SNL 2004

National Nuclear Security Administration
Sandia Site Office
P.O. Box 5400
Albuquerque, New Mexico 87185-5400

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Mr. James Bearzi, Chief
Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Road East
Building 1
Santa Fe, NM 87505

Dear Mr. Bearzi:

On behalf of Sandia Corporation and the Department of Energy (DOE), DOE is notifying you of a voluntary corrective action at Solid Waste Management Unit (SWMU) 91, Lead Firing Site (Thunder Range), at Sandia National Laboratories/New Mexico (SNL/NM) (EPA ID No. NM5890110518). Enclosed please find the Voluntary Corrective Action (VCA) Plan for SWMU 91.

The VCA is designed to remove debris and lead fragments from three areas at SWMU 91 and to conduct confirmatory sampling to ensure that the cleanup goal for lead is achieved. Work is expected to begin in the fourth quarter of fiscal year 2004. An Investigation Report for SWMU 91 will be submitted by June 30, 2005, as required by Table XI-3 of the Compliance Order on Consent for SNL/NM. To ensure that the schedule is met, we are requesting that you provide any comments on the VCA Plan by July 30, 2004.

Please contact John Gould at (505) 845-6089 with any questions regarding this submittal.

Sincerely,

Patty Wagner
Manager

Enclosure

SNL1150

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CERTIFICATION STATEMENT FOR APPROVAL AND FINAL RELEASE OF DOCUMENTS

Document title: **Voluntary Corrective Action Plan for SWMU 91, July 2004**

Document author: **Eric Larsen, Dept. 6134**

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to ensure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine or imprisonment for knowing violations.

Signature: Peter B. Davies — 6/28/04

Peter B. Davies
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Date

and

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Patty Wagner
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U.S. Department of Energy
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Sandia Site Office
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Date

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Sandia National Laboratories/New Mexico Environmental Restoration Project

VOLUNTARY CORRECTIVE ACTION PLAN FOR SWMU 91, LEAD FIRING SITE

June 2004

United States Department of Energy
Sandia Site Office

Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company, for the United States Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.

SNL1150

TABLE OF CONTENTS

LIST OF FIGURES iii
LIST OF TABLES iii
ACRONYMS AND ABBREVIATIONS v

1.0 INTRODUCTION 1-1

1.1 Objectives and Scope 1-1
1.2 Approach and Implementation 1-1
1.3 Background Issues 1-2

1.3.1 Regulatory Issues 1-2
1.3.2 Lead Cleanup Goal 1-2
1.3.3 Data Quality Objectives Process 1-2

2.0 DESCRIPTION OF SWMU 91—LEAD FIRING SITE 2-1

2.1 Site Description 2-1
2.2 Operational History 2-1
2.3 Waste Characteristics 2-9
2.4 Geology/Hydrology 2-9

3.0 SUMMARY OF EXISTING DATA 3-1

3.1 Evolution of the Conceptual Site Model 3-1

3.1.1 Pre-1996 Conceptual Site Model 3-1
3.1.2 Post-1996 Voluntary Corrective Measure Conceptual Site Model Development 3-6
3.1.3 Revised Conceptual Site Model Overview 3-11

3.2 Regulatory Interaction 3-12
3.3 Voluntary Corrective Action Approach 3-12

4.0 SWMU 91 VCA 4-1

4.1 Removal of Lead Fragments and Test Debris 4-1

4.1.1 Excavation 4-1
4.1.2 Mechanical Screening of Excavated Soil 4-2
4.1.3 Soil Pile Management 4-3

4.2 Verification of Corrective Action Objectives 4-3

4.2.1 Removal of Debris 4-3
4.2.2 Verification of Cleanup Goal—Excavated Areas 4-3
4.2.3 Verification of Cleanup Goal–Screened Soil Piles 4-4

TABLE OF CONTENTS (Concluded)

4.3 Waste Management 4-5

4.3.1 Screened Debris 4-5
4.3.2 Personal Protective Equipment and Project Waste 4-5
4.3.3 Lead Fragments 4-5
4.3.4 Rocks 4-6
4.3.5 Soil Clumps 4-6

4.4 Site Sampling 4-6

4.4.1 Data Quality Objectives 4-6

4.5 Site Restoration 4-7
4.6 Project Schedule 4-7
4.7 Health and Safety Requirements 4-7

5.0 REFERENCES 5-1

LIST OF FIGURES

Figure

2-1 Location of Kirtland Air Force Base and SWMU 91, Lead Firing Site 2-3

2-2 Location of SWMU 91, Lead Firing Site 2-5

2-3 Site Map of SWMU 91, Lead Firing Site.....2-7

3-1 Site Map of SWMU 91 Showing the Three Areas Targeted for Remediation 3-7

LIST OF TABLES

Table

3-1 Investigative History of SWMU 91.....3-2

LIST OF ATTACHMENTS

Attachment

1 Geophysical Survey Map

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ACRONYMS AND ABBREVIATIONS

AR/COC	analysis request/chain of custody
bgs	below ground surface
COC	constituent of concern
COOC	Compliance Order on Consent
CWL	Chemical Waste Landfill
DQO	data quality objective
EPA	U.S. Environmental Protection Agency
ER	Environmental Restoration
HASP	Health and Safety Plan
HE	high explosive
KAFB	Kirtland Air Force Base
kg	kilogram
mg	milligram(s)
mm	millimeter(s)
NBA	Northern Burial Area
NMED	New Mexico Environment Department
OU	Operable Unit
PPE	personal protective equipment
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
SBA	Southern Burial Area
SMO	Sample Management Office
SNL/NM	Sandia National Laboratories/New Mexico
SWMU	Solid Waste Management Unit
TA	Technical Area
TCLP	Toxicity Characteristic Leaching Procedure
TTBA	Test Trench Burial Area
UCL	upper confidence limit
VCA	Voluntary Corrective Action
VCM	Voluntary Corrective Measure

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1.0 INTRODUCTION

This document describes the Voluntary Corrective Action (VCA) to be conducted at Environmental Restoration (ER) Solid Waste Management Unit (SWMU) 91, the Lead Firing Site. The VCA addresses the removal of test debris, including lead fragments, from soil associated with shallow burial areas and related confirmatory soil sampling and geophysical surveys.

1.1 Objectives and Scope

The objectives of the VCA at SWMU 91 are to reduce impacts to human health and the environment through remediation of the site. This remedial action consists of source removal involving excavation and separation of test debris, including lead fragments, from soil; confirmatory soil sampling and geophysical surveys; and final site restoration. This VCA is intended to be the final remedy for SWMU 91.

Sandia National Laboratories/New Mexico (SNL/NM) ER Project considered several factors in determining the need for a VCA at SWMU 91.

- Test debris, including lead fragments, is present in the shallow subsurface.
- Previous sampling and archival data are sufficient for identifying the constituents of concern (COCs) and developing a comprehensive conceptual site model.
- The potential remedy is obvious and can be readily applied.
- Complete assessment and final remediation requires excavation at the site.
- The remedial action is intended as a final resolution to eliminate source material (lead fragments) and prevent potential release or migration of contaminants (lead) from the site.
- Environmental, safety, and health risk reductions will be achieved.

1.2 Approach and Implementation

The nature and extent of contamination associated with the Lead Firing Site was determined during previous Resource Conservation and Recovery Act (RCRA) Facility Investigations (RFIs). Cleanup of the site will generate solid waste in the form of test debris. This VCA will involve 1) the excavation of soil containing test debris and lead fragments from the shallow subsurface, 2) a mechanical screen to separate the test debris and lead fragments from the excavated soil, 3) a conveyor system and field personnel to separate lead fragments from other test debris for recycling, and 4) disposal of solid waste (test debris) at an approved facility. After confirmation data have been reviewed and it is determined that cleanup goals have been met, the excavated areas will be backfilled with clean fill material and with excavated screened soil that meets or exceeds the cleanup goal for total lead. Final site restoration activities at SWMU 91 will consist of regrading the surface and revegetation of the site.

1.3 Background Issues

1.3.1 Regulatory Issues

This VCA will be conducted under Sections VI.H.3 and 4 of the Compliance Order on Consent (COOC) issued on April 29, 2004 (NMED April 2004) and will not pose unacceptable risk to human health or the environment. The corrective action objectives developed for this VCA have been designed to achieve source reduction (see Chapter 4.0) and are consistent with the final site remedy. Final confirmatory sampling and geophysical surveys will be used to verify that the objectives have been met. As required by Sections VI.H and XI of the COOC, this VCA Plan will be submitted to the New Mexico Environment Department (NMED) at least 15 days prior to the start of fieldwork, and the Investigation Report will be submitted to the NMED by June 30, 2005. The Investigation Report will present the results of this VCA and provide the complete investigation history of SWMU 91.

1.3.2 Lead Cleanup Goal

The U.S. Environmental Protection Agency (EPA) intentionally does not provide any human health toxicological data on lead; therefore, no risk parameter values can be calculated. However, NMED guidance for the lead screening concentration for Unrestricted Industrial Land Use is 750 milligrams (mg)/kilogram (kg) (Olson and Moats March 2000). For SWMU 91, a soil cleanup goal of 750 mg/kg of lead will be used as a corrective action objective for this VCA.

