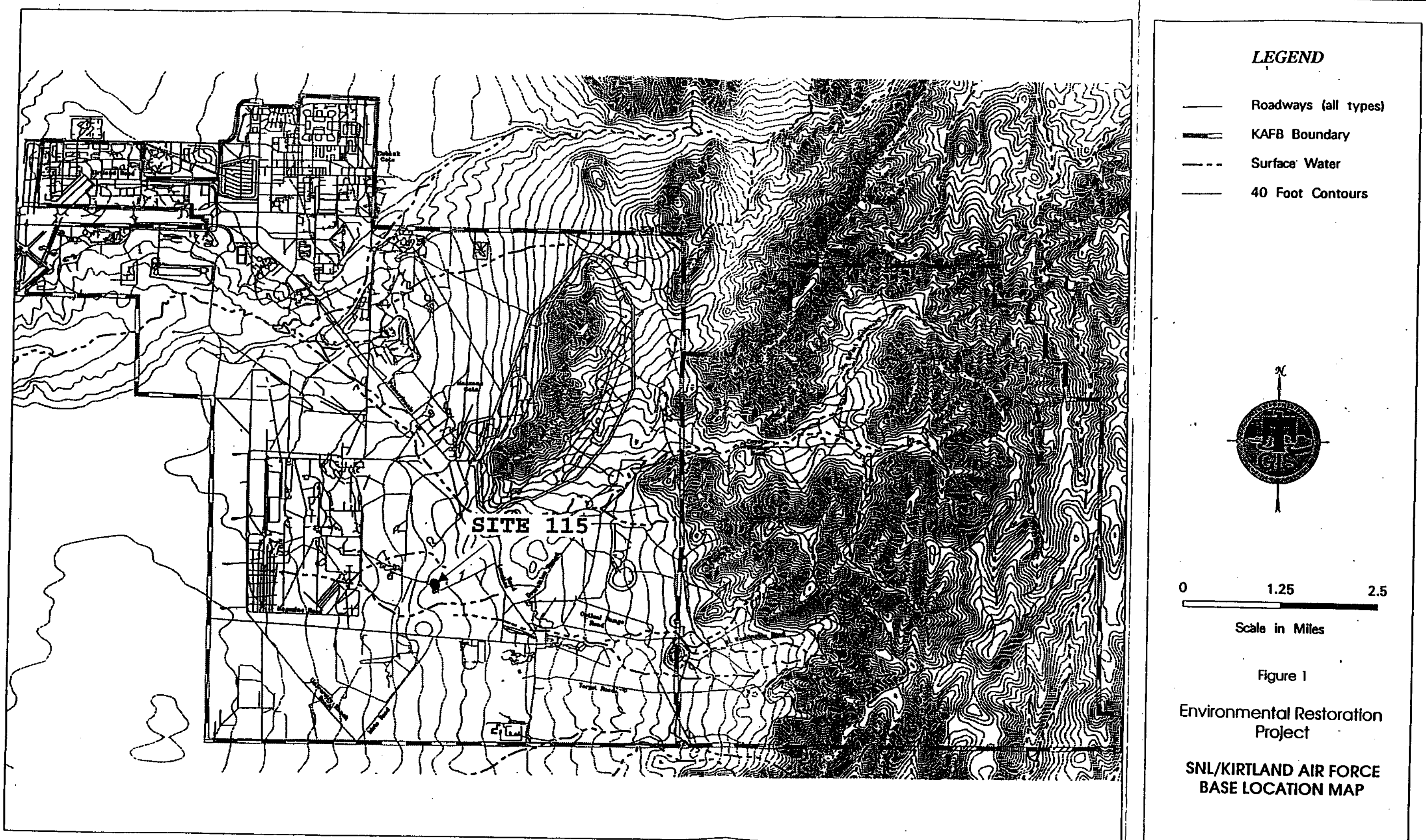

Figure 1

Environmental Restoration Project

SNL/KIRTLAND AIR FORCE BASE LOCATION MAP

Numerous devices and explosives were used at firing sites A and B. One of the timers tested was a "mild detonating fuze" (MDF). This is a very small amount of explosives contained inside a thin lead sheath. It looks like electrical solder. The explosives burn inside the sheath and the length of the fuze dictates the amount of time delay before the fuze initiates the main explosive device. The lead is vaporized as the fuze burns. Up to a gram of lead would be vaporized per shot (if MDF was used in that test)(634). Lead sheets and bricks were used during some tests but were not vaporized or dispersed. Small amounts of lead, maybe several pounds total, have been exploded as part of the casings on small shots (56). Sand bags were used to catch fragments but fingernail sized pieces may escape (56). Visible pieces from the casings were picked up after the shots (56).

Location C contains a test device simulating the firing chamber portion of a Davis gun (634). Only this portion of the gun was used in the tests. Less than ten tests were conducted (634). A maximum of 30 pounds of single-based or double-based gun propellant was used in each test (634). Typically about 10 pounds of HE was used. Single-based gun powders contain nitrocellulose. Double-based powders contain nitrocellulose and nitroglycerine. The test used a diaphragm that released the pressure in the chamber before it reached maximum pressure (634). When the diaphragm released, a significant amount of un-combusted gun propellant would be expelled out of the test chamber onto the ground (634). Site workers cleaned up most of this material after each test (634). The black powder cited in reference #166 was a very small amount and was part of the igniter (634).

In addition to the tests locations described above, the site supervisor remembers a test fixture on the outside of Building 9930 that he speculates was used for drop tests (634). The fixture was a metal pipe 20-30 feet high and about six feet in diameter. A door was located at the bottom of the pipe for access. The fixture has been removed by facilities. The fixture was located within the firing location A sampling area(634).

No DU containing components were used since the site supervisor came to the facility in 1976 (56). No reference to any DU testing was found during the background investigation.

Two 1984 interviews discussed an explosive test that dispersed a very small amount of mercury up to a mile away (18,19). The two interviewees worked for the site supervisor who was interviewed in 1995. One individual handled the explosives and mechanical parts of the test, and would be more knowledgeable about any mercury tests according to the site supervisor. The individual did not recall any tests involving mercury when re-interviewed in 1995. He speculated that maybe they blew up a thermometer by mistake. According to the site supervisor, the second individual did the electrical portions of the tests, and would not be as closely involved with the materials in the test. This individual could not be located for a follow-up interview. The site supervisor could not recall any mercury containing components that were tested. He speculated that maybe a component could have contained a mercury switch or a hearing aid battery that might have contained mercury.

Materials Used and Released

Materials observed or suspected of being present at Site #115, as well as materials that are believed to have been released, are listed below. Materials potentially released were determined based on interviews about the nature of the tests conducted at the site.

At firing locations A and B the components being tested were the detonator and timer themselves. The HE involved in the tests was the amount normally contained within the device. The HE would be detonated/ignited during the tests, destroying and dispersing the component materials.

At firing site location C, the Davis Gun chamber diaphragm released during the detonation and released unburned gun propellant on the ground around the chamber.

Table 1 - Materials Used/Released at ER Site # 115

Materials Used	Materials Potentially Released
HE used: TNT nitrocellulose, nitroglycerine, Comp B, CBX 9404, PBX 9502, PETN, nitromethane, photo flash powder (AL/Ammonium Perchlorate) (636)	HE potentially released TNT nitrocellulose, nitroglycerine, Comp B, CBX 9404, PBX 9502, PETN, nitromethane, photo flash powder (AL/Ammonium Perchlorate) (636) Combustion By-products: CO_2, CO, soot, semi-volatile and nonvolatile carbon) (DoD 1992)
Weapons Components	Steel, copper, aluminum, lead, and possibly beryllium.