1.3.3 Data Quality Objectives Process

This VCA will be conducted in accordance with the data quality objectives (DQOs) development process specified in the RFI Work Plan for Operable Unit (OU) 1335, Southwest Test Area (SNL/NM March 1996a). The two primary data requirements for this VCA are: 1) confirm that test debris greater than ½ inch in diameter has been removed from the site, and 2) verify that excavated areas and mechanically screened soil meet the cleanup goal of 750 mg/kg. SNL/NM's DQO process for this VCA follows these general steps:

- Compile and evaluate site background information
- Develop and refine a conceptual site model based upon field investigation and laboratory data
- Establish DQOs, including:
  - Corrective action objectives and cleanup goals
  - Confirmatory methods to ensure corrective action objectives have been achieved

2.0 DESCRIPTION OF SWMU 91—LEAD FIRING SITE

This chapter presents the site description, operational history, waste characteristics, and geology/hydrogeology of SWMU 91. This information has been combined with site investigation data to develop the revised conceptual site model discussed in Chapter 3.0.

2.1 Site Description

SWMU 91 is located within the boundaries of Kirtland Air Force Base (KAFB) (Figure 2-1), 1.6 miles west of the SNL/NM Solar Tower Facility and 0.6 miles south of Technical Area (TA)-III, south of Magazine Road (Figure 2-2). A gated fence surrounds the center of the test site and the cross-shaped trench where testing occurred. The site boundary extends beyond the fence, as determined from previous investigations. SWMU 91 occupies approximately 20 acres. Several other ER sites are located in the vicinity (Figure 2-3). SWMU 91 is located at the western end of the 19-foot-diameter shock tube (SWMU 89). Other sites in the area include the General Purpose Heat Source Test Area (SWMU 194), the Gas Cylinder Disposal Pit (SWMU 6), Scrap Yards/Open Dump (SWMU 17), and Old Thunderwells (SWMU 56).

The site is on KAFB land permitted to the U.S. Department of Energy. In general, the terrain is flat with a gentle slope to the southwest. The closest surface-water features are shallow secondary arroyos located approximately 2,500 feet to the south and 3,800 feet to the north. Precipitation is low in the region (approximately 8 inches per year) and surface runoff is minimal. Vegetation primarily consists of desert grasses, cacti, and tumbleweeds.

2.2 Operational History

The operational name formerly used by SNL/NM for SWMU 91 is the Flyer Plate Test Site. The flyer plate tests were conducted to determine whether impact fuses in a high-velocity reentry vehicle (warhead) could activate before the critical firing components were destroyed by the vehicle impact. Information regarding detailed test activities at the Flyer Plate Test Site is contained in the RFI Work Plan for OU 1335 (SNL/NM March 1996a) and is summarized as follows.

The tests were designed to study the behavior of the warhead firing components upon impact. In these tests, explosively driven flyer plates were fired against a stationary target vehicle. Velocities of up to 12,000 feet per second were achieved. Initially, the flyer plates were not rotated, but later it was found that rotating the flyer plates to impact the target vehicle at an angle would more accurately simulate the actual impact conditions of a reentry vehicle. The flyer plate tests began in 1962. Prior to 1975, the flyer plates were approximately 1 foot thick and 4 by 4 feet square and were constructed of either aluminum or Lucite™. Typically 4,000 pounds of the explosive cyclotol (TNT and RDX) were used to drive each of the nonrotating plates. The tests were conducted in the test trench at SWMU 91, and test debris was scattered over the general vicinity surrounding the test trench. After each test, general cleanup was typically performed, and test debris was consolidated and shallowly buried to the north of the test trench.

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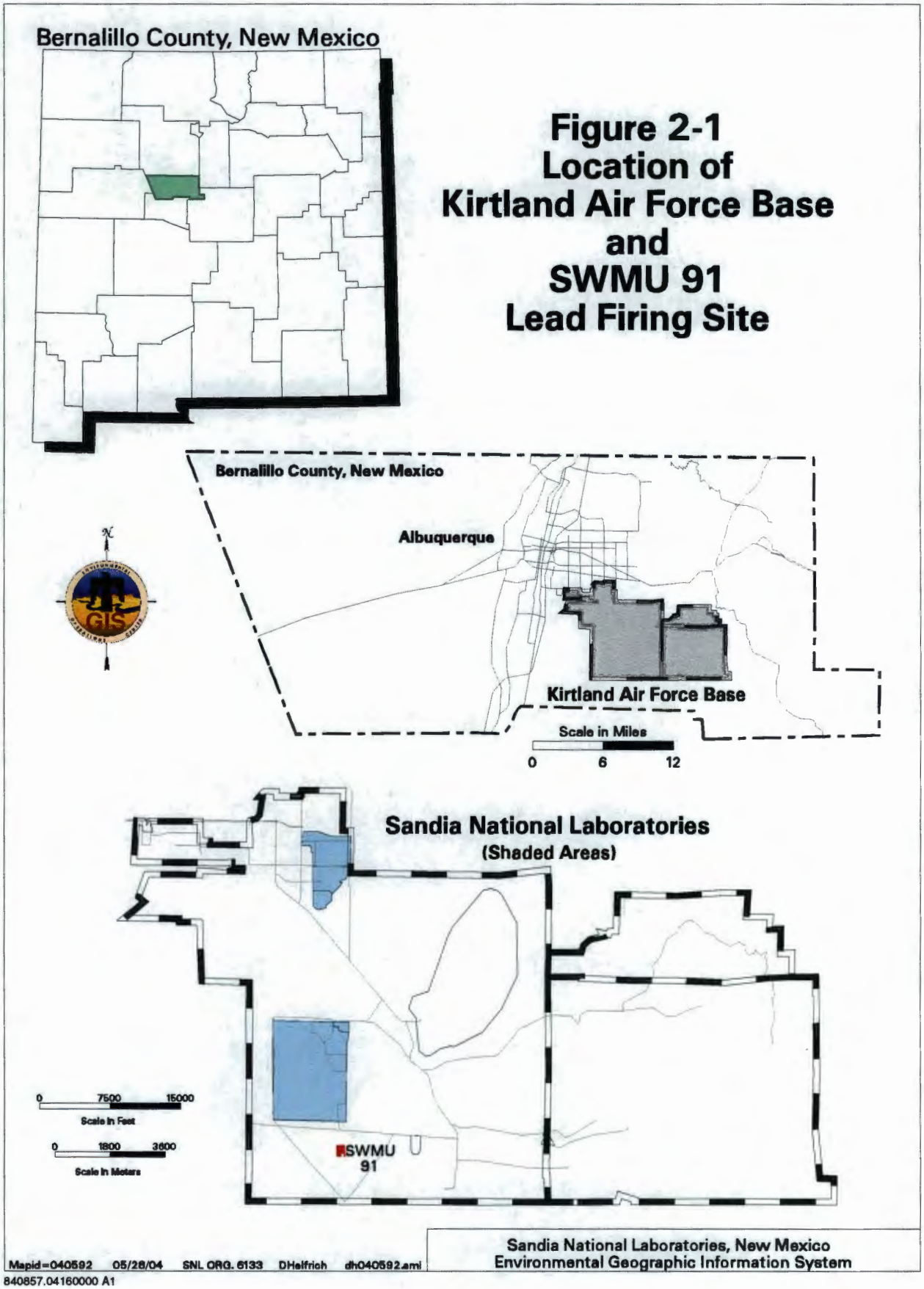

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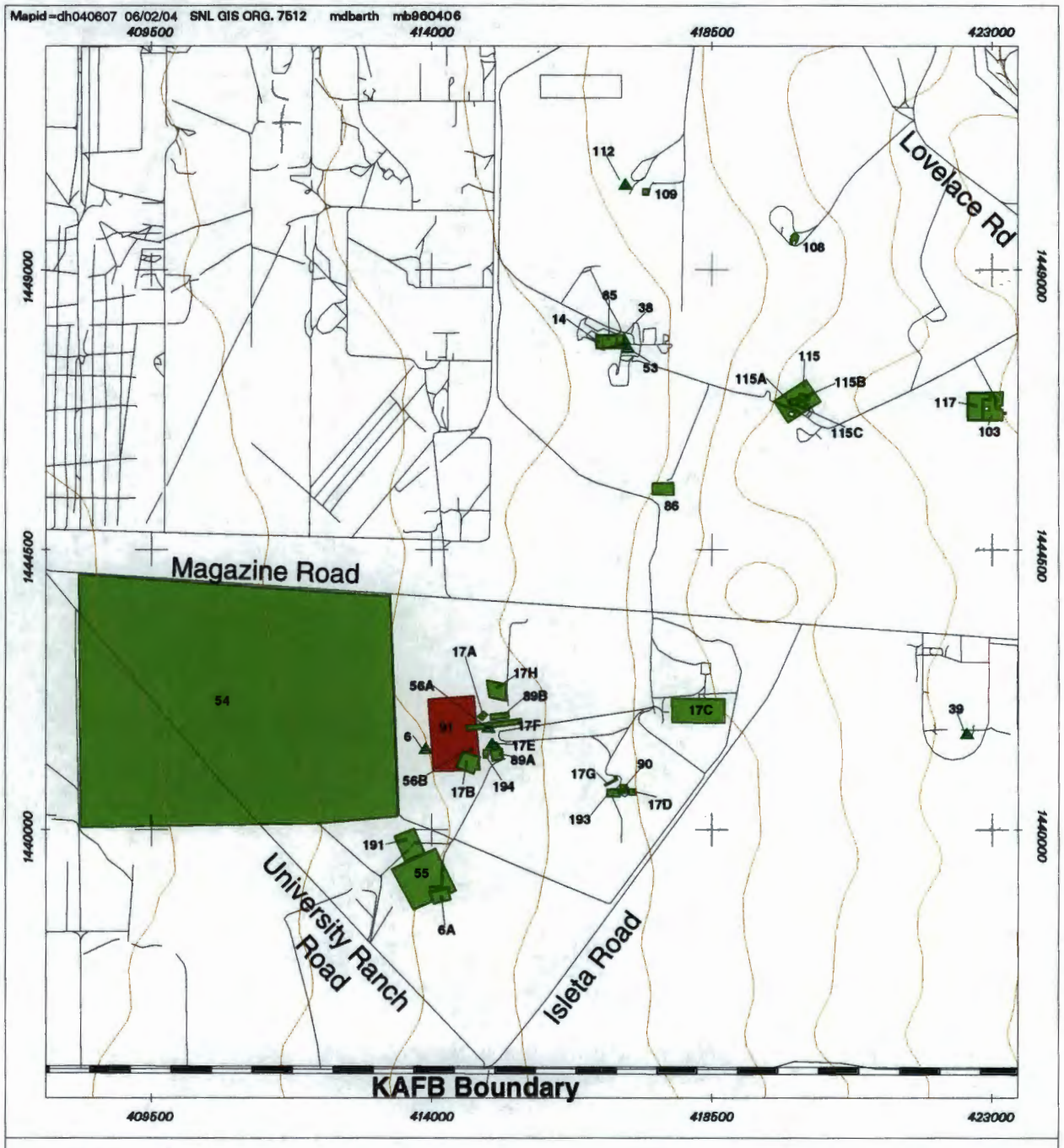

Legend

- 10 ft-Contour
- Road
- KAFB Boundary
- OU1335 SWMU < .1 acre
- Other OU1335 SWMU
- SWMU 91

Figure 2-2
Location of SWMU 91
Lead Firing Site

0 1300 2600
Scale in Feet

0 312 624
Scale in Meters

N

Sandia National Laboratories, New Mexico
Environmental Restoration Geographic Information System

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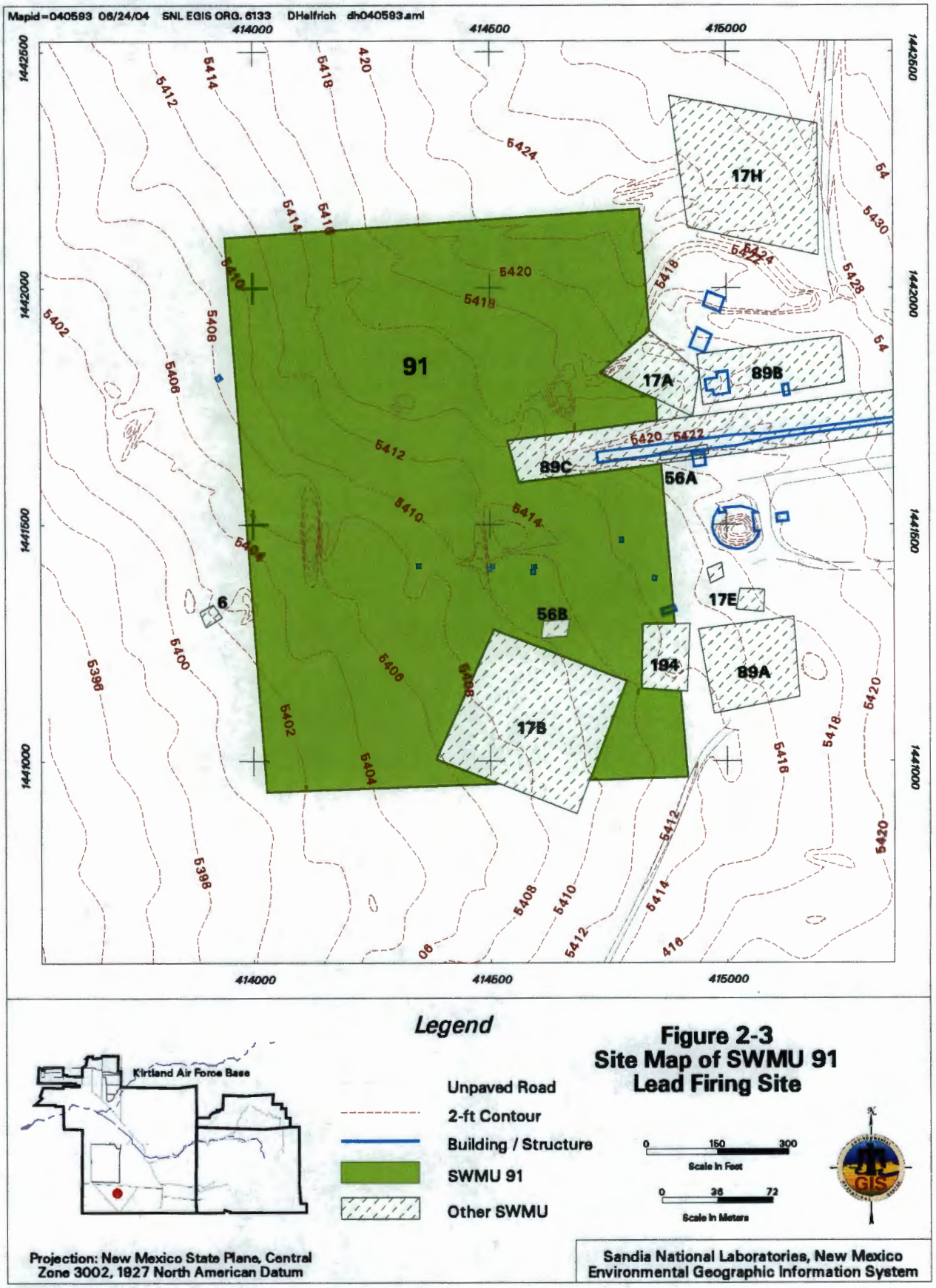

Figure 2-3
Site Map of SWMU 91
Lead Firing Site

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After 1975, flyer plates of various sizes were employed. The flyer plates varied from 1.8 to 5.5 inches in thickness and 12 to 20 inches in diameter and were constructed of aluminum. Explosive charges associated with these tests varied from 200 to 1,000 pounds of C-4 or C-4/nitromethane mix. The flyer plate tests continued into the late 1980s when the program was discontinued. Currently, no explosive testing is performed at SWMU 91.

In order to improve the energy transfer between the explosive and the plate, as well as for increased accuracy in controlling the speed and rotation of the plate, a barrel was developed in 1979 to house the explosive and the flyer plate. The initial barrels were cast iron, but steel-jacketed lead barrels were later used because of the significant procurement time required and higher cost of the cast iron barrels. The lead barrels weighed from 4,000 to 12,000 pounds, depending upon the amount of high explosive (HE) used. Each barrel was placed inside a corrugated pipe buried in the trench where the testing occurred. Another trench constructed perpendicular to the explosive system trench housed instrumentation and camera bunkers thus creating a cross-shaped trench pattern. The trenches were approximately 6 to 8 feet deep at the center point and tapered upwards to local grade at the ends.

2.3 Waste Characteristics

A total of five documented lead barrel/flyer plate tests were conducted using 1,000 pounds of C-4 explosives (5,000 pounds total) and 14,000 pounds of lead (70,000 pounds total). A total of eight documented lead barrel tests were run using 300 pounds of C-4 explosives (2,400 pounds total) and 4,000 pounds of lead (32,000 pounds total).

- Total HE used in documented tests: 7,400 pounds
- Total lead used in documented tests: 102,000 pounds

The barrel was destroyed during each test, and fragmented lead was released to the environment. According to one source, two shock waves were associated with each test. The first shock wave heated the lead to near melting temperatures, then the second shock wave dispersed the lead. The cloud containing the lead and explosive combustion by-products dissipated in a variety of directions, depending upon the local wind direction, dispersing lead contamination over the site. Test debris of varying sizes was also scattered across the site during each test.