Past Waste Management Practices

There are no reports of past chemical spills or other incidents related to hazardous/radioactive waste storage and handling.

Past Cleanups conducted

Some tests involved incomplete detonation of the HE (35). HE was cleaned up if chunks remained after tests (35). Gun propellant expelled from the Davis gun test conducted in area C was cleaned up after tests but was not documented (634).

Previous Investigations

ER Site 115 was identified during investigations conducted under the CEARP (DOE September 1987) and the RFA (EPA April 1987).

Numerous expended blank cartridges may have been scattered about the site during the 1977-1978 period according to one interviewee. A UXO surface clearance survey was performed at Site #115 and completed on 2/2/94. No live ordnance or UXO/HE debris was found (SNL/NM 1994).

In March of 1994, RUST Geotech Inc. conducted a surface gamma radiation survey at ER Site 115. No areas of radiation levels above background were found (RUST Geotech Inc. 1994)

Conceptual Model

Initial Conceptual Model

The conceptual model presented for ER Site 115 is an explosive testing site containing three firing locations. Tests were detonated on the surface and may have dispersed metal fragments and HE with subsequent deposition on the surface soils.

Existing Information on Nature and Extent of Contamination

Site # 115 has sparse small metal fragments visible on the soil surface. The potential COCs in these fragments has not been determined.

Potential Contaminant Migration Pathways

Potential pathways of contaminant migration include air, surface soil, surface water, infiltrating surface water (into the subsurface), and ground water.

The air pathway is primarily a concern only in high wind situations, since both the metals and the HE are dense and would not re-entrain easily, therefore, the air pathway is considered secondary.

The surface soil pathway is a concern from a direct ingestion, residential risk scenario, primarily since most of the potential contaminants of concern would have been deposited on the surface.

The surface water pathway was initially a concern due to the potential for contaminants at the surface of the site. The limited precipitation in the area and the small size of the tests, (thus limiting COC levels) make this pathway secondary.

Infiltrating surface water could provide a way for potential contaminants located at the surface to reach the subsurface. Due to the lack of significant COCs on the surface, and the local climate (very dry, low rainfall, and high evaporation rates), this pathway is secondary.

The ground water pathway is probably not significant due to the lack of significant COCs at the surface. The depth to ground water in the local area has not been determined. The nearest comparable well to site # 115 is the Chemical Waste Landfill monitoring wells which encountered water at approximately 500 ft. below ground level. The probable depth to groundwater and the lack of significant penetrating infiltration during rainfall events (high evaporation rates) result in this pathway being considered secondary.

Potential Public Health and Environmental Impacts

Public health and environmental impacts associated with ER Site 115 include the dermal exposure and ingestion of surface water from the surface-water pathway. However, because of the limited annual precipitation, exposure via the surface-water pathway is considered secondary. The receptor exposure via the air pathway includes inhalation and ingestion of particulates suspended by the wind and direct dermal exposures. Direct dermal exposure, inhalation, ingestion exposure via the air and soil pathways are considered the primary exposure routes, if COCs are present.

Data Needs/DQOs

The primary data need for ER Site 115 is characterization of the firing sites as potential sources of hazardous waste or hazardous constituents. This characterization will include defining both the nature and the extent of waste, if present at the site (Table 2). If a hazardous source is identified, additional data may be required to characterize the underlying soil media or surface-water and groundwater pathways. Geotechnical characterization data will be obtained at other nearby sites in OU 1335. Sensitive species surveys have been performed at the site to comply with NEPA requirements and to support potential ecological risk assessments. All other receptors and receptor scenarios have been identified in Sections 4.2.3.3.7 and 4.2.3.3.8, respectively of the PIP (SNL/NM February 1994). Level III analyses will be performed on all samples used to support a baseline risk assessment if initial sampling shows COC concentrations above action levels and background concentrations.

TABLE 2 - DATA QUALITY OBJECTIVES

DATA TYPE	DATA NEEDS	ACTION
Source Characterization	Characterize the nature and extent of COCs in the surface soils.	Collect soil samples from the firing site and analyze for HE, mercury, and TAL metals.
	Characterize the nature and extent of COCs at selected locations (contingency data)	Collect subsurface samples under each area where COCs were found above action levels and inadequate characterization exists. Analyze for HE, mercury, and TAL metals.
Environmental Characterization	Geotechnical Parameters	None - obtained at other locations in the OU

Sampling Plan

Sample collection for all the sites in this OU (including site 115) will be performed according to the methodology presented in Appendix 1 of this sampling and analysis plan. Appendix 1 of this work plan describes the specific technical approaches for performing UXO/HE, radiological, and land surveys. QC samples (including duplicates, matrix spikes, field blanks, trip blanks, and equipment rinsates) will be collected as specified in the generic QAPjP of the PIP (SNL/NM February 1994). All samples collected for laboratory analyses will be screened for gross alpha, gross beta, and gamma activity to meet DOT sample shipping requirements.

Sampling Plan Objectives and Technical Approach

The sampling plan at ER Site 115 is designed to collect adequate samples to meet the data needs outlined in Table 2. Specifically, sampling will be conducted to determine if regulated hazardous waste is present at the site and to determine if a release to the environment has occurred. Following supplemental UXO/HE and land surveys, intrusive sampling will be conducted to characterize the COCs in the test areas. Random samples will be collected from the three test areas. The samples will be screened and 20% will be sent to an off-site laboratory for verification. Field screening will also be conducted to monitor the site for health and safety concerns. Contingent upon the concentrations of COCs found in surface soil samples obtained from the initial sampling, additional surface and/or subsurface sampling may be conducted to define the extent of COCs at the site. Air sampling may also be conducted at the site to support a baseline risk assessment if COCs are detected above action levels and background concentrations. The sections below provide details on the ER Site 115 sampling plan.

Non-intrusive Surveys

Prior to initiation of sampling activities at the site, a supplemental UXO/HE survey will be performed to clear the site for sampling activities. Subsequent to this survey, a land survey or global positioning system will identify the locations of the surface samples.

Intrusive Sampling

Surface Soil Samples

Surface soil samples will be collected at each of the firing sites A, B, and C. A grid on five foot centers will be set up in each of the areas shown in Figure 2. Seven sampling locations at each of the three sites were randomly selected from the grid using a random number generator. The seven samples at each site were selected for different reasons, based on interviews. Site A has the highest probability of finding metals contamination. Site B is larger than site A but is less likely to have metals contamination. Site C is the smallest area but is most likely to have HE contamination. The samples will be screened using ICP for metals, HPLC for HE analyses and 20% will be sent to an off-site laboratory for verification. Off-site samples will be analyzed for HE, mercury, and metals. If screening detects radiation levels 1.3 times site specific background or higher, the samples will also be analyzed for uranium.

Contingency Sampling

Contingency samples will be collected to determine the extent of COCs at the site, if any surface soil samples from the test area contain COC concentrations at or above action levels and background concentrations. Additional subsurface soil samples will be collected at the depths of 5-, 10- and 15- feet below the surface of the test area if COCs are detected in the surface soil samples. Additionally, air sampling will be conducted at the site to support a baseline risk assessment, if COC concentrations in surface soil samples are at or above action levels and background concentrations.

Analytical Requirements

ER Site 115 samples will be analyzed according to the methods listed in Table 3. The samples will be screened using ICP for metals, HPLC for HE analyses and 20% will be sent to an off-site laboratory for verification.

The off-site analytical requirements include:

- Surface soil samples—HE compounds, mercury, TAL metals, and radionuclides (only if screening detects radiation levels 1.3 times site specific background levels or higher)

Level III analyses will be requested on all samples to collect data of sufficient quality to define the levels of potential COCs in the soil and sediment accurately and to support risk assessment calculations. The generic QAPjP in the PIP (SNL/NM February 1994) provides laboratory QA/QC requirements.

Investigation Derived Waste

Section 4.3.4.2 of the PIP (SNL/NM February 1994) and Appendix 1 discuss general procedures for the management of the ER Project investigation derived waste.

Table ' ... # 115
Confirm... Soil Sampling

Nonintrusive Sampling												
Survey Type	UXO/HE Survey	Radiological Survey	GPS Survey									
Number of Units	3.6 acres		21 points									

Intrusive Sampling												
Name of sample/location	Sample Media	Sample Type	No. of Samples	Sample Depth	Gross alpha/beta/gamma *	HE HPLC (in-house)	Metals ICP (in-house)	HE Compounds (SW 8300)	Metals (SW 6010/7000)	Isotopic Uranium -Alpha Spectroscopy **	Cesium **	Thorium **
Firing Sites (surface soil)	Soil	Grab	21	0-6"	x	21	21	5	5	5	5	5
QA	Soil	Grab	6	NA	x	9	9	3	3	3	3	3

* Field Screening, Level I/II analyses

** Only analyzed if screening reveals radioactivitity 1/3 above bachground

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636 Sandia National Laboratory/New Mexico, January 1995. Environmental Operations Record Center Record Number ER/7585/1335/115/int/94-78*

* Because many of the tests conducted at SNL/NM are classified, the SNL/NM reference numbers refer to a SNL/NM Record Center coding system intended to maintain the confidentiality of SNL/NM employees.

Appendix 1
Investigative Methods

F.1 Nonintrusive Surveys

Five types of nonintrusive surveys will be conducted at OU 1335 ER sites. Unexploded ordnance/high explosive (UXO/HE) surveys will be completed prior to any other surveys or sampling activities, followed by radiological, land, cultural resources, sensitive-species surveys, and geophysical surveys. UXO/HE surveys must be performed within one year preceding any scheduled sampling activities.

F.1.1 UXO/HE Survey

Because the UXO/HE surveys conducted by Kirtland Air Force Base (KAFB) from 1993 to 1994 only covered surface UXO/HE visible at the time of the survey, the time between the surveys completed to date and initiation of survey or sampling activities (scheduled for fiscal years 1995 through 1998) allows rain and wind erosion to expose subsurface UXO/HE. Therefore, preliminary UXO/HE surveys conducted to date will not meet health and safety protocol for sampling activities scheduled one or two years from now. As stated in Sandia National Laboratories/New Mexico (SNL/NM) Environmental Safety and Health Division (ES&H) Standard Operating Procedure SP473056, inactive sites will be resurveyed on a yearly basis as required in conjunction with sampling activities or until a corrective measure is implemented. Sites where active military exercises are carried out will be resurveyed in the 90-day period preceding any sampling activities.

F.1.2 Radiological Survey

Additional gamma radiation surveys may be conducted following the UXO/HE survey and during sampling activities to determine whether an imminent radiological health threat is present. The surveys will be conducted in a manner similar to the methods and protocol used by RUST Geotech Inc. (Appendix D) to update or augment radiological surveys performed to date. Posting of a site as a radiation area may change the scope and schedule of a site work plan, and any such changes must follow the guidance and documentation in Field Operating Procedure (FOP) 94-68.

F.1.3 Land Survey

Physical surveys will establish reference points for sample location grids, radiation survey points and anomalies, any significant manmade features or structures, and final sampling locations. All land surveys will conform to FOP 94-71 or will use the Global Positioning System (GPS). The following SNL/NM ER survey specifications will apply if the GPS is not used:

- Horizontal accuracy to be a minimum of 3rd Order, Class 2 (Horizontal Closure 1 in 5,000)
- Vertical accuracy to be 4th Order (vertical-angle elevation with reciprocal vertical angles measured between the traverse stations)
- All coordinates will be recorded in New Mexico State Plane Feet coordinates, vertical datum, North American Datum of 1927 (NAD27)
- Surveyor will provide a map showing all surveyed points with field identification and coordinates, including monuments used in the survey

The GPS will be used for locating points where an accuracy of 2 to 3 ft would be adequate for investigation requirements.

F.1.4 Cultural and Sensitive Species Surveys

Additional cultural resources survey (historical and archaeological) and a sensitive species survey may be conducted on all SNL/NM ER sites situated on KAFB and U.S. Forest Service (USFS) Cibola National Forest Withdrawn-Lands that have not had previous surveys. A description of the cultural resources survey is discussed in Section 3.7, and the survey methodology is discussed in Appendix A of this work plan. A description of the sensitive species survey is discussed in Section 3.8, and the survey methodology is described in Appendix B of this work plan.

F.1.5 Geophysics

Magnetometer and electromagnetic surveys may be conducted to locate buried utilities and potential UXO, prior to sampling. The equipment will be calibrated and operated in accordance with the manufacturer's instructions.

F.2 Intrusive Sampling

This section discusses technical approach, methods, and protocols for field screening and for obtaining surface soil and channel sediment samples, subsurface soil samples, debris samples, wipe samples, and site background samples. The sampling plans presented in Chapter 5.0 of this work plan discuss these sampling methods as they apply to specific sites.

F.2.1 Field-Screening

Field-screening for radioactivity will be performed on all debris and soil material removed and exposed. The purpose of field screening is to protect workers from potential imminent health threats and to locate any potential areas of high radioactivity for judgmental sampling (see Section 4.2.2.2).

Radiological surveys will be conducted using Geiger-Muller survey meters and sodium iodide scintillometers. If elevated radiation measurements are detected, the radioactive exposure-rate will be measured with a Reuter-Stokes Model RSS-111 Pressurized Ionization Chamber (or a similar portable device). If measured radioactive exposure levels are above 18 milliroentgens per hour (μR/hr), the Field Team Leader will stop all sampling operations and notify SNL/NM ES&H. The findings reported from the SNL/NM ES&H investigation will determine contingency actions. Judgmental samples will be collected from locations where radioactivity is greater than 1.3 times the background level.

F.2.2 Surface Soil and Channel Sediment Samples

Surface soil and channel sediment samples will be collected using a spade and scoop method (FOP 94-52), or hand auger (FOP 94-23), or a stainless steel surface soil ring sampler (FOP 94-24). Samples of soil and/or channel sediment from less than 6 in. deep will be collected using the spade and scoop method (FOP 94-52) or hand auger (FOP 94-23). Samples obtained from the upper 12 in. of soil or channel sediment will be obtained using the surface soil ring sampler (FOP 94-24) or hand auger (FOP 94-23). Both judgmental and random soil and channel sediment samples will be collected to satisfy the sampling requirements discussed in Chapter 5.0. Each sample type will be discussed independently to highlight specific methods or protocol not covered in the SNL/NM ER operating procedures (OP).

Judgmental Samples

Judgmental samples will be collected from locations (determined from observations and anecdotal information) that are most likely to contain the highest concentrations of contaminants of concern (COC). Positive field screening measurements, such as radiological compounds or volatile organic compounds (VOC), may be used to guide sample location selection. Positive field-screening is interpreted here as radioactivity present above 18 μR/hr (approximately 1.3 times the background level) or VOCs 5 parts per million (ppm) greater than the background level. Other judgmental sampling collections proposed for OU 1332 may include channel sediments from areas (such as channel bars) where COCs may have accumulated, samples from stained soils, samples from directly beneath debris mounds, and samples from the center of waste pits.