2.4 Geology/Hydrology

SWMU 91 lies on the western margin of the Sandia Fault Zone at an elevation of approximately 5,400 feet above mean sea level. The geology underlying the site consists of thick alluvial sediments that overlie deep bedrock. An alluvial fan and piedmont colluvium overlie the Santa Fe Group sediments. Although no monitoring wells currently exist in the immediate area, depth to groundwater is based upon monitoring wells at the Chemical Waste Landfill (CWL), approximately 0.6 miles to the north. Depth to groundwater at the CWL is approximately 480 feet below ground surface (bgs).

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3.0 SUMMARY OF EXISTING DATA

Investigations conducted under the Comprehensive Environmental Assessment and Response Program (DOE September 1987) and the "Final RCRA Facility Assessment Report of Solid Waste Management Units at Sandia National Laboratories, Albuquerque, New Mexico" (EPA April 1987) identified the Flyer Plate Test Site as a potential SWMU. Several investigations have been conducted at SWMU 91 beginning in 1992. Table 3-1 outlines the investigative history of the site and includes a brief description of each investigation with a corresponding summary of the results. This information, along with all relevant analytical data, has been integrated into a revised conceptual site model that forms the basis of the VCA. A complete discussion of previous investigations will be presented in the Investigation Report, which is expected to include include a Corrective Action Complete proposal for SWMU 91 after completion of this VCA.

3.1 Evolution of the Conceptual Site Model

Sections 3.1.1 and 3.1.2 briefly summarize the evolution of the SWMU 91 conceptual site model, which is based upon both newly collected information (1997 to date) as well as a re-evaluation of historic site data and information (pre-1997). The revised conceptual site model forms the basis for the final corrective action approach documented in Chapter 4.0 of this VCA Plan and builds upon lessons learned during the 1996 Voluntary Corrective Measure (VCM) conducted at SWMU 91 (Table 3-1).

3.1.1 Pre-1996 Conceptual Site Model

The initial conceptual site model for SWMU 91 was primarily based upon the documented explosive testing conducted at the site. This testing dispersed test debris and metals contamination, primarily lead, over the ground surface. Although documentation of some explosive testing did occur, many tests were either not documented or the records could not be found.

HE was used extensively at SWMU 91. It is estimated from the number of tests performed and the amount of explosives typically used in each test that a total of approximately 72,400 pounds of HE was detonated from 1962 to the late 1980s. Because the total HE used at SWMU 91 was greater than 2,000 pounds, the site was investigated for HE contamination. The results for samples collected from the test trench bottom and sidewalls for this purpose indicated all nondetections for HE compounds. Based upon the sampling performed to date at the site, lead is the only COC.

The initial conceptual site model assumed lead contamination was distributed in the surface soil in a predictable way, based upon the dispersion and fallout patterns associated with the explosive tests. The nature of the lead contamination was assumed to be predominantly adsorbed to soil, although visible fragments of lead were relatively common on the surface of the site along with other test debris. This model was the basis for the 1996 VCM that was conducted to cleanup both surface debris (visual) and surface soil lead contamination (based upon soil analytical results).

Table 3-1
Investigative History of SWMU 91

Investigation	Timeframe	Description	Results Summary
CEARP[a] and RCRA[b] Facility Assessment	1987 (Pre-ER Project)	SNL/NM-wide assessment of potential SWMUs from past operations and testing programs.	Investigations identified the Flyer Plate Test Site as a potential SWMU based upon past testing history.
Coyote Canyon Test Complex Environmental Assessment[c]	1992 (Pre-ER Project)	Large-scale surface soil sampling project to determine extent of lead and other metals contamination at the site, conducted by Hydrologic & Geoscience Consultants Limited in cooperation with New Mexico State University.	Lead was detected at concentrations ranging from 17.44 to 2,790 mg/kg, with a mean concentration of 342.5 mg/kg. Isoconcentration contour maps were generated from these data that indicated three areas of elevated lead concentrations, which became the focus of the 1996 VCM cleanup effort.
Archival Research and Aerial Photography Analysis[d]	1993–1996	Background investigation, including interviews with former staff that conducted testing at the site and a review of available historic aerial photographs.	Obtained information regarding the FPTP from documentation of individual tests. Additional information was obtained through interviews with former staff involved in the FPTP, historical test photos and technical reports, historical aerial photographs, and site visits.
UXO/HE[e]	1993–1994	KAFB Explosive Ordnance Disposal conducted walkover surveys to clear OU 1335 sites of UXO/HE.	No live UXO/HE or significant UXO/HE debris was found at the site.
Radiological Land Surveys[f]	1993–1994	RUST Geotech Inc. conducted walkover gamma radiation surveys to determine radiological hazards and locate areas with radiation greater than background levels at OU 1335 sites.	No radiological anomalies were found at the site related to past SWMU 91 activities.
Scoping Sampling	1995	Three boreholes were drilled to a depth of 20 ft in the three areas of elevated lead concentrations to determine the vertical extent of contamination.	Lead concentrations in borehole soil samples collected at depths ranging from 5 to 20 ft ranged from nondetect to 17 mg/kg, indicating lead contamination is restricted to the surface and shallow subsurface at the site.
RCRA Facility Investigation[d]	1996	Shallow subsurface samples were collected at 22 locations as part of the RCRA Facility Investigation fieldwork prior to conducting the 1996 VCM.	Lead concentrations ranged from nondetect to 8900 mg/kg. No concentrations of HE compounds were detected in the soil samples.

Refer to footnotes at end of table.

Table 3-1 (Continued)
Investigative History of SWMU 91

Investigation	Timeframe	Description	Results Summary
VCM	1996	Extensive grid sampling and analysis using a field-based X-Ray Fluorescence Laboratory, geophysical survey, and confirmatory sampling to target specific areas at the site with lead concentrations greater than 2,000 ppm in the soil. Removed the soil above this action level for off-site disposal.	Sixteen areas of soil contamination were excavated/scraped generating 450 cubic yards of soil. A total of 276 cubic yards were disposed of off site; 173 cubic yards were left on site after characterization sampling of the soil indicated it passed risk criteria. Five areas in the northern part of the site were excavated to investigate geophysical anomalies, but significant excavation and removal of shallowly buried debris was not performed. The 1996 VCM approach did not adequately address the presence of fine lead particles (<2 mm). As a result, the data obtained did not reflect actual site conditions, and the VCM failed to achieve the objectives based upon confirmatory sample results.
SWMU Reassessment	1997–1999	Evaluated all data generated to date, in particular the 1996 VCM analytical data.	Determined that fine lead particles dispersed through the surface and shallow subsurface soil invalidated the initial conceptual site model that assumed a more uniform, predictable pattern of lead-adsorbed-to-soil contamination scenario. Data gaps were determined and planning to fill those data gaps was performed.
Geophysical Survey	1999	Surveyed spatial gaps from 1996 survey and resurveyed areas excavated during 1996 VCM.	Filled spatial data gaps in the 1996 survey and obtained updated information where excavation had occurred as part of the 1996 VCM.
Post-VCM Sampling	1999	Conducted additional field sampling at specific locations to address high detections of selenium and arsenic, as well as high detection limits associated with some of the historic on-site analytical data. The Test Trench was resampled for HE compounds to verify earlier results with off-site laboratory data.	The off-site analytical results verified soil concentrations for selenium and arsenic were below background and eliminated the high detection limit issue. HE sample results from the Test Trench were all nondetections.

Refer to footnotes at end of table.

Table 3-1 (Continued)
Investigative History of SWMU 91

Investigation	Timeframe	Description	Results Summary
Lead Particle Characterization and Gravity Separation Testing	1999–2000	Laboratory study of soil from three areas of the site to characterize the form and distribution of lead contamination, including fine lead particles (<5mm). Large-volume (~5-gallon) samples were collected from the NBA, Test Trench Area, and Test Trench Bottom and Sidewalls.	Study involved gravity separation of light and heavy soil fractions, particle size distribution analyses of both light and heavy fractions, and total lead analyses of the various fractions. Study confirmed that most lead contamination is in the form of discrete, fine (<5 mm) particles, with most lead particles occurring in the >2.36- to 0.3-mm size fractions. Fine lead particles were most prevalent in the Test Trench Bottom and Sidewalls and least prevalent in the NBA.
Field Test #1	2000	Field checked geophysical survey data and tested debris segregation using a powerscreen. Three areas excavated based upon geophysical results indicating various concentrations of buried debris: a high concentration area, moderate concentration area, and low concentration area. Total lead analyses performed on screened soil.	Geophysical survey data were determined to be reliable indicators of buried debris concentration. Amount of debris, number of lead fragments, and total lead concentrations show good general correlation (area with most debris had most lead fragments and highest total lead concentrations). Debris segregation with the powerscreen was successful using a 2-inch screen. Soil clumps were a problem during the screening operation. Additional lead fragments were removed when soil was further processed through a ½-inch table screen.
Treatibility Testing	2000	Collected large-volume (~5-gallon) samples in the Test Trench Bottom and Sidewalls Area for further characterization and treatability testing. Two bench-scale laboratory treatability tests were conducted: one using Portland cement and the other using a patented additive (EnviroBlend®).	Treatability tests conducted with various mixtures to determine optimum ratios. Both tests were successful and indicated the SWMU 91 soil could be stabilized to pass TCLP analyses using either Portland cement or EnviroBlend®.