Random Samples

A random-number generator will determine the grid cell from which random samples will be collected. The sampling grid cells will be numbered as indicated in Figure F-2-1(a). Sample locations will correspond to the southwest corner of the cell selected by the random-number generator. If a structure is present within the grid, sample cells will be numbered as indicated

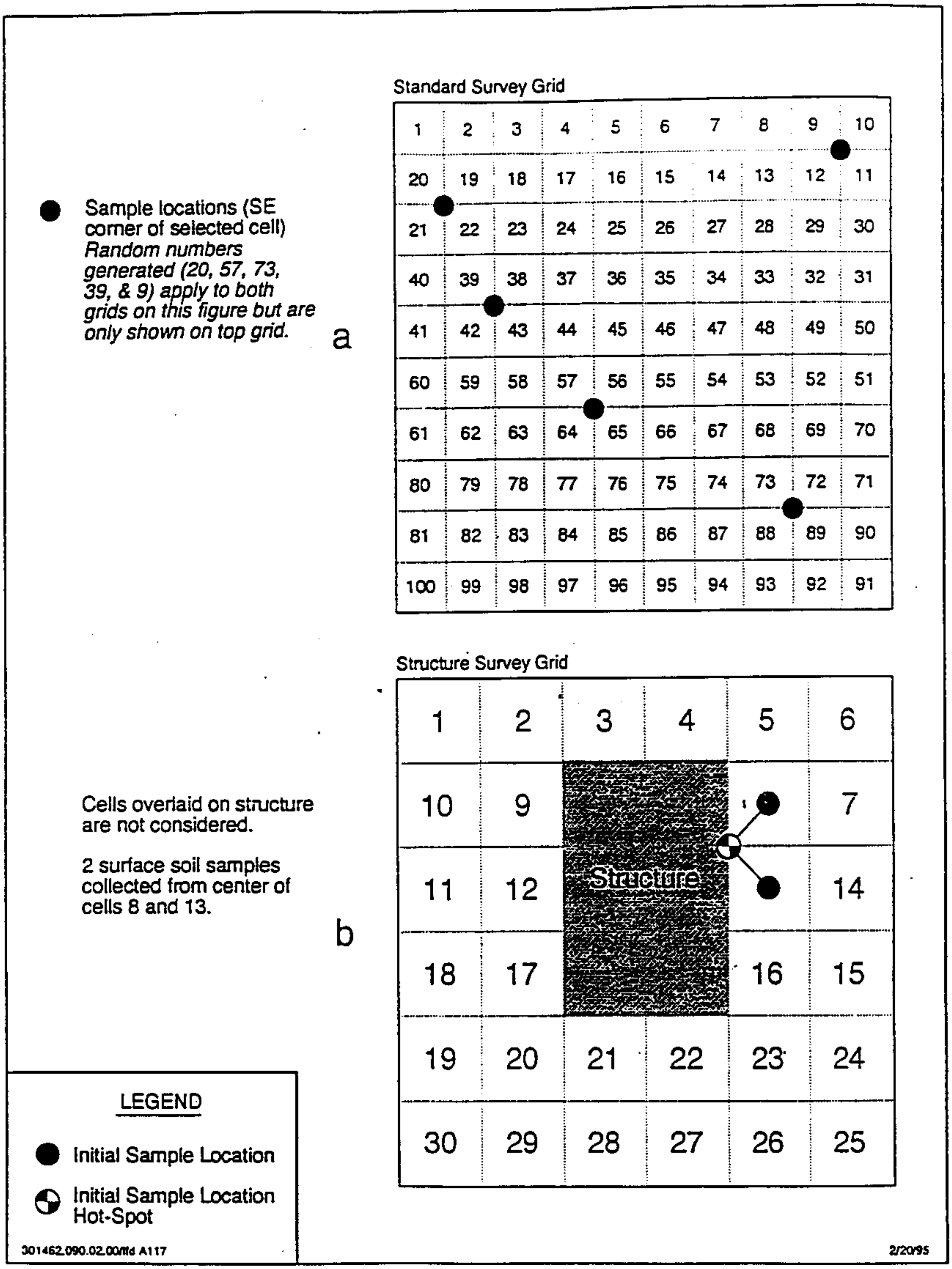


Figure F-2-1
Sampling Grids and Selection of Random Sample Locations

in Figure F-2-1(b). Cells will again be selected by random numbers and the southwest corner will be used as the sample location.

The grid for tests involving detonations is a set of eight radial lines, each separated by 45 degrees. This grid is established to focus the sampling around the blast point where contaminants are expected to be highest. The density of sampling locations is higher around the blast point under this grid system. Two samples from each radial will be randomly selected using a random-number generator. The center point will also be sampled.

F.2.3 Subsurface Soil Samples

Sample Intervals of Between 6 in. and 10 ft from the Ground Surface

A hand auger will be used to reach a depth of 6 in. above the sample horizon, and samples will be collected at depths of 5 ft and 10 ft with a thin-wall tube sampler (FOP 94-23, FOP 94-27), 6 in. above and below the target horizon. If the soil is loose and a thin-wall tube sampler cannot retrieve an intact sample, a split-spoon sampler or a hand auger (as appropriate) will be used to retrieve the sample (ASTM D1586-84).

Sample Intervals of Greater Than 10 ft from the Ground Surface

Boreholes for obtaining subsurface soil samples will be sampled at depths of 0 to 1.5, 5 to 6.5, 10 to 11.5, and 19 to 20.5 ft. Sampling plans in Chapter 5.0 suggest initial analysis of samples from a depth of 5 ft. If hazardous or radiological constituents are found in the sample from the 5-ft depth, the samples from the 10- and 20-ft depths also will be analyzed.

Trench Sampling

Trenches excavated to obtain subsurface soil samples associated with debris will be sampled at the horizons specified in the site sampling plans in Chapter 5.0. Trenches will be excavated using the methods discussed in FOP 94-39, and sampling from the trenches will proceed according to FOP 94-40.

F.2.4 Debris Samples

Samples from the debris mounds will determine whether the debris contains hazardous constituents. These samples will be obtained from trenches and mounds at locations identified in the site sampling plans in Chapter 5.0. Trenches will be excavated as discussed in Section F.2.3.

F.2.5 Wipe Samples

Wipe samples will be collected from various surfaces to determine whether contaminants are present on these surfaces. Samples will be collected at locations described in Chapter 5.0, using the SNL/NM procedures for collecting wipe samples (SNL/NM 1995).

F.2.6 Metal Fragments

Small metal fragments will be selected for analysis. Toxicity characteristic leaching procedures (TCLP) will be conducted on all fragments. X-ray fluorescence (XRF) analysis may also be run on the samples if required for characterization.

F.2.7 Site Background Samples

As discussed in Section 4.2.4.1 of the Program Implementation Plan (PIP) (SNL/NM February 1994), surface soil samples will be collected to establish site background concentrations for metals and activities of radionuclides for OU 1332 ER sites. Background concentrations and activities will be established at each OU 1332 ER site to support possible no-further-action proposals or to use in developing cleanup standards for sites that have been advanced to a corrective measures study. The statistical methods used to establish background levels will be consistent with the U.S. Environmental Protection Agency (EPA) methods used in "Background Concentrations of Naturally Occurring Constituents of Concern at Sandia National Laboratory" (IT May 1994b). Samples will be collected from soils similar to those underlying the solid waste management units (SWMU) being sampled (refer to Table 3-1 in the work plan for SWMU soil types). Seven radiological and five metals samples will be collected at four representative locations in the OU based on soil and rock types.

F.2.8 Sample Homogenizing

Soil and Channel Sediments

No composite samples are planned for OU 1332.