[a]DOE September 1987.
[b]EPA April 1987.
[c]SNL/NM September 1992.
[d]SNL/NM March 1996a.
[e]Young and Byrd September 1994.
[f]RUST Geotech Inc. December 1994.

Table 3-1 (Concluded)
Investigative History of SWMU 91

CEARP = Comprehensive Environmental Assessment and Response Program.
ER = Environmental Restoration.
FPTP = Flyer Plate Testing Program.
ft = Foot (feet).
HE = High explosive.
KAFB = Kirtland Air Force Base.
mg/kg = Milligram(s) per kilogram.
mm = millimeter(s).
NBA = Northern Burial Area.
OU = Operable Unit.
ppm = Part(s) per million.
RCRA = Resource Conservation and Recovery Act.
SNL/NM = Sandia National Laboratories/New Mexico.
SWMU = Solid Waste Management Unit.
TCLP = Toxicity characteristic leaching procedure.
UXO/HE = Unexploded ordnance/high explosives.
VCM = Voluntary corrective measure.

3.1.2 Post-1996 Voluntary Corrective Measure Conceptual Site Model Development

Based upon a detailed analysis of the 1996 VCM results and all data collected through completion of the VCM, it was determined that the site had not been adequately characterized. In particular, the initial conceptual site model did not adequately account for the occurrence of very small (less than 5 millimeters [mm]) lead particles in the soil. Very high (greater than 2,000 mg/kg) concentrations of lead were reported for several confirmatory samples collected following the 1996 VCM. Further evaluation determined these results were due to the occurrence of small lead particles in the soil sample ("nugget effect"). To address this problem, additional data were collected to fill critical gaps and better define the nature and extent of lead contamination; older analytical data sets were re-evaluated to develop a revised conceptual site model.

As part of this effort, the site was subdivided into three main areas based upon site history and testing practices, the distribution of buried debris (geophysical surveys), and the analytical results from more than 600 soil samples. These areas consist of: 1) Test Trench Bottom and Sidewalls, 2) Test Trench Area, and 3) Northern Burial Area (NBA) (formerly referred to as Subarea 1 in the 1996 VCM Plan). Each area is illustrated in Figure 3-1. The Test Trench Bottom and Sidewalls (hereafter referred to as the Test Trench Burial Area [TTBA])is the immediate area where the explosive tests were performed (i.e., the test trench feature itself). The Test Trench Area comprises the southern half of the site surrounding the test trench and includes miscellaneous dispersed shallow burial areas. To avoid confusion with theTTBA, this area is hereafter referred to as the Southern Burial Area (SBA). The NBA comprises the northern half of the site and defines the part of SWMU 91 where more extensive shallow burial of test debris occurred.

A critical aspect of the historic testing practices not fully accounted for in the initial conceptual site model was the movement and shallow burial of test debris and related surface soil to the north of the test trench after tests were completed. This was performed as part of site cleanup activities and was accomplished with bulldozers or similar heavy equipment according to interviews with former site workers (SNL/NM March 1996a). Geophysical results and direct excavation indicate burial was typically less than 2 feet bgs and did not involve organized disposal trenches or pits. This activity resulted in the disruption of the local surface and any test fallout patterns that might have been present. In addition, the movement and shallow burial of soil and test debris had the effect of mixing clean soil with surface soil directly impacted by the testing.

The following subsections briefly summarize the information used to develop the revised conceptual site model and final corrective action approach presented in Chapter 4.0. A more detailed presentation of this information will be provided in the Investigation Report following completion of the VCA.

3.1.2.1 Nature of Lead Contamination

Soil samples (approximately 5 gallons each) were collected in 1999 from the three main areas at SWMU 91 and were subjected to "float-sink" testing to determine the nature of lead contamination. Total lead analyses of the "float fraction" (lower specific gravity soil/sediment) ranged from 11 to 97 mg/kg. Total lead analyses of the "sink fraction" (higher specific gravity

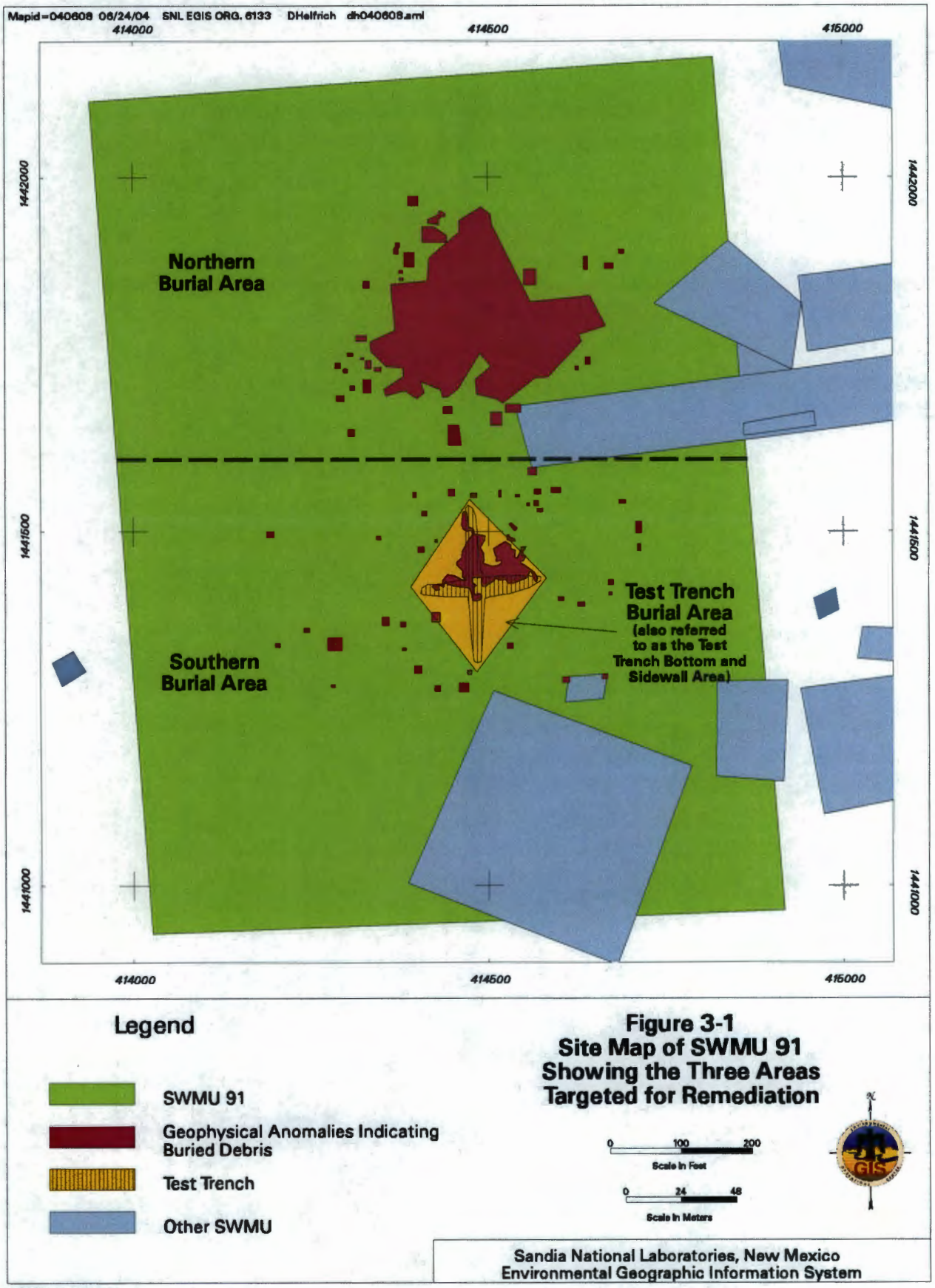

Figure 3-1
Site Map of SWMU 91 Showing the Three Areas Targeted for Remediation

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soil/sediment) ranged from 170 to 360,000 mg/kg. Weighted averages of the analytical results for the samples indicated that the TTBA was most contaminated (995 mg/kg), followed by the SBA (326 mg/kg), then the NBA (77 mg/kg).

Based upon the results of this study, the lead at SWMU 91 occurs mainly as "free particles" not bound to soil. The distribution of fine lead particles decreases with grain size; lead particles are most prevalent in the 0.3 to 2.36 mm range. In terms of the three defined areas, fine lead particles are most prevalent in the TTBA and least prevalent in the NBA.

3.1.2.2 Characterization of Lead Distribution in the Three Areas

All laboratory analytical results for soil samples collected at SWMU 91 since 1992 that are representative of the site were grouped according to the three areas. The only analytical results that were eliminated from this analysis are the results associated with soil that was removed as part of the 1996 VCM. Results for each of the three areas were averaged and are represented using the 95% upper confidence limit (UCL) of the mean concentration, which is presented as follows:

- TTBA (91 samples): 95% UCL of the mean concentration equals 756 mg/kg
- SBA (71 samples): 95% UCL of the mean concentration equals 482 mg/kg
- NBA (173 samples): 95% UCL of the mean concentration equals 505 mg/kg

This data set is in general agreement with the "float-sink" data and indicates that the TTBA is the most contaminated of the three areas. In addition, it is the only area that slightly exceeds the 750 mg/kg cleanup goal based upon the 95% UCL of the mean concentration using all available data.