Debris

Debris samples will be composited by passing the debris through a screen with 1-in. by 1-in. openings to segregate the debris fragments by size. Fragments smaller than 1 in. will be placed in a stainless steel mixing bowl and homogenized using a stainless steel spatula as described above. Each sample larger than 1 in. must be uniquely labeled and correlated with the paired size fraction that is smaller than 1 in. The coarse fraction will be retained for future investigation in the event the fine fraction is found to contain hazardous constituents.

F.3 Contingency Sampling

If soil samples are shown to contain COC concentrations above action levels or background concentrations (whichever is higher), contingency samples will be collected (refer to Chapter 4, Figure 4-1, repeating Steps 4 through 19). The contingency sampling will be implemented to determine the vertical and lateral extent of COCs from sources currently presented in the conceptual model. If the conceptual model is changed significantly after initial sampling, the type, number, and location of contingency samples proposed in Chapter 5.0 may require modification. Contingency sampling will be conducted according to the procedures in Section 5.1.3. Sampling grids will be set up in sample cells named according to Figures F-2-1a and F-2-1b.

F.4 Sample Containers

Samples will be placed in appropriate containers, as described in Section 6.2 of the generic quality assurance project plan of the PIP (SNL/NM February 1994).

F.5 Sample Management

All work associated with field collection, preservation management, and custody of samples, as well as chain-of-custody requirements will follow FOP 94-34. Quality control samples will be collected in accordance with the generic Quality Assurance Project Plan of the PIP (SNL/NM February 1994, Appendix F).

F.6 Field Documentation

All field sampling activities will be documented using procedures and forms in AOP 94-22 or as described in procedures-specific OPs.

F.7 Equipment Decontamination

All sampling equipment will be decontaminated according to FOP 94-26. Equipment will be decontaminated before every sampling event (i.e., before each sample is collected and upon completing the sampling). Generated wastes will be handled as described in Section 4.3.4 of the PIP (SNL/NM February 1994).

F.8 Investigation Derived Waste

Section 4.3.4.2 of the PIP (SNL/NM February 1994) discusses general procedures for managing the investigation-derived waste (IDW). The following is a possible list of IDW that may be generated during OU 1332 ER site sampling investigations:

- Used expendable personal protective clothing (Tyvek, booties, gloves, etc.)
- Used disposable sampling equipment
- Decontamination rinsates generated from sampling equipment
- Debris and soil resulting from trenching and sampling activities

IDW will be characterized based on the results of associated environmental media samples and/or IDW waste sampling. All IDW will be managed in conformance to the SNL/NM ER Project Waste Management and Characterization Procedure FOP 94-78.

References

IT, see IT Corporation.

IT Corporation (IT), May 1994b. "Background Concentrations of Naturally Occurring Constituents of Concern at Sandia National Laboratories," IT Corporation, Albuquerque, New Mexico.

Sandia National Laboratories (SNL/NM), February 1994, draft. "Program Implementation Plan for Albuquerque Potential Release Sites," Sandia National Laboratories, Albuquerque, New Mexico.

Sandia National Laboratories/New Mexico (SNL/NM), 1995. "Chip, Wipe, and Sweep Sampling for Waste Characterization Field Operating Procedure," Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

SNL/NM, see Sandia National Laboratories.

AOP 94-22 Sandia National Laboratories/New Mexico, February 1994. "SMO User's Guide," Sandia National Laboratories, Albuquerque, New Mexico.

ASTM-D-1586-84

FOP 94-23 Sandia National Laboratories/New Mexico, March 1994. "Hand Auger and Thin-Wall Tube Sampler," Sandia National Laboratories, Albuquerque, New Mexico.

FOP 94-24 Sandia National Laboratories/New Mexico, March 1994. "Stainless Steel Surface Soil Ring Sampler," Sandia National Laboratories, Albuquerque, New Mexico.

FOP 94-26 Sandia National Laboratories/New Mexico, April 1994. "General Equipment Decontamination," Sandia National Laboratories, Albuquerque, New Mexico.

FOP 94-27 Sandia National Laboratories/New Mexico, March 1994. "Thin-Walled Tube Sampling of Soils," Sandia National Laboratories, Albuquerque, New Mexico.

FOP 94-34 Sandia National Laboratories/New Mexico, 1994, in preparation. "Field Sample Management and Custody," Sandia National Laboratories, Albuquerque, New Mexico.

FOP 94-39 Sandia National Laboratories/New Mexico, January 1994. "Excavating Methods," Sandia National Laboratories, Albuquerque, New Mexico.

FOP 94-40 Sandia National Laboratories/New Mexico, November 1994. "Test Pit Logging, Mapping, and Sampling," Sandia National Laboratories, Albuquerque, New Mexico.

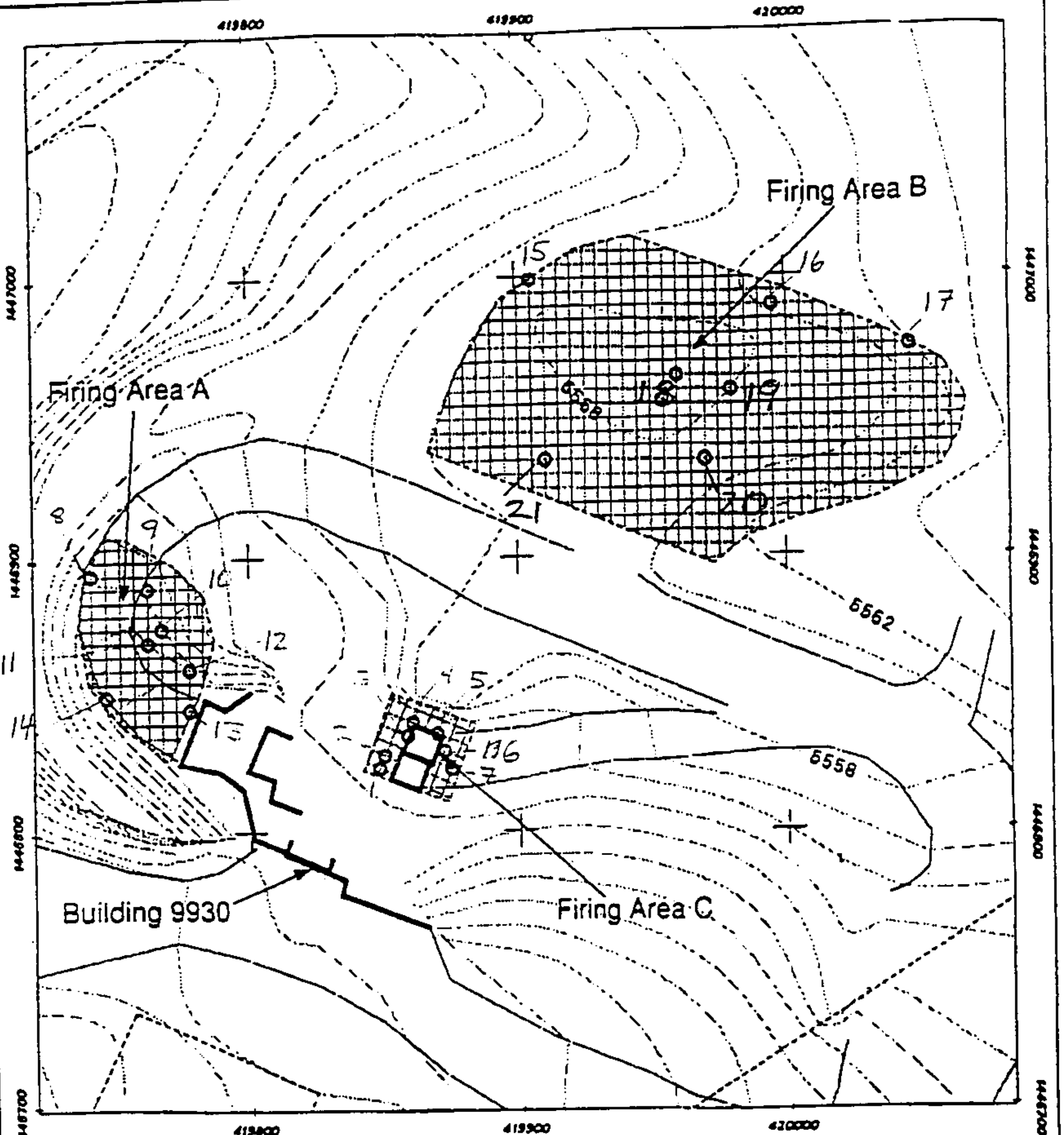
FOP 94-52 Sandia National Laboratories/New Mexico, January 1994. "Spade and Scoop Method for Collection of Soil Samples," Sandia National Laboratories, Albuquerque, New Mexico.