3.1.2.3 Vertical Extent of Buried Debris and Fine Lead Particles

Geophysical surveys (EM-61) clearly show the location (distribution) and approximate depth of the buried test debris. Depth of burial is generally less than 2 feet bgs based upon the geophysical survey and results of Field Test #1 (Table 3-1).

In areas that have not been disturbed at the site, fine lead particles are concentrated in the upper 6 inches of the soil. Where grading and burial have occurred, the particles have also been mixed and buried and are generally present in the upper 2 feet of the soil. In most cases where subsurface samples were collected (including beneath the TTBA), the lead concentration decreases rapidly with depth.

3.1.2.4 Results of Field Test #1

Field Test #1 was conducted to verify the revised conceptual site model and test the debris segregation process using a mechanical powerscreen. Three areas within the NBA were selected for the field test based upon the geophysical survey results. These included the following:

- Dig Area 1–Large anomaly,
- Dig Area 2–Medium anomaly, and
- Dig Area 3–"Clean area" but proximal to anomalous areas.

At each area, a 10- by 10-foot square was excavated to a depth of 2 to 3 feet. Excavated soil/debris was run through a powerscreen with a 2-inch bottom screen size. Four soil samples were collected for total lead analysis from the screened soil resulting from each dig area. The four samples per screened soil pile were homogenized (ball milled) prior to analysis, and the results for each dig area soil pile were averaged to determine the representative total lead concentration.

The results of Field Test #1 indicate a general correlation between amount of test debris, lead fragments (greater than 2 inches), and total lead concentrations in the soil for each dig area, summarized as follows:

- Dig Area 1 contained the most debris (a total of 22 lead fragments) and had the highest average total lead concentration of 448 mg/kg.

- Dig Area 2 contained moderate debris (a total of 6 lead fragments) and had an average total lead concentration of 395 mg/kg.

- Dig Area 3 contained minimal debris (no lead fragments) and had the lowest average total lead concentration of 140 mg/kg.

As part of Field Test #1, approximately 3 cubic yards of Dig Area 1 soil that was processed through the 2-inch powerscreen was subsequently processed through a ½-inch table screen. The purpose of this effort was to determine whether screening site soil to ½ inch would result in the removal of additional lead fragments. Approximately 20 lead fragments were removed by the ½-inch screen, along with other miscellaneous small debris items.

The results of Field Test #1 demonstrated that the geophysical data are reliable indicators of buried debris and the depth of burial and confirm that lead fragments are co-located with other metallic test debris. The powerscreen was very effective for removing debris greater than 2 inches in diameter. Additional soil processing with a ½-inch table screen indicated that significant additional lead fragment removal may be accomplished by using a smaller screen size (½-inch versus 2-inch).

3.1.2.5 Treatability Study Testing

Two separate treatability studies have been conducted on SWMU 91 soil from the TTBA Area. Previous characterization work (Section 3.1.2.2) indicated the TTBA contained the highest concentration of fine lead particles. The objective of the treatability studies was to evaluate the use of EnviroBlend® and Portland cement and to determine whether these additives could effectively stabilize the lead contamination. The studies tested various formulations and dosages of stabilization chemistry and determined optimum mixtures based upon Toxicity Characteristic Leaching Procedure (TCLP) results. Both studies were successful and verified that in all cases both the EnviroBlend® and Portland cement were effective in stabilizing the lead contamination in SWMU 91 soil to below the TCLP leachable lead limit of 5.0 mg/kg.

3.1.3 Revised Conceptual Site Model Overview

The key elements of the revised conceptual site model for SWMU 91 are summarized as follows:

- The site has been subdivided into three main areas based upon the site history, presence of buried debris, and the distribution of fine lead particles. These areas consist of 1) TTBA, 2) SBA, and 3) NBA.
- The only COC at the site is lead. Contamination also occurs at the site in the form of buried test debris (solid waste).
- Lead soil contamination is largely in the form of discrete, fine particles in the size range of 0.075 to 5 mm. The larger lead fragments (greater than ½ inch) are co-located with buried test debris.
- Shallow burial of test debris, including larger lead fragments, was focused in the NBA, which also served as a source for topsoil used to cover the lead barrel during tests. Significant mixing of the near-surface soil took place in the NBA as a routine part of "test setup" and "test cleanup" operations. Depth of burial is generally 2 feet or less. Contamination associated with fine lead particles is also confined to these depths in the NBA.
- The distribution of fine lead particles is not uniform. Most fine lead particle contamination is concentrated in the immediate vicinity of the TTBA. Fine lead particles are present in the SBA and NBA, but are more dispersed (i.e., not concentrated). For the NBA, this is probably due in part to the surface soil with fine lead particles being mixed with clean soil as grading and earth moving took place.
- Due to the form of the lead contamination (fine particles), it is very difficult to identify and isolate smaller, localized areas of contamination within the three main areas using conventional, reliable analytical methods.
- To address the nugget effect in soil samples, EPA guidance for homogenizing sample materials (ball milling) should be followed (EPA March 1995).

3.1.3.1 Potential Contaminant Migration Pathways, Exposure Pathways, and Receptors

The potential contaminant migration pathways at SWMU 91 include air, subsurface soil, surface water, and (secondarily) groundwater. Based upon the physical characteristics of SWMU 91 and the nature and extent of contamination, the only media of concern is surface/shallow subsurface soil. The primary exposure pathways for the site receptors (industrial worker and native animal species) are ingestion of soil, and to a lesser extent, dermal contact with soil. Contaminated surface-soil material could also become airborne, but because of the relatively high specific gravity of the discrete lead particles, this is not a viable exposure pathway.

Because there are no primary arroyo channels located in the near vicinity of SWMU 91, the surface-water pathway is not relevant. In addition, there is limited precipitation (less then 9 inches per year) and high evaporation (98 percent of total rainfall), which results in negligible runoff. Limited precipitation, high evapotranspiration, and the depth to groundwater (estimated to be approximately 480 feet bgs) preclude groundwater as a viable exposure pathway.

3.2 Regulatory Interaction

Between August 1999 and May 2000, a series of three meetings took place between ER Project and NMED personnel. The objectives of the meetings were to present the current understanding of SWMU 91, present new information as it became available, and to discuss key issues with NMED that would determine the path to final corrective action. These discussions culminated at the May 16, 2000, meeting in which the following items were discussed:

- The revised conceptual site model,
- The results of Field Test #1,
- Cleanup level for lead,
- Ball milling soil prior to laboratory analysis for total lead according to EPA guidance (EPA March 1995),
- Various final remediation (VCA) approaches, and
- Final confirmatory soil sampling objectives.

Based upon discussions with the NMED, the lead cleanup goal of 750 mg/kg was established. Based upon the revised conceptual site model addressing the occurrence of fine lead particles, it was agreed that individual sample results might exceed 750 mg/kg. However, the 95% UCL of the mean concentration calculated for each of the three areas of the site using final confirmatory analytical results must be 750 mg/kg or less.

The results of the May 16, 2000, meeting were summarized in a formal memorandum distributed to all meeting participants (Mitchell July 2000). Subsequent informal discussions focused primarily on final verification sampling details. Due to funding issues at the time (2000), final planning and field implementation were delayed until 2004.

3.3 Voluntary Corrective Action Approach

The VCA approach presented in this plan consists of source removal based upon the revised conceptual site model presented in Section 3.1.3. Approximately 7,500 cubic yards of soil and debris will be excavated from the shallow subsurface of the three defined areas and segregated using a combination of heavy equipment, mechanical powerscreen, conveyor system, and waste segregation field personnel. For purposes of this VCA, debris is defined as material greater than ½ inch in diameter. The distribution of buried debris is defined by site geophysical surveys. Confirmatory geophysical surveys will be conducted to verify the debris removal.

Confirmatory soil samples will be collected from both the excavated areas (in situ soil) and from the soil piles generated during the mechanical screening process. All confirmatory soil samples will be homogenized according to EPA guidance (EPA March 1995) using a ball mill or similar approach and analyzed at an off-site laboratory for total lead concentration. The confirmatory analytical results for excavated areas (in situ soil samples) will be grouped by the three areas, and the 95% UCL of the mean concentration will be calculated. As long as the 95% UCL of the

mean concentration is equal to or less than 750 mg/kg for total lead, no additional corrective action will be required for the excavated areas. If the 95% UCL of the mean concentration is greater than 750 mg/kg, the need for additional corrective action will be discussed with the NMED.

The confirmatory analytical results for the mechanically screened soil piles will be compared directly to the 750 mg/kg total lead cleanup goal. Soil piles with analytical results equal to or less than 750 mg/kg total lead will be returned to the site. If the analytical result(s) for a soil pile is greater than 750 mg/kg, additional investigation of the soil pile will be performed to determine final disposition as discussed in Section 4.2.3.

Based upon the revised conceptual site model, two of the three areas of SWMU 91 (NBA and SBA) are well below the 750 mg/kg total lead soil cleanup goal, based upon the 95% UCL of the mean concentration calculated for soil sample results characterizing these two areas (Section 3.1.2.2). The calculated 95% UCL of the mean concentration for the sample results characterizing the TTBA is 756 mg/kg total lead. Although this calculated result is slightly higher than the cleanup goal, none of these samples were homogenized to address the impact of fine lead particles. The impact of the nugget effect in the analytical results is to skew the 95% UCL of the mean concentration higher. As part of this VCA, confirmatory samples collected from the TTBA will be homogenized and the analytical results used to determine whether additional action(s) are required.

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4.0 SWMU 91 VCA

The SMWU 91 VCA involves the excavation and mechanical separation of lead fragments and other test debris greater than ½ inch in diameter from soil within the NBA, the SBA, and the TTBA. Excavation will occur where geophysical survey results indicate the presence of buried debris. After the lead fragments and debris are mechanically separated from the soil, confirmatory soil sampling of the excavated areas and resulting screened soil will be performed as described in Sections 4.2.2 and 4.2.3, respectively. Lead fragments separated from other debris will be managed for recycling by the SNL/NM Lead Reuse Program, and the other debris will be recycled or disposed of at an appropriate facility.

After all corrective action activities are completed, the entire SWMU 91 area impacted by VCA activities will be regraded and revegetated.

The following corrective action objectives have been developed for the SWMU 91 VCA:

1. Removal of Lead Fragments and Test Debris: Excavation and removal of lead fragments and test debris greater than ½ inch in diameter from the shallow subsurface soil in locations determined by geophysical survey results.

2. Verification of Cleanup Goal: Total lead concentration equal to or less than 750 mg/kg by area based upon the 95% UCL of the mean concentration calculated for the corresponding area confirmatory data set (in situ samples). Soil pile data will be evaluated separately from in situ excavation area soil data.

Achievement of Corrective Action Objective 1 will be verified through geophysical surveys and documentation of the segregation effort. Achievement of Corrective Action Objective 2 will be verified through confirmatory sampling of both the excavated areas (in situ soil) and the excavated/screened soil to be returned to the site.

4.1 Removal of Lead Fragments and Test Debris

4.1.1 Excavation

The geophysical survey results will be used to guide the excavation of buried debris in each of the three areas of SWMU 91. The locations of buried debris in the three defined areas are shown in the geophysical survey map included as Attachment 1. The depth of excavation is assumed to be 2 feet. The following information and Attachment 1 summarize the excavation/removal scope for the NBA, SBA, and TTBA.

- The NBA contains the highest concentration of buried debris. The debris buried in the NBA includes a wide range of materials in varying sizes. The largest of these areas, NBA-1, covers approximately 46,400 square feet. In addition to NBA-1, 29 other burial areas occur within the NBA ranging in size from 14 to 680 square feet. Approximately 4,900 cubic yards of debris and soil will be excavated for processing through the mechanical screen.

- The SBA contains smaller, discrete burial areas that are less concentrated than the NBA. The geophysical anomalies associated with the SBA appear to be more indicative of isolated items. The largest of these areas, SBA-25, covers approximately 380 square feet. In addition to SBA-25, 37 other burial areas occur within the SBA ranging in size from 15 to 160 square feet. Approximately 300 cubic yards of debris and soil will be excavated for processing through the mechanical screen.
- The TTBA contains discrete burial areas and the remainder of the test trench. The debris buried in the TTBA is expected to be test materials blown into the ground during test activities. The TTBA covers approximately 14,500 square feet, and is comprised of the north-south and east-west intersecting trenches as well as adjacent anomalies. Approximately 2,600 cubic yards of debris and soil will be excavated for processing through the mechanical screen.

The results of Field Test #1 indicate that the depth of burial does not exceed 2 feet bgs at the site; therefore, the initial target excavation depth will be 2 feet bgs. Hand-held metal detectors and visual inspection will be used to verify removal of debris. If debris is detected below 2 feet, the immediate area containing the debris will be excavated until removal is verified. A track-type tractor, motor grader, tracked excavator, wheeled loader, or combination of similar equipment will be used to push/pile excavated material into large load-out piles. Soil excavated from isolated geophysical anomalies outside the larger, main excavation areas may be transported to an adjacent load-out pile using a dump truck or front-end loader. The load-out piles will be positioned to minimize the distance required to transport the excavated soil to the mechanical screen for processing. All excavated soil will remain within the area from which it was excavated. In other words, excavated NBA soil and debris will not be combined or staged with SBA soil. Any identifiable lead fragments exhumed during excavation will be separated and managed in accordance with applicable sections of SNL/NM's Environmental Health and Safety Manual, Section 10L – Management of Excess Metallic Lead, until the lead can be recycled or reused through SNL/NM's Lead Reuse Program or other outside vendor.

Prior to beginning excavation activities, an earthen berm will be constructed around the perimeter of the area being excavated using native materials to minimize storm water run-on/runoff. If sheet flow at the site cannot be directed using earthen berms, other suitable storm water controls, such as rock, straw bales, and/or silt fencing, will be installed in locations requiring additional support.

4.1.2 Mechanical Screening of Excavated Soil

After excavation and creation of load-out piles within a burial area, the separation of lead fragments and test debris greater than ½ inch from soil will be performed using a mechanical powerscreen unit equipped with ½-inch mesh lower screen. Soil from various excavations within a burial area will be combined during the screening process; however, soil excavated from different burial areas will be kept separate. Based upon mechanical screening experience from the CWL site, soil and debris will be screened to 2 inches prior to processing through a ½-inch mesh screen.

Soil and debris will be placed onto the mechanical screen using a rubber tire loader. All material greater than ½ inch will be segregated and staged as debris for further segregation,

recycling, or disposal. Any identifiable lead fragments isolated during the mechanical separation process will be managed in accordance with applicable sections of SNL/NM's Environmental Health and Safety Manual, Section 10L – Management of Excess Metallic Lead. In addition to the debris greater than ½ inch, rocks and soil clumps are expected to be present in the screened debris. Rocks and soil clumps will be handled and processed as described in Sections 4.3.4 and 4.3.5.

4.1.3 Soil Pile Management

All soil excavated from SWMU 91 will be screened and segregated into operationally efficient piles, typically 50 or 100 cubic yards, for sampling. The soil piles will not be covered, but water or dust control solution may be sprayed on the piles during periods of strong winds to control dust. Soil piles awaiting analytical evaluation will be staged on the excavated surface of the site or on top of unexcavated anomalies. A marker will be inserted on each soil pile displaying the corresponding site-specific sample identification number inscribed in permanent ink or paint that contrasts with the marker background. Additionally, the approximate location of each soil pile and site confirmatory sample location will be tracked using a sample logbook and site map.

4.2 Verification of Corrective Action Objectives

4.2.1 Removal of Debris

The removal of debris greater than ½ inch will be verified using hand-held metal detectors, visual inspection, documentation of the mechanical screening process, and a confirmatory EM-61 geophysical survey(s). As individual geophysical anomalies are excavated in a burial area, a hand-held metal detector and visual inspection will be used to verify debris removal in the immediate vicinity. After completing the excavation, confirmatory sampling, backfilling, and regrading of a burial area, an EM-61 geophysical survey will be performed to complete the verification process. Based upon the relatively common occurrence of small (less than ½ inch in diameter) ferrous metal in the shallow subsurface of SWMU 91, such as nails and small wire, only anomalies indicating a significant debris item or concentration of debris will be further investigated and removed.

4.2.2 Verification of Cleanup Goal—Excavated Areas

Confirmatory soil samples will be collected from the floor of the excavated burial areas to confirm the in situ soil meets the cleanup goal for total lead concentration. The soil samples will be analyzed for lead, and the results will be grouped by burial area. An excavated area will meet the cleanup goal once the analytical results confirm that the total lead concentration for the burial area is equal to or less than 750 mg/kg, based upon the 95% UCL of the mean concentration calculated for the corresponding confirmatory data set. These data will be used to confirm previous sampling results and the revised conceptual site model, which indicates these areas should already be at or below the cleanup goal. In situ soil sample results and soil pile confirmatory sample results for individual burial areas will not be combined for conservatism, because the soil pile samples are expected to have a higher lead concentration

than the in situ soil beneath the corresponding excavated area. Soil sampling procedures, sample management, and DQOs are discussed in Section 4.4.

In the NBA, a 60-foot grid will be established on the excavation floor of NBA-1, and a grab sample will be collected from the node of each grid point. In addition to the grid-based sampling, confirmatory samples will be collected from all excavation areas outside NBA-1 that are greater than 100 square feet. Approximately 30 confirmatory soil samples are expected to be collected from the NBA.