FOP 94-68 Sandia National Laboratories/New Mexico, May 1994. "Field Change Control," Sandia National Laboratories, Albuquerque, New Mexico.

FOP 94-71 Sandia National Laboratories/New Mexico, May 1994. "Land Surveying," Sandia National Laboratories, Albuquerque, New Mexico.

FOP 94-78 Sandia National Laboratories/New Mexico, July 1994. "Environmental Restoration Project Waste Management and Characterization Procedure," Sandia National Laboratories, Albuquerque, New Mexico.

SP473056 Sandia National Laboratories/New Mexico, August 1994. "Control of Unexploded Ordnance at Sandia National Laboratories/New Mexico Environmental Restoration Sites," Sandia National Laboratories, Albuquerque, New Mexico.



Legend

- 2 Foot Contours
- Sampling Grid on 5 Foot Centers
- Roads
- Buildings
- ER Site 115
- o Randomly Selected Sampling Points

Sandia National Laboratories, New Mexico
Environmental Restoration Geographic Information System

Figure 2
Potential Soil Sampling Locations at ER Site 115

Scale in Feet: 0 — 30 — 60

Scale in Meters: 0 — 7.3 — 14.4

Unclassified

DRAFT

1:720

1 in = 60'

DWSmech SNL GIS ORG. 7512 06/01/98 MAPID=650777

RSI

Justification for Class III Permit Modification

April 2000

Solid Waste Management Unit 115
Operable Unit 1335
Round 6

RSI Originally Submitted September 1999

OU 1335

Site-Specific Comments

ER Site 115, Firing Site (Building 9930) (Active)

ER Site 90 ***[sic]*** **may be appropriate for NFA** ***with respect to historical testing activities*****, pending submittal and review of the information requested below. Because this is as an "Active Site", additional site characterization may be necessary if testing activities have been done at the site since the time of the confirmatory sampling, or if testing activities are carried out in the future.**

U.S. Department of Energy/Sandia National Laboratories/New Mexico agree that ER Site 115 may be appropriate for NFA with respect to historical testing activities and that further characterization may be required if future testing activities are performed that have potential impacts on the environment.

1. **See general comment 5**

   Response: Twenty-one soil samples plus one duplicate sample collected at ER Site 115 were identified as follows: 115-GR-(001 through 020)-SS. The designator *115* represents the SWMU number, *GR* represents a grab sample, 001 through 020 represents the sample location (shown on Figure 2-1), and SS represents a surface sample with sampling depth of 0 to 6 inches. Figure 2-1 actually shows the sample locations as 1 through 20 instead of 001 through 020.

2. **Table 3-2 -- Should the units of mg/kg actually be µg/kg?**

   Response: The units should be µg/kg. A corrected Table 3-2 is included in Attachment F.

3. **Table 3-3 -- Analytical results of four of six samples exceed the approved background level for As. Human and ecological risk assessments must be completed to evaluate the risk of elevated As at this site.**

   Response: The risk assessment for arsenic is provided in Attachment G.

4. **Table 3-4 -- The MDL's for As, Cd, Se, Ag exceed their approved background levels. Because the detection limits for the LAS data are acceptable, and because this is a low priority site, HRMB will not require additional analysis of samples using lower detection limits.**

   Response: No additional analysis of samples using lower detection limits will be performed.

Attachment F

ATTACHMENT F

ER SITE 115
REVISED TABLE 3-2

Table 3-2
Summary of Explosives Results for ER Site 115 Soil Samples
SNL/NM ER Chemical Laboratory

Sample Location:		Site 115	Site 115	Site 115	Site 115	Site 115	Site 115	Site 115	Site 115
ER Sample ID:		115-GR-001-0-SS	115-GR-002-0-SS	115-GR-003-0-SS	115-GR-004-0-SS	115-GR-005-0-SS	115-GR-006-0-SS	115-GR-007-0-SS	115-GR-008-0-SS
Sample Type:		On-site	On-site	On-site	On-site	On-site	On-site	On-site	On-site
Sample Depth:		Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface
Sample Date:		08/02/95	08/02/95	08/02/95	08/02/95	08/02/95	08/02/95	08/02/95	08/02/95
	MDL[b] (µg/kg mg/kg)	(µg/kgmg/kg)	(µg/kgmg/kg)	(µg/kgmg/kg)	(µg/kgmg/kg)	(µg/kgmg/kg)	(µg/kgmg/kg)	(µg/kgmg/kg)	(µg/kgmg/kg)
Explosives[a]									
HMX	100	<100	<100	<100	<100	<100	<100	<100	<100
NG	30	<30	<30	<30	<30	<30	<30	<30	<30
PETN	150	<150	<150	<150	<150	<150	<150	<150	<150
RDX	150	<150	<150	<150	<150	<150	<150	<150	<150
TNT	76	<76	<76	<76	<76	<76	<76	<76	<76

Sample Location:		Site 115	Site 115	Site 115	Site 115	Site 115	Site 115	Site 115	Site 115
ER Sample ID:		115-GR-009-0-SS	115-GR-010-0-SS	115-GR-011-0-SS	115-GR-012-0-SS	115-GR-013-0-SS	115-GR-014-0-SS	115-GR-015-0-SS	115-GR-016-0-SS
Sample Type:		On-site	On-site	On-site	On-site	On-site	On-site	On-site	On-site
Sample Depth:		Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface
Sample Date:		08/02/95	08/02/95	08/02/95	08/02/95	08/02/95	08/02/95	08/02/95	08/02/95
	MDL[b] (µg/kg mg/kg)	(µg/kgmg/kg)	(µg/kgmg/kg)	(µg/kgmg/kg)	(µg/kgmg/kg)	(µg/kgmg/kg)	(µg/kgmg/kg)	(µg/kgmg/kg)	(µg/kgmg/kg)
Explosives[a]									
HMX	100	<100	<100	<100	<100	<100	<100	<100	<100
NG	30	<30	<30	<30	<30	<30	<30	<30	<30
PETN	150	<150	<150	<150	<150	<150	<150	<150	<150
RDX	150	<150	<150	<150	<150	<150	<150	<150	<150
TNT	76	<76	<76	<76	<76	<76	<76	<76	Trace

Sample Location:		Site 115	Site 115	Site 115	Site 115	Site 115
ER Sample ID:		115-GR-017-0-SS	115-GR-018-0-SS	115-GR-019-0-SS	115-GR-020-0-SS	115-GR-021-0-SS
Sample Type:		On-site	On-site	On-site	On-site	On-site
Sample Depth:		Surface	Surface	Surface	Surface	Surface
Sample Date:		08/02/95	08/02/95	08/02/95	08/02/95	08/02/95
	MDL[b] (µg/kg mg/kg)	(µg/kgmg/kg)	(µg/kgmg/kg)	(µg/kgmg/kg)	(µg/kgmg/kg)	(µg/kgmg/kg)
Explosives[a]						
HMX	100	<100	<100	<100	<100	<100
NG	30	<30	<30	<30	<30	<30
PETN	150	<150	<150	<150	<150	<150
RDX	150	<150	<150	<150	<150	<150
TNT	76	<76	<76	<76	<76	<76

[a] Explosives analyzed using modified EPA Method 8330 (EPA November 1986).
[b] MDL = Minimum detection limit.

HMX = Cyclotetramethylene tetranitramine.
µmg/kg = MicroMilligram(s) per kilogram.
NG = Nitroglycerin.
PETN = Pentaerythritol tetranitrate.
RDX = Cyclo-1,3,5-trimethylene-2,4,6-trinitramine.
TNT = Trinitrotoluene.

Attachment G

ATTACHMENT G

ER SITE 115
ARSENIC RISK ASSESSMENT

SUMMARY HUMAN HEALTH AND ECOLOGICAL RISK SCREENING ANALYSIS FOR ER SITE 115 (MAX CONC.)

I. Introduction

This summary risk screening analysis for ER Site 115 is performed as part of the Request for Supplemental Information comments as set forth by Kieling 1999. In order to simplify the risk assessment process and be conservative, the maximum values of the COCs or one-half their respective detection limits (whichever is greater) are used in the calculation of risk. Human health maximum concentrations are obtained from the complete data set regardless of depth. The ecological data maximum concentrations are obtained from samples collected from ground surface to 5 ft bgs. For this risk screening analysis, all samples were collected between 0 and 5 ft bgs.

II. Background Screening Procedure

II.1. Methodology

Maximum COC concentrations from ER Site 115 are compared to the approved SNL/NM maximum screening level for this area. The SNL/NM maximum background concentration is selected to provide the background screen in Table 1 and used to calculate human health risk attributable to background in Table 3. Only the COCs that are above their respective SNL/NM maximum background screening level or do not have a quantifiable background screening level are considered in further risk assessment analyses.

II.2 Background Screening Procedure Results

A comparison of the ER Site 115 maximum COC concentrations to the SNL/NM maximum background values (Dinwiddie September 1997) for the human health and ecological risk assessment is presented in Table 1. Seven nonradiological COCs exceed their respective background screening values. One inorganic COC does not have a quantified background screening level and, therefore, it is not known whether this COC exceeds background.

The maximum concentration value for lead is 230 milligrams per kilogram (mg/kg). The EPA intentionally does not provide any human health toxicological data on lead and, therefore, no risk parameter values can be calculated. However, EPA Region 6 guidance for the lead screening value considering an industrial land use scenario is 2,000 mg/kg (EPA 1996); for a residential land use scenario, the EPA screening guidance value is 400 mg/kg (EPA 1994). The maximum concentration value for lead at this site is less than both screening values and, therefore, lead is eliminated from further consideration in the human health risk assessment.

III. Human Health Risk Screening Analysis

III.1 Comparison of Risk Values to Numerical Guidelines

The recommended land use for ER Site 115 is industrial. However, for comparison, both industrial and residential land uses are presented.

Table 1
COCs for Human Health and Ecological Risk Assessment for ER Site 115 with Comparison to the Associated SNL/NM Background Screening Value

COC Name	Maximum Concentration (mg/kg)	SNL/NM Background Concentration (mg/kg)[a]	Is Maximum COC Concentration Less Than or Equal to the Applicable SNL/NM Background Screening Value?
Arsenic	43	5.6	No
Barium	290	130	No
Beryllium	1.0	0.65	No
Cadmium	5[b]	<1	No
Chromium, total	12	17.3	Yes
Lead	230	21.4	No
Mercury	0.19 J	<0.25	Unknown
Selenium	25[b]	<1	No
Silver	5[b]	<1	No

[a] From Dinwiddie (September 1997) Southwest Supergroup.
[b] Parameter was nondetect. Concentration assumed to be 0.5 of detection limit.
COC = Constituent of concern.
ER = Environmental Restoration.
J = Concentration is estimated.
mg/kg = Milligram(s) per kilogram.
SNL/NM = Sandia National Laboratories/New Mexico

For the industrial land-use scenario nonradiological COCs, the HI calculated is 0.2 (below the numerical guideline of 1 suggested in the RAGS [EPA 1989])(Table 2). Excess cancer risk is estimated at 2E-5(Table 2). Guidance from the New Mexico Environment Department (NMED) indicates that excess lifetime risk of developing cancer by an individual must be less than 1E-6 for Class A and B carcinogens and less than 1E-5 for Class C carcinogens (NMED March 1998). The excess cancer risk is driven by arsenic which is a Class A carcinogen. Thus, the excess cancer risk for this site is above the suggested acceptable risk value (1E-6).

This assessment also determined risks considering background concentrations of the potential nonradiological COCs for both the industrial and residential land use scenarios (Table 3). For the COCs, assuming the industrial land use scenario, the HI is 0.02 and the excess cancer risk is 3E-6. Incremental risk is determined by subtracting risk associated with background from potential COC risk. These numbers are not rounded before the difference is determined and, therefore, may appear to be inconsistent with numbers presented in tables and within the text. For conservatism, the background constituents that do not have quantified background screening levels are assumed to have a HI and excess cancer risk of 0.00 for the incremental risk calculation. The incremental HI is 0.13, and incremental cancer risk is 1.70E-5 for the industrial land use scenario. The incremental excess risk value is above the proposed guideline considering an industrial land use scenario.

The HI calculated for the nonradiological COCs is driven by arsenic. Twenty-seven samples were collected for arsenic; all but six of the samples were nondetect but had high detection limits (50 mg/kg). The remaining six data points consist of five samples and a duplicate. One sample and the associated duplicate had reported concentrations of 43 and 37, respectively. The higher concentration (43 mg/kg) was used as the maximum in the risk calculations. When the next highest detected concentration (7.9 mg/kg) is used, the associated and incremental excess cancer risks are 4.1E-6 and 1.2E-6, respectively, which are slightly above the proposed guidelines. However, according to site history, arsenic is not a COC. In addition, the presence of arsenic could be from herbicides, pesticides, and rat poisoning. This 0.5-acre site is currently used for explosives testing (approximately 2 tests per week) in the established laboratory facility. Personnel use the building rather than the area from which the samples were collected, to obtain an 8-hour daily exposure. Personnel could use the vegetated area for breaks, resembling a recreational scenario. The associated excess cancer risks considering the recreational land use scenario for 43 and 7.9 mg/kg are 2.5E-6 and 4.6E-7, respectively. With the more realistic exposure scenario, the incremental excess cancer risk from arsenic is within the proposed guidelines.

Using the maximum values, the calculated HI for the residential land use scenario nonradiological COCs is 16, which is above the numerical guidance (Table 2). Excess cancer risk is estimated at 5E-4. The excess cancer risk is driven by arsenic which is a Class A carcinogen. Thus, the excess cancer risk for this site is above the suggested acceptable risk value (1E-6). The HI for associated background for the residential land use scenario is 0.3, the excess cancer risk is 6E-5 (Table 3). The incremental HI is 15.59, and the incremental cancer risk is 4.4E-4 for the residential land use scenario. These incremental risk calculations indicate

Table 2
Human Health Risk Assessment Values for ER Site 115
Nonradiological COCs

COC Name	Maximum Concentration (mg/kg)	Industrial Land-Use Scenario[a]		Residential Land-Use Scenario[a]	
		Hazard Index	Cancer Risk	Hazard Index	Cancer Risk
Arsenic	43	0.14	2E-5	2.46	5E-4
Barium	290	0.00	--	0.04	--
Beryllium	1.0	0.00	4E-10	0.00	7E-10
Cadmium	5[b]	0.01	2E-9	4.09	3E-9
Mercury	0.19 J	0.00	--	0.33	--
Selenium	25[b]	0.00	--	8.80	--
Silver	5[b]	0.00	--	0.21	--
Total		**0.2**	**2E-5**	**16**	**5E-4**

[a]From EPA (1989).
[b]Parameter was nondetect. Concentration assumed to be 0.5 of detection limit.
COC = Constituent of concern.
ER = Environmental Restoration.
J = Concentration is estimated.
mg/kg = Milligram(s) per kilogram.
-- = Information not available.