Due to the size of the geophysical anomalies in the SBA, confirmatory grab samples will be collected from all excavation areas greater than 100 square feet. In addition to the size-specific sample locations, the floor of eight to ten smaller excavated locations will be sampled. The additional sample locations will be selected to achieve a representative overview of conditions in the SBA. A minimum of 16 confirmatory samples will be collected from the SBA.

In the TTBA, a 30-foot grid will be established on the excavation floor for confirmatory soil sample collection. The more closely spaced, 30-foot grid was selected due to the size of the TTBA and previous sampling results that indicate this part of SWMU 91 is very close to the cleanup goal. A grab sample will be collected from the node of each grid point. Approximately 16 confirmatory samples are expected to be collected from the TTBA.

If the cleanup goal is not achieved based upon confirmatory sample results, additional sampling may be performed. Another option would be to excavate and dispose of the highest lead concentration soil as waste and resample that excavated location.

4.2.3 Verification of Cleanup Goal–Screened Soil Piles

Confirmatory soil samples will be collected from the soil piles after completing the mechanical screening process to remove lead fragments and test debris greater than ½ inch in diameter. The soil pile confirmatory samples will be analyzed for lead, and the results compared to the 750 mg/kg total lead cleanup goal. The minimum sampling frequency for soil piles will be one sample per 50 cubic yards. A total of 150 soil pile samples are expected to be collected for all three burial areas combined.

If the analytical result(s) characterizing a soil pile are equal to or less than 750 mg/kg, that soil pile will be returned to the excavated area. If the analytical result(s) characterizing a soil pile are greater than 750 mg/kg, that soil pile will be further investigated to determine final disposition. Further investigative steps may include reprocessing the soil pile through the mechanical screen, resampling of the soil pile, and/or off-site disposal.

All soil piles for a specific burial area will be regraded in that same burial area as long as the cleanup goal is achieved. These data will be used to confirm previous sampling results and the revised conceptual site model, which indicates these areas should already be at or below the cleanup goal. Soil sampling procedures, sample management, and DQOs are discussed in Section 4.4.

4.3 Waste Management

The following types of wastes are expected at SWMU 91:

- Screened debris (greater than ½ inch) including wood, metals, plastics, glass, and concrete, and
- Personal protective equipment (PPE) and project waste.

Other materials that are not waste will also be generated from remediation activities. These materials include the following:

- Lead fragments (greater than ½ inch),
- Rocks, and
- Soil clumps.

4.3.1 Screened Debris

After the debris has been mechanically separated from the excavated soil, it will be stockpiled for segregation within the operational boundary of SWMU 91. The debris pile will not be covered but may be partially isolated using cement barriers to delineate the segregation area and aid in transfer during the segregation process. The segregation process will involve a conveyor belt, waste management technicians, and a skid loader. The conveyor belt will be set up adjacent to the debris pile. The skid loader will transport the debris to the conveyor belt feed hopper in a bucket and release the debris onto the belt in an even distribution of material across the belt surface. The waste management technicians will stop the conveyor belt once it is full and remove all debris from the belt. The debris removed from the belt will be placed into appropriate containers according to debris category. Segregated debris will not be sampled. The debris will be segregated according to final disposal requirements. Any soil remaining on the belt will be allowed to exit the belt where it will be removed by the skid loader and added to backfill piles for sampling. Debris segregation will begin during or following the soil screening operation.

4.3.2 Personal Protective Equipment and Project Waste

PPE and waste produced during VCA remediation activities at SWMU 91 will be managed in accordance with applicable SNL/NM waste disposal guidelines contained in the Environmental Safety and Health Manual (Reference).

4.3.3 Lead Fragments

All lead fragments generated from excavation, screening, or segregation at SWMU 91 will be managed in accordance with applicable sections of SNL/NM's Environmental Health and Safety Manual, Section 10L – Management of Excess Metallic Lead. Identifiable lead fragments will be stored in clearly labeled and sealed drums. Lead fragments may be temporarily stored on waterproof plastic wrap that entirely covers the top, bottom, and sides of the metallic lead.

4.3.4 Rocks

Rocks excavated during remediation activities will be incorporated into the soil used for backfill.

4.3.5 Soil Clumps

Soil clumps and vegetation generated during the excavation, screening, or segregation of SWMU 91 soil will be broken up and returned to the site as backfill. In order to minimize the volume of soil present in the debris segregation process, the debris pile will be spread out on the site floor to an appropriate thickness (approximately 6 inches), and then traversed using an excavator, bulldozer, or other tracked vehicle. Any large debris items or identifiable lead fragments will be separated from the soil/debris before using a tracked vehicle. Once the equipment traverses the debris, it will be scooped up into a loader bucket and passed through the ½-inch mechanical screen a second time. The resulting debris will be relatively free of soil clumps that will facilitate the identification and segregation of debris.

4.4 Site Sampling

This VCA addresses contaminant source removal. The sampling activities at the site will include sampling of screened soil generated from excavation and confirmatory sampling of the excavated areas. This section presents the data collection procedures for this project. Soil sampling data and results of geophysical surveys will determine whether project objectives have been met. Specific field and laboratory procedures associated with the VCA will be specified in a separate field implementation plan.

All samples collected will be delivered to the SNL/NM Sample Management Office (SMO) for shipment to the analytical laboratory. Every sample collected at the site will be recorded using a SMO Analysis Request/Chain of Custody (AR/COC) form and tracked according to the AR/COC number. Sampling personnel will follow SMO protocol for completing AR/COC forms and sample labeling requirements. In addition to the SMO sample identification requirements, each sample will be assigned a site-specific identification number consisting of the site number, area identification, six digit date code, and pile number (e.g., 91-NBA-060504-001 for the first soil pile sample collected on June 5, 2004, from the northern section of SWMU 91).

Disposable polyethylene-type scoops will be used to collect the soil samples. Each scoop will be used only once per pile or site confirmatory location. Used scoops will be cleaned until all visible signs of contamination have been removed. Following decontamination, the used scoops will be disposed of as solid waste.

4.4.1 Data Quality Objectives

The primary DQO for the VCA confirmatory sampling program is to produce defensible analytical results. Confirmatory samples will be collected from excavated areas and from stockpiled soil piles. The samples will be analyzed for total lead using EPA Method 6010. Approximately 39 site confirmatory samples and 150 soil pile samples will be collected for analysis from the site.

Laboratory data for verification used for this project will require an analytical Level III data package provided by an off-site laboratory. Inorganic compound analyses shall be performed by the laboratory using EPA procedures contained in the most recent edition of "Test Methods for Evaluating Solid Waste" (SW-846) (EPA November 1986) or equivalent, nationally recognized, validated analytical methods.

Laboratory data will be evaluated using EPA SW-846 criteria and the SNL/NM ER Project "Data Validation Procedure for Chemical and Radiochemical Data" (AOP [Administrative Operating Procedure] 00-03) (SNL/NM December 1999). This SNL/NM procedure was developed in accordance with the EPA "Contract Laboratory Program National Functional Guidelines For Inorganic and Organic Data Review" (EPA February 1994).

4.5 Site Restoration

Once soil sample results have confirmed the soil piles intended for use as site backfill material are at or below the cleanup goal of 750 mg/kg of lead, backfill activities will begin. Soil piles meeting the criteria for backfill will be spread out over excavated surfaces in lifts using a bulldozer or equivalent heavy equipment. Additional soil required to backfill areas where soil has been removed for off-site disposal will be acquired from a borrow pit in TA-III. Approximately 3,500 cubic yards will be required to backfill the trench to grade. Water will be added to backfill material to control dust and achieve soil compaction levels comparable to natural conditions. After backfill and grading of the site have been completed, disturbed areas will be seeded with a native seed blend.

4.6 Project Schedule

The following proposed VCA schedule has been developed to ensure submittal of the Final Investigation Report to the NMED by June 30, 2005, as required by the Compliance Order on Consent (NMED April 2004).

Activity	Begin Date	End Date
Submit SWMU 91 VCA Plan to NMED	Not Applicable	07-06-04
Perform Site Preparations for VCA	07-12-04	07-26-04
Implement VCA Fieldwork Activities	07-27-04	09-28-04
Complete Site Restoration	09-29-04	10-12-04
Submit Final Investigation Report	Not Applicable	06-30-05

4.7 Health and Safety Requirements

Field activities associated with this project will be performed under the Southwest Test Area, OU 1335 Health and Safety Plan (HASP) (SNL/NM March 1996b) and a HASP Addendum. The HASP Addendum will be completed prior to the commencement of fieldwork. Emergency phone numbers and route-to-hospital maps will be posted in the SWMU 91 field office during project fieldwork. An initial health and safety briefing will be conducted at the beginning of the project, and daily tailgate safety meetings will be performed to address specific concerns for the daily activities.

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ATTACHMENT 1
Geophysical Survey Map

TO VIEW THE MAP/MAPS ASSOCIATED WITH THIS DOCUMENT PLEASE CALL THE HAZARDOUS WASTE BUREAU AT 505-476-6000 TO MAKE AN APPOINTMENT