Table 3
Human Health Risk Assessment Values for ER Site 115
Nonradiological Background Constituents

COC Name	Background Concentration[a] (mg/kg)	Industrial Land-Use Scenario[b]		Residential Land-Use Scenario[b]	
		Hazard Index	Cancer Risk	Hazard Index	Cancer Risk
Arsenic	5.6	0.02	3E-6	0.32	6E-5
Barium	130	0.00	--	0.02	--
Beryllium	0.65	0.00	3E-10	0.00	5E-10
Cadmium	<1	--	--	--	--
Mercury	<0.25	--	--	--	--
Selenium	<1	--	--	--	--
Silver	<1	--	--	--	--
Total		**0.02**	**3E-6**	**0.3**	**6E-5**

[a]From Dinwiddie (September 1997) Southwest Supergroup.
[b]From EPA (1989).
COC = Constituent of concern.
ER = Environmental Restoration.
mg/kg = Milligram(s) per kilogram.
-- = Information not available.

contribution above proposed guidance to human health risk from the COCs considering a residential land use scenario.

III.2 Summary of Human Health Risk Assessment

Uncertainties associated with the calculations are considered small relative to the conservativeness of risk assessment analysis. It is, therefore, concluded that ER Site 115 poses insignificant risk to human health under an industrial land use scenario.

IV. Ecological Risk Screening Assessment for ER Site 115

Risks to ecological receptors at ER Site 115 were calculated using the methodology described in "Predictive Ecological Risk Assessment Methodology, Environmental Restoration Program, Sandia National Laboratories, New Mexico" (IT July 1998). For the analytes that exceeded the background screening values for this site, the maximum concentrations in soil were used to estimate dietary exposures in the deer mouse (*Peromyscus maniculatus*) and the burrowing owl (*Speotyto cunicularia*). The maximum soil concentrations and estimated dietary exposures were compared to plant and wildlife benchmark values, respectively. Hazard quotients (HQ) were used to quantify the comparison with benchmarks for plants and wildlife exposure.

Table 4 presents the results of the comparisons for COCs to background. The maximum value of arsenic and lead, and half of the detection limit of cadmium, selenium, and silver produced hazard quotients (HQ) greater than one. This is an active testing laboratory (industrial land use) not intended to grow agricultural plants. The maximum value of arsenic and barium, and half of the detection limit of selenium produced HQs more than one for two or more of the mouse diets. For the burrowing owl, organic mercury produced an HQ greater than 1; however, inorganic mercury produced insignificant risk to the owl. It is unlikely that mercury is in the organic form. Toxicity data for beryllium and silver are not available to calculate risk to the owl. Because of these concentrations at this 0.5-acre site and the fact that the home range of the owl is 32 acres, no significant risk is expected. The HQ of selenium (half the detection limit) is also above 1 for all receptors. However, selenium is an essential nutrient for living organisms. Selenium is not expected to contribute significant risk to the wildlife receptors at this site.

Many uncertainties are associated with the characterization of ecological risks at ER Site 115. These uncertainties result from assumptions used in calculating risk that may overestimate or underestimate true risk presented at a site. For this risk assessment, assumptions are made that are more likely to overestimate exposures and risk rather than to underestimate them. These conservative assumptions are used to provide more protection to the ecological resources potentially affected by the site. Conservatisms incorporated into this risk assessment include the use of maximum measured analyte concentrations in soil to evaluate risk, the use of wildlife toxicity benchmarks based upon NOAEL values, the incorporation of strict herbivorous and strict insectivorous diets for predicting the extreme HQ values for the deer mouse, and the use of 1.0 as the area use factor for wildlife receptors regardless of seasonal use or home range size. Each of these uncertainties, which are consistent among each of the SWMU-specific ecological risk

Table 4
Hazard Quotients for Ecological Receptors at ER Site 115

Constituent of Potential Ecological Concern	Maximum Concentration (mg/kg)	Plant HQ[a]	Deer Mouse HQ (Herbivorous)[a]	Deer Mouse HQ (Omnivorous)[a]	Deer Mouse HQ (Insectivorous)[a]	Burrowing Owl HQ[a]
Arsenic	43	**4.30**	**3.01**	**27.10**	**51.18**	0.02
Barium	290	0.58	0.73	**2.55**	**4.37**	0.03
Beryllium	1.0	0.10	0.00	0.06	0.12	NA
Cadmium	5[b]	**1.67**	0.24	0.25	0.26	0.01
Lead	230	**4.60**	0.25	0.19	0.14	0.14
Mercury (organic)	0.19 J	0.63	0.48	0.48	0.48	**2.70**
Mercury (inorganic)	0.19 J	0.00	0.00	0.00	0.00	0.04
Selenium	25[b]	**25.00**	**5.17**	**7.66**	**10.14**	**1.65**
Silver	5[b]	**2.50**	0.02	0.01	0.01	NA
Background						
Arsenic	5.6	0.56	0.39	**3.53**	**6.67**	0.00
Barium	130	0.26	0.33	**1.14**	**1.96**	0.01
Beryllium	0.65	0.07	0.00	0.04	0.08	NA
Cadmium	as 1.0	0.33	0.05	0.05	0.05	0.00
Lead	21.4	0.43	0.02	0.02	0.01	0.01
Mercury (organic)	as 0.25	0.83	0.63	0.63	0.63	**3.56**
Mercury (inorganic)	as 0.25	0.00	0.00	0.00	0.00	0.05
Selenium	as 1.0	**1.00**	0.21	0.31	0.41	0.07
Silver	as 1.0	0.50	0.00	0.00	0.00	NA

[a]**Bold** text indicates HQ or HI exceeds unity.
[b]Parameter was nondetect. Concentration assumed to be 0.5 of detection limit.
J = Concentration is estimated.
mg/kg = Milligram(s) per kilogram.
NA = Not available because of insufficient toxicity data available for risk estimation purposes.
HQ = Hazard quotient.

assessments, is discussed in greater detail in the uncertainty section of the ecological risk assessment methodology document for the SNL/NM ER Program (IT 1998).

The main risk driver is arsenic. Out of the five sample locations, concentrations of 43 and 37 mg/kg were detected at one sample location (as a split/duplicates), the next highest sample concentration was 7.9 mg/kg. Using 7.9 as the maximum concentration gives an incremental HQ of about 3 for the insectivorous mouse using the current soil-to-insect transfer factor. However, based upon a recent SNL/NM biovalidation study(IT 1999), the site-specific soil-to-insect transfer factor is about 20 percent of that currently used. Therefore, an arsenic soil content of 7.9 mg/kg does not contribute significant risk to the mouse. Furthermore, arsenic could be from herbicide, pesticide, and rat poisoning applications.

Because this site is an active laboratory facility, the habitat for ecological receptors is poor. With the consideration of the size of the site (0.5 acre), the ecological risk to wildlife is expected to be low.

V. References

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